

Analizador Léxico

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Análisis Sintáctico

Se hizo un analizador sintáctico con la ayuda de la herramienta de Bison, para el lenguaje C y que corre en C, este analizador trabaja en conjunto con Flex, para tomar los tokens que este le otorga y revisar con las gramáticas que les sean ingresadas.

Bison

jaajaj

Código Preprocesado (Sin Pretty Print)

```
1
2
3
4
5 static int Hres ;
6 static int Vres ;
7 static int maxAA ;
8 static int maxReflection ;
9 static int maxTransparency ;
10 static long double rays = 0 ;
11 static long double similar = 0 ;
12 static long double Xmax ;
13 static long double Ymax ;
14 static long double Xmin ;
15 static
```

Código Preprocesado (Sin Pretty Print)

```
1 long double Ymin ;
2 static long double Xdif ;
3 static long double Ydif ;
4 static long double Ia ;
5 static long double e ;
6 static int debug = 0 ;
7 static int rec = 0 ;
8 struct Color {
9 long double r ;
10 long double g ;
11 long double b ;
12 } ;
13 struct Point2D {
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double u ;  
2 long double v ;  
3 } ;  
4 struct Point3D {  
5 long double x ;  
6 long double y ;  
7 long double z ;  
8 } ;  
9 struct Vector {  
10 long double x ;  
11 long double y ;  
12 long double z ;  
13 } ;  
14 struct
```

Código Preprocesado (Sin Pretty Print)

```
1 Light {  
2 long double Xp ;  
3 long double Yp ;  
4 long double Zp ;  
5 long double c1 ;  
6 long double c2 ;  
7 long double c3 ;  
8 long double lp ;  
9 } ;  
10 struct Object {  
11 long double Xc ;  
12 long double Yc ;  
13 long double Zc ;  
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double other ;  
2 struct Vector directionVector ;  
3 long double extraD ;  
4 long double Xother ;  
5 long double Yother ;  
6 long double Zother ;  
7 long double Kd ;  
8 long double Ka ;  
9 long double Kn ;  
10 long double Ks ;  
11 long double o1 ;  
12 long double o2 ;  
13 long double o3 ;  
14 long
```


Código Preprocesado (Sin Pretty Print)

```
1 double A ;  
2 long double B ;  
3 long double C ;  
4 long double D ;  
5 long double E ;  
6 long double F ;  
7 long double G ;  
8 long double H ;  
9 long double I ;  
10 long double J ;  
11 int pointAmount ;  
12 long double D1 ;  
13 long double D2 ;  
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double K1 ;
2 long double K2 ;
3 long double height ;
4 struct Color color ;
5 struct Point2D * points2D ;
6 struct Point3D * points3D ;
7 struct Vector ( * normalVector ) ( ) ;
8 struct Intersection ( * intersectionFuncion ) ( ) ;
9 struct Color ( * retrieveTextureColor ) ( ) ;
10 struct Vector x0y0z0 ;
11 struct Vector x1y1z1 ;
12 struct Vector x2y2z2 ;
13 struct Vector x3y3z3 ;
14 int
```

Código Preprocesado (Sin Pretty Print)

```
1 numberPlaneCuts ;
2 int numberTextures ;
3 int numberDraftPlanes ;
4 struct PlaneCut * planeCuts ;
5 struct Texture * textures ;
6 struct DraftPlane * draftPlanes ;
7 } ;
8 struct PlaneCut {
9     struct Vector normal ;
10    struct Vector point ;
11    long double d ;
12 } ;
13 struct Texture {
14     char
```

Código Preprocesado (Sin Pretty Print)

```
1 * filename ;
2 struct Color * * textureMap ;
3 int vRes ;
4 int hRes ;
5 struct Vector greenwich ;
6 struct Vector north ;
7 } ;
8 struct DraftPlane {
9 char * filename ;
10 struct Color * * textureMap ;
11 int vRes ;
12 int hRes ;
13 struct Vector greenwich ;
14 struct
```

Código Preprocesado (Sin Pretty Print)

```
1 Vector north ;  
2 } ;  
3 struct Intersection {  
4 long double Xi ;  
5 long double Yi ;  
6 long double Zi ;  
7 long double distance ;  
8 struct Object object ;  
9 long double null ;  
10 } ;  
11 static struct Light * Lights ;  
12 static struct Object * Objects ;  
13 static struct Vector eye ;  
14 static
```

Código Preprocesado (Sin Pretty Print)

```
1 struct Color * * Framebuffer ;
2 static struct Color background ;
3 static int numberObjects = 0 ;
4 static int numberLights = 0 ;
5 static int lightIndex = 0 ;
6 static int objectIndex = 0 ;
7 static char * escenaFile = "escena1.txt" ;
8 long double min ( long double a , long double b ) {
9     if ( a < b ) { return a ; }
10    else { return b ; }
11 }
12 long double max ( long double a , long double b ) {
13     if ( a > b ) { return a ; }
14     else
```

Código Preprocesado (Sin Pretty Print)

```
1 { return b ; }
2 }
3 int testPlaneCut ( struct PlaneCut plane , long double
    x , long double y , long double z ) {
4 int val = ( plane . normal . x * x ) + ( plane . normal
    . y * y ) + ( plane . normal . z * z ) + plane . d
    ;
5 if ( val > 0 ) {
6 return 1 ;
7 } else {
8 return 0 ;
9 }
10 }
11 int testIntersection ( long double x , long double y ,
    long double z , struct Object object ) {
12 int k , sign ;
13 int accept = 1 ;
14 int
```

Código Preprocesado (Sin Pretty Print)

```
1 amount = object . numberPlaneCuts ;
2 for ( k = 0 ; k < amount ; k ++ ) {
3   sign = testPlaneCut ( object . planeCuts [ k ] , x , y
      , z ) ;
4   if ( sign == 1 ) {
5     accept = 0 ;
6   }
7 }
8 return accept ;
9 }
10 long double pointProduct ( struct Vector a , struct
    Vector b ) {
11   long double pp = 0 ;
12   pp += ( a . x * b . x ) ;
13   pp += ( a . y * b . y ) ;
14   pp
```


Código Preprocesado (Sin Pretty Print)

```
1 += ( a . z * b . z ) ;
2 return pp ;
3 }
4 struct Vector crossProduct ( struct Vector a , struct
    Vector b ) {
5 struct Vector newVector ;
6 newVector . x = ( a . y * b . z ) - ( a . z * b . y ) ;
7 newVector . y = ( a . z * b . x ) - ( a . x * b . z ) ;
8 newVector . z = ( a . x * b . y ) - ( a . y * b . x ) ;
9 return newVector ;
10 }
11 long double getNorm ( struct Vector vector ) {
12 long double norm = sqrt ( pow ( vector . x , 2 ) + pow
    ( vector . y , 2 ) + pow ( vector . z , 2 ) ) ;
13 return norm ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 struct Vector normalize ( struct Vector vector ) {
3 long double norm = getNorm ( vector ) ;
4 struct Vector unitVector ;
5 if ( norm != 0 ) {
6 unitVector . x = vector . x / norm ;
7 unitVector . y = vector . y / norm ;
8 unitVector . z = vector . z / norm ;
9 } else {
10 unitVector . x = vector . x ;
11 unitVector . y = vector . y ;
12 unitVector . z = vector . z ;
13 }
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1  unitVector ;
2  }
3  void saveFile ( ) {
4  int i , j ;
5  FILE * file ;
6  file = fopen ( "scene.ppm" , "w" ) ;
7  if ( file == NULL ) {
8  printf ( "Error creating/opening file!\n" ) ;
9  exit ( 1 ) ;
10 }
11 fprintf ( file , "%s\n" , "P3" ) ;
12 fprintf ( file , "%i %i\n" , Hres , Vres ) ;
13 fprintf ( file , "%i\n" , 255 ) ;
14 for
```

Código Preprocesado (Sin Pretty Print)

```
1 ( i = Vres - 1 ; i >= 0 ; i -- ) {
2 for ( j = 0 ; j < Hres ; j ++ ) {
3 int R = ( int ) 255 * Framebuffer [ i ] [ j ] . r ;
4 int G = ( int ) 255 * Framebuffer [ i ] [ j ] . g ;
5 int B = ( int ) 255 * Framebuffer [ i ] [ j ] . b ;
6 fprintf ( file , "%i %i %i    " , R , G , B ) ;
7 }
8 fprintf ( file , "\n" ) ;
9 }
10 fclose ( file ) ;
11 }
12 long double getAttenuationFactor ( struct Light light ,
    long double distance ) {
13 long double value = 1 / ( light . c1 + ( light . c2 *
    distance ) + ( light . c3 * pow ( distance , 2 ) )
    ) ;
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1 min ( 1.0 , value ) ;  
2 }  
3 struct Color difusseColor ( long double l , struct  
    Color color ) {  
4 struct Color newColor ;  
5 newColor . r = l * color . r ;  
6 newColor . g = l * color . g ;  
7 newColor . b = l * color . b ;  
8 return newColor ;  
9 }  
10 struct Color specularHighlight ( long double E , struct  
    Color color ) {  
11 struct Color newColor ;  
12 newColor . r = color . r + ( E * ( 1 - color . r ) ) ;  
13 newColor . g = color . g + ( E * ( 1 - color . g ) ) ;  
14 newColor
```

Código Preprocesado (Sin Pretty Print)

```
1 . b = color . b + ( E * ( 1 - color . b ) ) ;
2 return newColor ;
3 }
4 struct Intersection sphereIntersection ( struct Vector
    anchor , struct Vector direction , struct Object
    object ) {
5 long double t , t1 , t2 ;
6 long double Xdif = anchor . x - object . Xc ;
7 long double Ydif = anchor . y - object . Yc ;
8 long double Zdif = anchor . z - object . Zc ;
9 struct Intersection tempIntersect ;
10 tempIntersect . null = 0 ;
11 long double B = 2 * ( ( direction . x * Xdif ) + (
    direction . y * Ydif ) + ( direction . z * Zdif ) )
    ;
12 long double C = pow ( Xdif , 2 ) + pow ( Ydif , 2 ) +
    pow ( Zdif , 2 ) - pow ( object . other , 2 ) ;
13 long double discriminant = pow ( B , 2 ) - ( 4 * C ) ;
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( discriminant >= 0 ) {
2 long double root = sqrt ( discriminant ) ;
3 B *= - 1 ;
4 t1 = ( B + root ) / 2 ;
5 t2 = ( B - root ) / 2 ;
6 if ( t1 > e ) {
7 if ( t2 > e ) {
8 t = min ( t1 , t2 ) ;
9 templIntersect . distance = t ;
10 templIntersect . object = object ;
11 templIntersect . Xi = anchor . x + ( t * direction . x )
    ;
12 templIntersect . Yi = anchor . y + ( t * direction . y )
    ;
13 templIntersect . Zi = anchor . z + ( t * direction . z )
    ;
14 int
```

Código Preprocesado (Sin Pretty Print)

```
1 accept = testIntersection ( templIntersect . Xi ,  
    templIntersect . Yi , templIntersect . Zi , object )  
    ;  
2 if ( accept == 0 ) {  
3 t = max ( t1 , t2 ) ;  
4 templIntersect . distance = t ;  
5 templIntersect . object = object ;  
6 templIntersect . Xi = anchor . x + ( t * direction . x )  
    ;  
7 templIntersect . Yi = anchor . y + ( t * direction . y )  
    ;  
8 templIntersect . Zi = anchor . z + ( t * direction . z )  
    ;  
9 int accept = testIntersection ( templIntersect . Xi ,  
    templIntersect . Yi , templIntersect . Zi , object )  
    ;  
10 if ( accept == 0 ) {  
11 templIntersect . null = 1 ;  
12 }
```


Código Preprocesado (Sin Pretty Print)

```
1  else {
2  t = t1 ;
3  templIntersect . distance = t ;
4  templIntersect . object = object ;
5  templIntersect . Xi = anchor . x + ( t * direction . x )
    ;
6  templIntersect . Yi = anchor . y + ( t * direction . y )
    ;
7  templIntersect . Zi = anchor . z + ( t * direction . z )
    ;
8  int accept = testIntersection ( templIntersect . Xi ,
    templIntersect . Yi , templIntersect . Zi , object )
    ;
9  if ( accept == 0 ) {
10 templIntersect . null = 1 ;
11 }
12 }
13 } else {
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( t2 > e ) {  
2 t = t2 ;  
3 templIntersect . distance = t ;  
4 templIntersect . object = object ;  
5 templIntersect . Xi = anchor . x + ( t * direction . x )  
6 ;  
7 templIntersect . Yi = anchor . y + ( t * direction . y )  
8 ;  
9 templIntersect . Zi = anchor . z + ( t * direction . z )  
10 ;  
11 int accept = testIntersection ( templIntersect . Xi ,  
12 templIntersect . Yi , templIntersect . Zi , object )  
13 ;  
14 if ( accept == 0 ) {  
15 templIntersect . null = 1 ;  
16 }  
17 } else {  
18 templIntersect . null = 1 ;  
19 }  
20 }
```

Código Preprocesado (Sin Pretty Print)

```
1  
2 }  
3 return templIntersect ;  
4 } else {  
5 templIntersect . null = 1 ;  
6 return templIntersect ;  
7 }  
8 }  
9 struct Vector sphereNormal ( struct Object object ,  
    struct Vector vector ) {  
10 struct Vector normal ;  
11 normal . x = vector . x - object . Xc ;  
12 normal . y = vector . y - object . Yc ;  
13 normal . z = vector . z - object . Zc ;  
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1 normal ;
2 }
3 int getSign ( long double v ) {
4 if ( v >= 0 ) { return 1 ; }
5 else { return 0 ; }
6 }
7 struct Intersection polygonIntersection ( struct Vector
      anchor , struct Vector direction , struct Object
      object ) {
8 long double denominator = ( direction . x * object . Xc
      ) + ( direction . y * object . Yc ) + ( direction
      . z * object . Zc ) ;
9 struct Intersection tempIntersect ;
10 tempIntersect . null = 0 ;
11 if ( denominator == 0 ) {
12 tempIntersect . null = 1 ;
13 return tempIntersect ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1 else {
2 long double numerator = - ( anchor . x * object . Xc +
    anchor . y * object . Yc + anchor . z * object . Zc
    + object . other ) ;
3 long double t = numerator / denominator ;
4 templIntersect . distance = t ;
5 templIntersect . object = object ;
6 templIntersect . Xi = anchor . x + ( t * direction . x )
    ;
7 templIntersect . Yi = anchor . y + ( t * direction . y )
    ;
8 templIntersect . Zi = anchor . z + ( t * direction . z )
    ;
9 long double maxA_B = max ( fabs ( object . Xc ) , fabs
    ( object . Yc ) ) ;
10 long double maxA_B_C = max ( maxA_B , fabs ( object .
    Zc ) ) ;
11 long double u , v ;
12 if ( maxA_B_C == fabs ( object . Xc ) ) {
```

Código Preprocesado (Sin Pretty Print)

```
1 = templIntersect . Yi ;
2 } else if ( maxA_B_C == fabs ( object . Yc ) ) {
3 u = templIntersect . Xi ;
4 v = templIntersect . Zi ;
5 } else if ( maxA_B_C == fabs ( object . Zc ) ) {
6 u = templIntersect . Xi ;
7 v = templIntersect . Yi ;
8 }
9 int NC = 0 ;
10 int NV = object . pointAmount ;
11 struct Point2D * points2DArrayTemp = malloc ( sizeof (
    struct Point2D ) * NV ) ;
12 for ( int i = 0 ; i < NV ; i ++ ) {
13 points2DArrayTemp [ i ] . u = object . points2D [ i ] .
    u - u ;
14 points2DArrayTemp
```

Código Preprocesado (Sin Pretty Print)

```
1 [ i ] . v = object . points2D [ i ] . v - v ;
2 }
3 int SH = getSign ( points2DArrayTemp [ 0 ] . v ) ;
4 int NSH ;
5 int a = 0 ;
6 int b = ( a + 1 ) % NV ;
7 for ( a = 0 ; a < NV - 1 ; ) {
8 NSH = getSign ( points2DArrayTemp [ b ] . v ) ;
9 if ( SH != NSH ) {
10 if ( points2DArrayTemp [ a ] . u > 0 &&
    points2DArrayTemp [ b ] . u > 0 ) {
11 NC ++ ;
12 } else if ( points2DArrayTemp [ a ] . u > 0 ||
    points2DArrayTemp [ b ] . u > 0 ) {
13 long double N = ( points2DArrayTemp [ b ] . u -
    points2DArrayTemp [ a ] . u ) ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double D = ( points2DArrayTemp [ b ] . v -  
    points2DArrayTemp [ a ] . v ) ;  
2 if ( D != 0 ) {  
3     if ( points2DArrayTemp [ a ] . u - ( (  
        points2DArrayTemp [ a ] . v * N ) / D ) > 0 ) {  
4         NC ++ ;  
5     }  
6 }  
7 }  
8 }  
9 SH = NSH ;  
10 a ++ ;  
11 b ++ ;  
12 }  
13 if ( NC % 2 == 0 ) { templIntersect . null = 1 ; }  
14 else
```


Código Preprocesado (Sin Pretty Print)

```
1 { templIntersect . null = 0 ; }
2 int accept = testIntersection ( templIntersect . Xi ,
    templIntersect . Yi , templIntersect . Zi , object )
    ;
3 if ( accept == 0 ) {
4 templIntersect . null = 1 ;
5 }
6 free ( points2DArrayTemp ) ;
7 return templIntersect ;
8 }
9 }
10 struct Vector polygonNormal ( struct Object object ) {
11 struct Point3D point0 = object . points3D [ 0 ] ;
12 struct Point3D point1 = object . points3D [ 1 ] ;
13 struct Point3D point2 = object . points3D [ 2 ] ;
14 struct
```

Código Preprocesado (Sin Pretty Print)

```
1 Vector vector1 = { point1 . x - point0 . x , point1 . y
    - point0 . y , point1 . z - point0 . z } ;
2 struct Vector vector2 = { point2 . x - point1 . x ,
    point2 . y - point1 . y , point2 . z - point1 . z }
    ;
3 struct Vector normal = crossProduct ( vector1 , vector2
    ) ;
4 return normal ;
5 }
6 struct Intersection cylinderIntersection ( struct
    Vector anchor , struct Vector direction , struct
    Object object ) {
7 struct Intersection tempIntersect ;
8 tempIntersect . null = 0 ;
9 long double xo = object . Xc ;
10 long double yo = object . Yc ;
11 long double zo = object . Zc ;
12 long double xq = object . directionVector . x ;
13 long double yq = object . directionVector . y ;
```

Código Preprocesado (Sin Pretty Print)

```
1 double zq = object . directionVector . z ;
2 long double xd = direction . x ;
3 long double yd = direction . y ;
4 long double zd = direction . z ;
5 long double xe = anchor . x ;
6 long double ye = anchor . y ;
7 long double ze = anchor . z ;
8 long double radius = object . other ;
9 long double xdxq = xd * xq ;
10 long double ydyq = yd * yq ;
11 long double zdzq = zd * zq ;
12 long double xexq = xe * xq ;
13 long double yeyq = ye * yq ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double zezq = ze * zq ;
2 long double xoxq = xo * xq ;
3 long double yoyq = yo * yq ;
4 long double zozq = zo * zq ;
5 long double coef1 = xdxq * xq + ydyq * xq + zdzq * xq -
    xd ;
6 long double coef2 = xdxq * yq + ydyq * yq + zdzq * yq -
    yd ;
7 long double coef3 = xdxq * zq + ydyq * zq + zdzq * zq -
    zd ;
8 long double coef4 = xo + xexq * xq - xoxq * xq + yeyq *
    xq - yoyq * xq + zezq * xq - zozq * xq - xe ;
9 long double coef5 = yo + xexq * yq - xoxq * yq + yeyq *
    yq - yoyq * yq + zezq * yq - zozq * yq - ye ;
10 long double coef6 = zo + xexq * zq - xoxq * zq + yeyq *
    zq - yoyq * zq + zezq * zq - zozq * zq - ze ;
11 long double A = pow ( coef1 , 2 ) + pow ( coef2 , 2 ) +
    pow ( coef3 , 2 ) ;
12 long double B = 2 * ( coef1 * coef4 + coef2 * coef5 +
```

Código Preprocesado (Sin Pretty Print)

```
1 ( coef5 , 2 ) +  
2 pow ( coef6 , 2 ) -  
3 pow ( radius , 2 ) ;  
4 long double discriminant = pow ( B , 2 ) - ( 4 * A * C  
    ) ;  
5 long double t , t1 , t2 ;  
6 if ( discriminant >= 0 ) {  
7 long double root = sqrt ( discriminant ) ;  
8 B *= - 1 ;  
9 t1 = ( B - root ) / ( 2 * A ) ;  
10 t2 = ( B + root ) / ( 2 * A ) ;  
11 long double Xi ;  
12 long double Yi ;  
13 long double Zi ;  
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double d1 = object . D1 ;
2 long double d2 = object . D2 ;
3 if ( t1 > e ) {
4   if ( t2 > e ) {
5     t = min ( t1 , t2 ) ;
6     Xi = xe + ( t * xd ) ;
7     Yi = ye + ( t * yd ) ;
8     Zi = ze + ( t * zd ) ;
9     if ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi
        - zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo )
        * yq + ( Zi - zo ) * zq ) >= d1 ) {
10      templIntersect . Xi = Xi ;
11      templIntersect . Yi = Yi ;
12      templIntersect . Zi = Zi ;
13      templIntersect . distance = t ;
14      templIntersect
```

Código Preprocesado (Sin Pretty Print)

```
1 . object = object ;
2 int accept = testIntersection ( templIntersect . Xi ,
    templIntersect . Yi , templIntersect . Zi , object )
    ;
3 if ( accept == 0 ) {
4 t = max ( t1 , t2 ) ;
5 Xi = xe + ( t * xd ) ;
6 Yi = ye + ( t * yd ) ;
7 Zi = ze + ( t * zd ) ;
8 if ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi
    - zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo )
    * yq + ( Zi - zo ) * zq ) >= d1 ) {
9 templIntersect . Xi = Xi ;
10 templIntersect . Yi = Yi ;
11 templIntersect . Zi = Zi ;
12 templIntersect . distance = t ;
13 templIntersect . object = object ;
14 int
```

Código Preprocesado (Sin Pretty Print)

```
1  accept = testIntersection ( templIntersect . Xi ,  
    templIntersect . Yi , templIntersect . Zi , object )  
    ;  
2  if ( accept == 0 ) {  
3  templIntersect . null = 1 ;  
4  }  
5  return templIntersect ;  
6  } else {  
7  templIntersect . null = 1 ;  
8  return templIntersect ;  
9  }  
10 }  
11 return templIntersect ;  
12 } else {  
13 t = max ( t1 , t2 ) ;  
14 Xi
```


Código Preprocesado (Sin Pretty Print)

```
1 = xe + ( t * xd ) ;
2 Yi = ye + ( t * yd ) ;
3 Zi = ze + ( t * zd ) ;
4 if ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi
    - zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo )
    * yq + ( Zi - zo ) * zq ) >= d1 ) {
5 templIntersect . Xi = Xi ;
6 templIntersect . Yi = Yi ;
7 templIntersect . Zi = Zi ;
8 templIntersect . distance = t ;
9 templIntersect . object = object ;
10 } else {
11 templIntersect . null = 1 ;
12 }
13 int accept = testIntersection ( templIntersect . Xi ,
    templIntersect . Yi , templIntersect . Zi , object )
    ;
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( accept == 0 ) {
2 templIntersect . null = 1 ;
3 }
4 return templIntersect ;
5 }
6 } else {
7 t = t1 ;
8 Xi = xe + ( t * xd ) ;
9 Yi = ye + ( t * yd ) ;
10 Zi = ze + ( t * zd ) ;
11 if ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi
    - zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo )
    * yq + ( Zi - zo ) * zq ) >= d1 ) {
12 templIntersect . Xi = Xi ;
13 templIntersect . Yi = Yi ;
14 templIntersect
```

Código Preprocesado (Sin Pretty Print)

```
1 . Zi = Zi ;
2 templIntersect . distance = t ;
3 templIntersect . object = object ;
4 int accept = testIntersection ( templIntersect . Xi ,
    templIntersect . Yi , templIntersect . Zi , object )
    ;
5 if ( accept == 0 ) {
6 templIntersect . null = 1 ;
7 }
8 return templIntersect ;
9 } else {
10 templIntersect . null = 1 ;
11 return templIntersect ;
12 }
13 }
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1 else {
2   if ( t2 > e ) {
3     t = t2 ;
4     Xi = xe + ( t * xd ) ;
5     Yi = ye + ( t * yd ) ;
6     Zi = ze + ( t * zd ) ;
7     if ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi
        - zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo )
        * yq + ( Zi - zo ) * zq ) >= d1 ) {
8       templIntersect . Xi = Xi ;
9       templIntersect . Yi = Yi ;
10      templIntersect . Zi = Zi ;
11      templIntersect . distance = t ;
12      templIntersect . object = object ;
13      int accept = testIntersection ( templIntersect . Xi ,
        templIntersect . Yi , templIntersect . Zi , object )
        ;
14    if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( accept == 0 ) {  
2 templIntersect . null = 1 ;  
3 }  
4 return templIntersect ;  
5 } else {  
6 templIntersect . null = 1 ;  
7 return templIntersect ;  
8 }  
9 } else {  
10 templIntersect . null = 1 ;  
11 return templIntersect ;  
12 }  
13 }  
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  else {  
2  templIntersect . null = 1 ;  
3  return templIntersect ;  
4  }  
5  }  
6  struct Vector cilinderNormal ( struct Object object ,  
    struct Vector intersectionPoint ) {  
7  struct Vector normalCilinder ;  
8  long double x = intersectionPoint . x ;  
9  long double y = intersectionPoint . y ;  
10 long double z = intersectionPoint . z ;  
11 long double xo = object . Xc ;  
12 long double yo = object . Yc ;  
13 long double zo = object . Zc ;  
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double xq = object . directionVector . x ;
2 long double yq = object . directionVector . y ;
3 long double zq = object . directionVector . z ;
4 long double xxoxq = ( x - xo ) * xq ;
5 long double yyoyq = ( y - yo ) * yq ;
6 long double zzozq = ( z - zo ) * zq ;
7 long double parenth = ( xxoxq + yyoyq + zzozq ) ;
8 long double pxq = 2 * ( xo + parenth * xq - x ) ;
9 long double pyq = 2 * ( yo + parenth * yq - y ) ;
10 long double pzq = 2 * ( zo + parenth * zq - z ) ;
11 normalCilinder . x = pxq * ( pow ( xq , 2 ) - 1 ) +
12 pyq * ( yq * xq ) +
13 pzq * ( zq * xq ) ;
14 normalCilinder
```

Código Preprocesado (Sin Pretty Print)

```
1  . y = pxq * ( xq * yq ) +
2  pyq * ( pow ( yq , 2 ) - 1 ) +
3  pzq * ( zq * yq ) ;
4  normalCilinder . z = pxq * ( xq * zq ) +
5  pyq * ( yq * zq ) +
6  pzq * ( pow ( zq , 2 ) - 1 ) ;
7  normalCilinder = normalize ( normalCilinder ) ;
8  return normalCilinder ;
9  }
10 struct Intersection coneIntersection ( struct Vector
    anchor , struct Vector direction , struct Object
    object ) {
11 struct Intersection tempIntersect ;
12 tempIntersect . null = 0 ;
13 long double xo = object . Xc ;
14 long
```


Código Preprocesado (Sin Pretty Print)

```
1 double yo = object . Yc ;
2 long double zo = object . Zc ;
3 long double xq = object . directionVector . x ;
4 long double yq = object . directionVector . y ;
5 long double zq = object . directionVector . z ;
6 long double xd = direction . x ;
7 long double yd = direction . y ;
8 long double zd = direction . z ;
9 long double k1 = object . K1 ;
10 long double k2 = object . K2 ;
11 long double xe = anchor . x ;
12 long double ye = anchor . y ;
13 long double ze = anchor . z ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double xdxq = xd * xq ;
2 long double ydyq = yd * yq ;
3 long double zdzq = zd * zq ;
4 long double xexq = xe * xq ;
5 long double yeyq = ye * yq ;
6 long double zezq = ze * zq ;
7 long double xoxq = xo * xq ;
8 long double yoyq = yo * yq ;
9 long double zozq = zo * zq ;
10 long double coef1 = xdxq * xq + ydyq * xq + zdzq * xq -
    xd ;
11 long double coef2 = xdxq * yq + ydyq * yq + zdzq * yq -
    yd ;
12 long double coef3 = xdxq * zq + ydyq * zq + zdzq * zq -
    zd ;
13 long double coef4 = xo + xexq * xq - xoxq * xq + yeyq *
    xq - yoyq * xq + zezq * xq - zozq * xq - xe ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double coef5 = yo + xexq * yq - xoxq * yq + yeyq * yq -  
  yoyq * yq + zezq * yq - zozq * yq - ye ;  
2 long double coef6 = zo + xexq * zq - xoxq * zq + yeyq *  
  zq - yoyq * zq + zezq * zq - zozq * zq - ze ;  
3 long double coefk = pow ( k2 / k1 , 2 ) ;  
4 long double coef7 = xdxq + ydyq + zdzq ;  
5 long double coef8 = xexq - xoxq + yeyq - yoyq + zezq -  
  zozq ;  
6 long double A = pow ( coef1 , 2 ) + pow ( coef2 , 2 ) +  
  pow ( coef3 , 2 ) - ( coefk * pow ( coef7 , 2 ) )  
  ;  
7 long double B = 2 * ( ( coef1 * coef4 + coef2 * coef5 +  
  coef3 * coef6 ) - ( coefk * coef7 * coef8 ) ) ;  
8 long double C = pow ( coef4 , 2 ) + pow ( coef5 , 2 ) +  
  pow ( coef6 , 2 ) - ( coefk * pow ( coef8 , 2 ) )  
  ;  
9 long double discriminant = pow ( B , 2 ) - ( 4 * A * C  
  ) ;  
10 long double t , t1 , t2 ;
```

Código Preprocesado (Sin Pretty Print)

```
1 = ( B + root ) / ( 2 * A ) ;  
2 t2 = ( B - root ) / ( 2 * A ) ;  
3 long double Xi ;  
4 long double Yi ;  
5 long double Zi ;  
6 long double d1 = object . D1 ;  
7 long double d2 = object . D2 ;  
8 if ( t1 > e ) {  
9   if ( t2 > e ) {  
10    t = min ( t1 , t2 ) ;  
11    Xi = xe + ( t * xd ) ;  
12    Yi = ye + ( t * yd ) ;  
13    Zi = ze + ( t * zd ) ;  
14    if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi -  
    zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo ) *  
    yq + ( Zi - zo ) * zq ) >= d1 ) {  
2 templIntersect . Xi = Xi ;  
3 templIntersect . Yi = Yi ;  
4 templIntersect . Zi = Zi ;  
5 templIntersect . distance = t ;  
6 templIntersect . object = object ;  
7 int accept = testIntersection ( templIntersect . Xi ,  
    templIntersect . Yi , templIntersect . Zi , object )  
    ;  
8 if ( accept == 0 ) {  
9 t = max ( t1 , t2 ) ;  
10 Xi = xe + ( t * xd ) ;  
11 Yi = ye + ( t * yd ) ;  
12 Zi = ze + ( t * zd ) ;  
13 if ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi  
    - zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo )  
    * yq + ( Zi - zo ) * zq ) >= d1 ) {
```

Código Preprocesado (Sin Pretty Print)

```
1 . Xi = Xi ;
2 templIntersect . Yi = Yi ;
3 templIntersect . Zi = Zi ;
4 templIntersect . distance = t ;
5 templIntersect . object = object ;
6 int accept = testIntersection ( templIntersect . Xi ,
    templIntersect . Yi , templIntersect . Zi , object )
    ;
7 if ( accept == 0 ) {
8 templIntersect . null = 1 ;
9 }
10 return templIntersect ;
11 } else {
12 templIntersect . null = 1 ;
13 return templIntersect ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  
2 }  
3 return templIntersect ;  
4 } else {  
5 t = max ( t1 , t2 ) ;  
6 Xi = xe + ( t * xd ) ;  
7 Yi = ye + ( t * yd ) ;  
8 Zi = ze + ( t * zd ) ;  
9 if ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi  
    - zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo )  
    * yq + ( Zi - zo ) * zq ) >= d1 ) {  
10 templIntersect . Xi = Xi ;  
11 templIntersect . Yi = Yi ;  
12 templIntersect . Zi = Zi ;  
13 templIntersect . distance = t ;  
14 templIntersect
```

Código Preprocesado (Sin Pretty Print)

```
1 . object = object ;
2 int accept = testIntersection ( templIntersect . Xi ,
    templIntersect . Yi , templIntersect . Zi , object )
    ;
3 if ( accept == 0 ) {
4 templIntersect . null = 1 ;
5 }
6 return templIntersect ;
7 } else {
8 templIntersect . null = 1 ;
9 return templIntersect ;
10 }
11 }
12 } else {
13 t = t1 ;
14 Xi
```


Código Preprocesado (Sin Pretty Print)

```
1 = xe + ( t * xd ) ;
2 Yi = ye + ( t * yd ) ;
3 Zi = ze + ( t * zd ) ;
4 if ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi
    - zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo )
    * yq + ( Zi - zo ) * zq ) >= d1 ) {
5 templIntersect . Xi = Xi ;
6 templIntersect . Yi = Yi ;
7 templIntersect . Zi = Zi ;
8 templIntersect . distance = t ;
9 templIntersect . object = object ;
10 int accept = testIntersection ( templIntersect . Xi ,
    templIntersect . Yi , templIntersect . Zi , object )
    ;
11 if ( accept == 0 ) {
12 templIntersect . null = 1 ;
13 }
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1 templIntersect ;
2 } else {
3 templIntersect . null = 1 ;
4 return templIntersect ;
5 }
6 }
7 else {
8 if ( t2 > e ) {
9 t = t2 ;
10 Xi = xe + ( t * xd ) ;
11 Yi = ye + ( t * yd ) ;
12 Zi = ze + ( t * zd ) ;
13 if ( d2 >= ( ( Xi - xo ) * xq + ( Yi - yo ) * yq + ( Zi
    - zo ) * zq ) && ( ( Xi - xo ) * xq + ( Yi - yo )
    * yq + ( Zi - zo ) * zq ) >= d1 ) {
14 templIntersect
```

Código Preprocesado (Sin Pretty Print)

```
1 . Xi = Xi ;
2 templIntersect . Yi = Yi ;
3 templIntersect . Zi = Zi ;
4 templIntersect . distance = t ;
5 templIntersect . object = object ;
6 int accept = testIntersection ( templIntersect . Xi ,
    templIntersect . Yi , templIntersect . Zi , object )
    ;
7 if ( accept == 0 ) {
8 templIntersect . null = 1 ;
9 }
10 return templIntersect ;
11 } else {
12 templIntersect . null = 1 ;
13 return templIntersect ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 } else {
3 templIntersect . null = 1 ;
4 return templIntersect ;
5 }
6 }
7 } else {
8 templIntersect . null = 1 ;
9 return templIntersect ;
10 }
11 }
12 struct Vector coneNormal ( struct Object object ,
    struct Vector intersectionPoint ) {
13 struct Vector normalCone ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double x = intersectionPoint . x ;
2 long double y = intersectionPoint . y ;
3 long double z = intersectionPoint . z ;
4 long double xo = object . Xc ;
5 long double yo = object . Yc ;
6 long double zo = object . Zc ;
7 long double xq = object . directionVector . x ;
8 long double yq = object . directionVector . y ;
9 long double zq = object . directionVector . z ;
10 long double k1 = object . K1 ;
11 long double k2 = object . K2 ;
12 long double xxoxq = ( x - xo ) * xq ;
13 long double yyoyq = ( y - yo ) * yq ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double zzozq = ( z - zo ) * zq ;
2 long double parenth = ( xxoxq + yyoyq + zzozq ) ;
3 long double pxq = 2 * ( xo + parenth * xq - x ) ;
4 long double pyq = 2 * ( yo + parenth * yq - y ) ;
5 long double pzq = 2 * ( zo + parenth * zq - z ) ;
6 long double k1sq = pow ( k1 , 2 ) ;
7 long double k2sq2 = 2 * pow ( k2 , 2 ) ;
8 long double lastFactorDerivedX = ( k2sq2 * xq * parenth
   ) / k1sq ;
9 long double lastFactorDerivedY = ( k2sq2 * yq * parenth
   ) / k1sq ;
10 long double lastFactorDerivedZ = ( k2sq2 * zq * parenth
   ) / k1sq ;
11 normalCone . x = pxq * ( pow ( xq , 2 ) - 1 ) +
12 pyq * ( yq * xq ) +
13 pzq * ( zq * xq ) - lastFactorDerivedX ;
14 normalCone
```

Código Preprocesado (Sin Pretty Print)

```
1 . y = pxq * ( xq * yq ) +
2 pyq * ( pow ( yq , 2 ) - 1 ) +
3 pzq * ( zq * yq ) - lastFactorDerivedY ;
4 normalCone . z = pxq * ( xq * zq ) +
5 pyq * ( yq * zq ) +
6 pzq * ( pow ( zq , 2 ) - 1 ) - lastFactorDerivedZ ;
7 normalCone = normalize ( normalCone ) ;
8 return normalCone ;
9 }
10 long double whatsTheD ( struct Object object ) {
11 struct Point3D point = object . points3D [ 0 ] ;
12 long double theD = - ( ( object . Xc * point . x ) + (
    object . Yc * point . y ) + ( object . Zc * point .
    z ) ) ;
13 return theD ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 long double whatsTheDGeneral ( struct Vector
    normalNotNormalized , struct Vector point ) {
3 long double theD = - ( ( normalNotNormalized . x *
    point . x ) + ( normalNotNormalized . y * point . y
    ) + ( normalNotNormalized . z * point . z ) ) ;
4 return theD ;
5 }
6 struct Object getABCD ( struct Object object ) {
7 struct Vector normal = polygonNormal ( object ) ;
8 object . Xc = normal . x ;
9 object . Yc = normal . y ;
10 object . Zc = normal . z ;
11 object . other = whatsTheD ( object ) ;
12 long double L = getNorm ( normal ) ;
13 object . Xc /= L ;
14 object
```


Código Preprocesado (Sin Pretty Print)

```
1 . Yc /= L ;
2 object . Zc /= L ;
3 object . other /= L ;
4 return object ;
5 }
6 struct Intersection discIntersection ( struct Vector
    anchor , struct Vector direction , struct Object
    object ) {
7 long double denominator = ( direction . x * object .
    directionVector . x ) + ( direction . y * object .
    directionVector . y ) + ( direction . z * object .
    directionVector . z ) ;
8 struct Intersection templIntersect ;
9 templIntersect . null = 1 ;
10 if ( denominator == 0 ) {
11 templIntersect . null = 1 ;
12 return templIntersect ;
13 } else {
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double numerator = - ( ( anchor . x * object .  
    directionVector . x ) + ( anchor . y * object .  
    directionVector . y ) + ( anchor . z * object .  
    directionVector . z ) + object . extraD ) ;  
2 long double t = numerator / denominator ;  
3 templIntersect . distance = t ;  
4 templIntersect . object = object ;  
5 templIntersect . Xi = anchor . x + ( t * direction . x )  
    ;  
6 templIntersect . Yi = anchor . y + ( t * direction . y )  
    ;  
7 templIntersect . Zi = anchor . z + ( t * direction . z )  
    ;  
8 long double distanceToCenter = sqrt ( pow (  
    templIntersect . Xi - object . Xc , 2 ) +  
9 pow ( templIntersect . Yi - object . Yc , 2 ) +  
10 pow ( templIntersect . Zi - object . Zc , 2 ) ) ;  
11 if ( distanceToCenter < object . other ) {  
12 templIntersect . null = 0 ;  
    }
```

Código Preprocesado (Sin Pretty Print)

```
1  accept = testIntersection ( templIntersect . Xi ,  
    templIntersect . Yi , templIntersect . Zi , object )  
    ;  
2  if ( accept == 0 ) {  
3  templIntersect . null = 1 ;  
4  }  
5  return templIntersect ;  
6  }  
7  }  
8  struct Vector discNormal ( struct Object object ) {  
9  return object . directionVector ;  
10 }  
11 struct Intersection ellipseIntersection ( struct Vector  
    anchor , struct Vector direction , struct Object  
    object ) {  
12 long double denominator = ( direction . x * object .  
    directionVector . x ) + ( direction . y * object .  
    directionVector . y ) + ( direction . z * object .  
    directionVector . z ) ;
```

Código Preprocesado (Sin Pretty Print)

```
1 . null = 1 ;
2 if ( denominator == 0 ) {
3 templIntersect . null = 1 ;
4 return templIntersect ;
5 } else {
6 long double numerator = - ( ( anchor . x * object .
    directionVector . x ) + ( anchor . y * object .
    directionVector . y ) + ( anchor . z * object .
    directionVector . z ) + object . extraD ) ;
7 long double t = numerator / denominator ;
8 templIntersect . distance = t ;
9 templIntersect . object = object ;
10 templIntersect . Xi = anchor . x + ( t * direction . x )
    ;
11 templIntersect . Yi = anchor . y + ( t * direction . y )
    ;
12 templIntersect . Zi = anchor . z + ( t * direction . z )
    ;
13 long double distanceToD1 = sqrt ( pow ( templIntersect .
```

Código Preprocesado (Sin Pretty Print)

```
1 ( templIntersect . Yi - object . Yc , 2 ) +  
2 pow ( templIntersect . Zi - object . Zc , 2 ) ) ;  
3 long double distanceToD2 = sqrt ( pow ( templIntersect .  
4     Xi - object . Xother , 2 ) +  
5     pow ( templIntersect . Yi - object . Yother , 2 ) +  
6     pow ( templIntersect . Zi - object . Zother , 2 ) ) ;  
7 if ( ( distanceToD1 + distanceToD2 ) < object . other )  
8 {  
9     templIntersect . null = 0 ;  
10 }  
11 else {  
12     templIntersect . null = 1 ;  
13 }  
14 int accept = testIntersection ( templIntersect . Xi ,  
15     templIntersect . Yi , templIntersect . Zi , object )  
16 ;  
17 if ( accept == 0 ) {  
18     templIntersect
```

Código Preprocesado (Sin Pretty Print)

```
1 . null = 1 ;
2 }
3 return templIntersect ;
4 }
5 }
6 struct Vector ellipseNormal ( struct Object object ) {
7 return object . directionVector ;
8 }
9 struct Intersection quadraticIntersection ( struct
    Vector anchor , struct Vector direction , struct
    Object object ) {
10 long double t , t1 , t2 ;
11 struct Intersection templIntersect ;
12 templIntersect . null = 0 ;
13 long double a = ( object . A * pow ( direction . x , 2
    ) ) + ( object . B * pow ( direction . y , 2 ) ) +
    ( object . C * pow ( direction . z , 2 ) ) +
14 2
```

Código Preprocesado (Sin Pretty Print)

```
1 * ( ( object . D * direction . x * direction . y ) * (
    object . E * direction . y * direction . z ) * (
    object . F * direction . x * direction . z ) ) ;
2 long double b = 2 * ( ( object . A * anchor . x *
    direction . x ) + ( object . B * anchor . y *
    direction . y ) + ( object . C * anchor . z *
    direction . z )
3 + ( object . D * anchor . x * direction . y ) + (
    object . D * anchor . y * direction . x )
4 + ( object . E * anchor . y * direction . z ) + (
    object . E * anchor . z * direction . y )
5 + ( object . F * anchor . z * direction . x ) + (
    object . F * anchor . x * direction . z )
6 + ( object . G * direction . x ) + ( object . H *
    direction . y ) + ( object . J * direction . z ) )
;
7 long double c = ( object . A * pow ( anchor . x , 2 ) )
    + ( object . B * pow ( anchor . y , 2 ) ) + (
    object . C * pow ( anchor . z , 2 ) )
```

Código Preprocesado (Sin Pretty Print)

```
1 = ( b + root ) / ( 2 * a ) ;
2 t2 = ( b - root ) / ( 2 * a ) ;
3 if ( t1 > e ) {
4   if ( t2 > e ) {
5     t = min ( t1 , t2 ) ;
6     templIntersect . distance = t ;
7     templIntersect . object = object ;
8     templIntersect . Xi = anchor . x + ( t * direction . x )
          ;
9     templIntersect . Yi = anchor . y + ( t * direction . y )
          ;
10    templIntersect . Zi = anchor . z + ( t * direction . z )
          ;
11    int accept = testIntersection ( templIntersect . Xi ,
          templIntersect . Yi , templIntersect . Zi , object )
          ;
12    if ( accept == 0 ) {
13      t = max ( t1 , t2 ) ;
14      templIntersect
```


Código Preprocesado (Sin Pretty Print)

```
1 . distance = t ;
2 templIntersect . object = object ;
3 templIntersect . Xi = anchor . x + ( t * direction . x )
  ;
4 templIntersect . Yi = anchor . y + ( t * direction . y )
  ;
5 templIntersect . Zi = anchor . z + ( t * direction . z )
  ;
6 int accept = testIntersection ( templIntersect . Xi ,
  templIntersect . Yi , templIntersect . Zi , object )
  ;
7 if ( accept == 0 ) {
8 templIntersect . null = 1 ;
9 }
10 }
11 } else {
12 t = t1 ;
13 templIntersect . distance = t ;
14 templIntersect
```

Código Preprocesado (Sin Pretty Print)

```
1 . object = object ;
2 templIntersect . Xi = anchor . x + ( t * direction . x )
  ;
3 templIntersect . Yi = anchor . y + ( t * direction . y )
  ;
4 templIntersect . Zi = anchor . z + ( t * direction . z )
  ;
5 int accept = testIntersection ( templIntersect . Xi ,
  templIntersect . Yi , templIntersect . Zi , object )
  ;
6 if ( accept == 0 ) {
7 templIntersect . null = 1 ;
8 }
9 }
10 } else {
11 if ( t2 > e ) {
12 t = t2 ;
13 templIntersect . distance = t ;
14 templIntersect
```

Código Preprocesado (Sin Pretty Print)

```
1 . object = object ;
2 templIntersect . Xi = anchor . x + ( t * direction . x )
  ;
3 templIntersect . Yi = anchor . y + ( t * direction . y )
  ;
4 templIntersect . Zi = anchor . z + ( t * direction . z )
  ;
5 int accept = testIntersection ( templIntersect . Xi ,
  templIntersect . Yi , templIntersect . Zi , object )
  ;
6 if ( accept == 0 ) {
7 templIntersect . null = 1 ;
8 }
9 } else {
10 templIntersect . null = 1 ;
11 }
12 }
13 return templIntersect ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  else {
2  templIntersect . null = 1 ;
3  return templIntersect ;
4  }
5  }
6  struct Vector quadraticNormal ( struct Object object ,
    struct Vector intersectionVector ) {
7  long double xElement = ( ( object . A *
    intersectionVector . x ) + ( object . D *
    intersectionVector . y )
8  + ( object . F * intersectionVector . z ) + ( object .
    G ) ) ;
9  long double yElement = ( ( object . D *
    intersectionVector . x ) + ( object . B *
    intersectionVector . y )
10 + ( object . E * intersectionVector . z ) + ( object .
    H ) ) ;
11 long double zElement = ( ( object . F *
    intersectionVector . x ) + ( object . E *
```

Código Preprocesado (Sin Pretty Print)

```
1 normalNotNormalized ;
2 }
3 long double uRectangle ( struct Vector x0y0z0 , struct
    Vector x1y1z1 , struct Vector xiyizi ) {
4 struct Vector U ;
5 U . x = x1y1z1 . x - x0y0z0 . x ;
6 U . y = x1y1z1 . y - x0y0z0 . y ;
7 U . z = x1y1z1 . z - x0y0z0 . z ;
8 struct Vector i0 ;
9 i0 . x = xiyizi . x - x0y0z0 . x ;
10 i0 . y = xiyizi . y - x0y0z0 . y ;
11 i0 . z = xiyizi . z - x0y0z0 . z ;
12 long double H = getNorm ( U ) ;
13 U = normalize ( U ) ;
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1 pointProduct ( i0 , U ) / H ;
2 }
3 long double vRectangle ( struct Vector x0y0z0 , struct
    Vector x3y3z3 , struct Vector xiyizi ) {
4 struct Vector V ;
5 V . x = x3y3z3 . x - x0y0z0 . x ;
6 V . y = x3y3z3 . y - x0y0z0 . y ;
7 V . z = x3y3z3 . z - x0y0z0 . z ;
8 struct Vector i0 ;
9 i0 . x = xiyizi . x - x0y0z0 . x ;
10 i0 . y = xiyizi . y - x0y0z0 . y ;
11 i0 . z = xiyizi . z - x0y0z0 . z ;
12 long double L = getNorm ( V ) ;
13 V = normalize ( V ) ;
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1 pointProduct ( i0 , V ) / L ;
2 }
3 struct Color planeTexture ( struct Intersection in ,
    struct Vector normal ) {
4 struct Object object = in . object ;
5 struct Vector ipoint ;
6 ipoint . x = in . Xi ;
7 ipoint . y = in . Yi ;
8 ipoint . z = in . Zi ;
9 long double u = uRectangle ( object . x0y0z0 , object .
    x1y1z1 , ipoint ) ;
10 long double v = vRectangle ( object . x0y0z0 , object .
    x3y3z3 , ipoint ) ;
11 struct Color color ;
12 for ( int i = 0 ; i < object . numberTextures ; i ++ )
    {
13 int xs = object . textures [ i ] . hRes * u ;
14 int
```

Código Preprocesado (Sin Pretty Print)

```
1 ys = object . textures [ i ] . vRes * v ;
2 color = object . textures [ i ] . textureMap [ xs ] [
    ys ] ;
3 }
4 return color ;
5 }
6 long double uCylinder ( struct Vector anchor , struct
    Vector Q , struct Vector normal , struct Vector
    greenwich , struct Vector xiyizi ) {
7 long double tempu = acos ( pointProduct ( normal ,
    greenwich ) ) / ( 2 * 3.14159265 ) ;
8 struct Vector darkSide = crossProduct ( Q , greenwich )
    ;
9 long double d = whatsTheDGeneral ( darkSide , anchor )
    ;
10 long double test = darkSide . x * xiyizi . x + darkSide
    . y * xiyizi . y + darkSide . z * xiyizi . z + d ;
11 if ( test < 0 ) {
12 tempu = 1 - tempu ;
13 }
```


Código Preprocesado (Sin Pretty Print)

```
1 tempu ;
2 }
3 long double vCylinder ( struct Vector anchor , struct
    Vector Q , struct Vector xiyizi , long double den )
    {
4 struct Vector i0 ;
5 i0 . x = xiyizi . x - anchor . x ;
6 i0 . y = xiyizi . y - anchor . y ;
7 i0 . z = xiyizi . z - anchor . z ;
8 return pointProduct ( Q , i0 ) / den ;
9 }
10 struct Color cylinderTexture ( struct Intersection in ,
    struct Vector normal ) {
11 struct Object object = in . object ;
12 struct Vector gw = object . textures [ 0 ] . greenwich
    ;
13 struct Vector ipoint ;
14 ipoint
```

Código Preprocesado (Sin Pretty Print)

```
1 . x = in . Xi ;
2 ipoint . y = in . Yi ;
3 ipoint . z = in . Zi ;
4 struct Vector anchor ;
5 anchor . x = object . Xc ;
6 anchor . y = object . Yc ;
7 anchor . z = object . Zc ;
8 long double u = uCylinder ( anchor , object .
    directionVector , normal , gw , ipoint ) ;
9 long double v = vCylinder ( anchor , object .
    directionVector , ipoint , object . D2 - object .
    D1 ) ;
10 struct Color color ;
11 for ( int i = 0 ; i < object . numberTextures ; i ++ )
    {
12 int xs = object . textures [ i ] . hRes * u ;
13 int ys = object . textures [ i ] . vRes * v ;
14 color
```

Código Preprocesado (Sin Pretty Print)

```
1 = object . textures [ i ] . textureMap [ xs ] [ ys ] ;
2 }
3 return color ;
4 }
5 long double uSphere ( struct Vector center , struct
    Vector north , long double radius , struct Vector
    xiyizi , struct Vector greenwich ) {
6 struct Vector ic ;
7 ic . x = xiyizi . x - center . x ;
8 ic . y = xiyizi . y - center . y ;
9 ic . z = xiyizi . z - center . z ;
10 long double icnorth = pointProduct ( north , ic ) ;
11 struct Vector inprime ;
12 inprime . x = xiyizi . x - north . x * icnorth ;
13 inprime . y = xiyizi . y - north . y * icnorth ;
14 inprime
```

Código Preprocesado (Sin Pretty Print)

```
1 . z = xiyizi . z - north . z * icnorth ;
2 struct Vector nprime ;
3 nprime . x = inprime . x - center . x ;
4 nprime . y = inprime . y - center . y ;
5 nprime . z = inprime . z - center . z ;
6 nprime = normalize ( nprime ) ;
7 long double tempu = acos ( pointProduct ( nprime ,
    greenwich ) ) / ( 2 * 3.14159265 ) ;
8 struct Vector darkSide = crossProduct ( north ,
    greenwich ) ;
9 long double d = whatsTheDGeneral ( darkSide , center )
    ;
10 long double test = darkSide . x * xiyizi . x + darkSide
    . y * xiyizi . y + darkSide . z * xiyizi . z + d ;
11 if ( test < 0 ) {
12 tempu = 1 - tempu ;
13 }
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1 tempu ;
2 }
3 long double vSphere ( struct Vector center , struct
    Vector north , long double radius , struct Vector
    xiyizi ) {
4 struct Vector south ;
5 south . x = center . x - radius * north . x ;
6 south . y = center . y - radius * north . y ;
7 south . z = center . z - radius * north . z ;
8 struct Vector i0 ;
9 i0 . x = xiyizi . x - south . x ;
10 i0 . y = xiyizi . y - south . y ;
11 i0 . z = xiyizi . z - south . z ;
12 return pointProduct ( north , i0 ) / ( 2 * radius ) ;
13 }
14 struct
```

Código Preprocesado (Sin Pretty Print)

```
1 Color sphereTexture ( struct Intersection in , struct
    Vector normal ) {
2 struct Object object = in . object ;
3 struct Vector gw = object . textures [ 0 ] . greenwich
    ;
4 struct Vector north = object . textures [ 0 ] . north ;
5 struct Vector ipoint ;
6 ipoint . x = in . Xi ;
7 ipoint . y = in . Yi ;
8 ipoint . z = in . Zi ;
9 struct Vector center ;
10 center . x = object . Xc ;
11 center . y = object . Yc ;
12 center . z = object . Zc ;
13 long double u = uSphere ( center , north , object .
    other , ipoint , gw ) ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double v = vSphere ( center , north , object . other ,  
    ipoint ) ;  
2 struct Color color ;  
3 for ( int i = 0 ; i < object . numberTextures ; i ++ )  
    {  
4 int xs = object . textures [ i ] . hRes * u ;  
5 int ys = object . textures [ i ] . vRes * v ;  
6 color = object . textures [ i ] . textureMap [ xs ] [ ys ] ;  
7 }  
8 return color ;  
9 }  
10 long double uCone ( struct Vector anchor , struct  
    Vector Q , struct Vector normal , struct Vector  
    greenwich , struct Vector xiyizi ) {  
11 struct Vector aux = crossProduct ( normal , Q ) ;  
12 struct Vector nprime = crossProduct ( aux , Q ) ;  
13 long double tempu = acos ( pointProduct ( nprime ,  
    greenwich ) ) / ( 2 * 3.14159265 ) ;
```

Código Preprocesado (Sin Pretty Print)

```
1 Vector darkSide = crossProduct ( Q , greenwich ) ;
2 long double d = whatsTheDGeneral ( darkSide , anchor )
  ;
3 long double test = darkSide . x * xiyizi . x + darkSide
  . y * xiyizi . y + darkSide . z * xiyizi . z + d ;
4 if ( test < 0 ) {
5 tempu = 1 - tempu ;
6 }
7 return tempu ;
8 }
9 struct Color coneTexture ( struct Intersection in ,
  struct Vector normal ) {
10 struct Object object = in . object ;
11 struct Vector gw = object . textures [ 0 ] . greenwich
  ;
12 struct Vector ipoint ;
13 ipoint . x = in . Xi ;
14 ipoint
```


Código Preprocesado (Sin Pretty Print)

```
1 . y = in . Yi ;
2 ipoint . z = in . Zi ;
3 struct Vector anchor ;
4 anchor . x = object . Xc ;
5 anchor . y = object . Yc ;
6 anchor . z = object . Zc ;
7 long double u = uCone ( anchor , object .
    directionVector , normal , gw , ipoint ) ;
8 long double v = vCylinder ( anchor , object .
    directionVector , ipoint , object . D2 - object .
    D1 ) ;
9 struct Color color ;
10 for ( int i = 0 ; i < object . numberTextures ; i ++ )
    {
11 int xs = object . textures [ i ] . hRes * u ;
12 int ys = object . textures [ i ] . vRes * v ;
13 color = object . textures [ i ] . textureMap [ xs ] [
    ys ] ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 return color ;
3 }
4 struct Intersection getFirstIntersection ( struct
    Vector anchor , struct Vector direction ) {
5 rays += 1 ;
6 int k ;
7 int objectsAmount = numberObjects ;
8 long double tmin ;
9 struct Intersection intersection ;
10 struct Intersection tempIntersection ;
11 intersection . null = 1 ;
12 tmin = 10000000 ;
13 tempIntersection . null = 1 ;
14 for
```

Código Preprocesado (Sin Pretty Print)

```
1 ( k = 0 ; k < objectsAmount ; k ++ ) {
2   templIntersection = Objects [ k ] . intersectionFuncion
   ( anchor , direction , Objects [ k ] ) ;
3   if ( templIntersection . null != 1 && templIntersection .
       distance > e && templIntersection . distance < tmin
       ) {
4     tmin = templIntersection . distance ;
5     intersection = templIntersection ;
6   }
7   templIntersection . null = 1 ;
8 }
9 return intersection ;
10 }
11 struct Color ponderColor ( struct Color baseColor ,
    struct Color reflectionColor , long double o1 ,
    long double o2 ) {
12   struct Color color ;
13   color . r = baseColor . r * o1 + reflectionColor . r *
    o2 ;
```

Código Preprocesado (Sin Pretty Print)

```
1 . g = baseColor . g * o1 + reflectionColor . g * o2 ;
2 color . b = baseColor . b * o1 + reflectionColor . b *
  o2 ;
3 return color ;
4 }
5 struct Color getColor ( struct Vector anchor , struct
  Vector direction , struct Vector V , int rLevel ) {
6 struct Color color ;
7 struct Intersection intersection ;
8 struct Intersection * templIntersection ;
9 intersection = getFirstIntersection ( anchor ,
  direction ) ;
10 if ( intersection . null == 1 ) {
11 color = background ;
12 } else {
13 int k ;
14 int
```

Código Preprocesado (Sin Pretty Print)

```
1 lightsAmount = numberLights ;
2 struct Object Q = intersection . object ;
3 struct Vector L ;
4 struct Vector intersectVector = { intersection . Xi ,
    intersection . Yi , intersection . Zi } ;
5 struct Vector N = normalize ( Q . normalVector ( Q ,
    intersectVector ) ) ;
6 struct Vector R ;
7 if ( pointProduct ( N , direction ) > 0 ) {
8 N . x *= - 1 ;
9 N . y *= - 1 ;
10 N . z *= - 1 ;
11 }
12 long double Fatt ;
13 long double l = 0.0 ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double E = 0.0 ;
2 for ( k = 0 ; k < numberLights ; k ++ ) {
3 struct Intersection obstacle ;
4 struct Vector light = { Lights [ k ] . Xp -
    intersection . Xi , Lights [ k ] . Yp -
    intersection . Yi , Lights [ k ] . Zp -
    intersection . Zi } ;
5 L = light ;
6 L = normalize ( light ) ;
7 long double pp = pointProduct ( N , L ) ;
8 obstacle = getFirstIntersection ( intersectVector , L )
    ;
9 long double distanceToLight = getNorm ( light ) ;
10 if ( obstacle . null == 1 || ( obstacle . distance > e
    && obstacle . distance > distanceToLight ) ) {
11 Fatt = getAttenuationFactor ( Lights [ k ] ,
    distanceToLight ) ;
12 if ( pp > 0.0 ) {
13 R . x = ( 2 * N . x * pp ) - L . x ;
```

Código Preprocesado (Sin Pretty Print)

```
1 . y = ( 2 * N . y * pp ) - L . y ;
2 R . z = ( 2 * N . z * pp ) - L . z ;
3 R = normalize ( R ) ;
4 I = I + ( pp * Q . Kd * Fatt * Lights [ k ] . Ip ) ;
5 }
6 long double pp2 = pointProduct ( R , V ) ;
7 if ( pp2 > 0.0 ) {
8 E = E + ( pow ( pp2 , Q . Kn ) * Q . Ks * Lights [ k ]
    . Ip * Fatt ) ;
9 }
10 }
11 }
12 if ( Q . numberTextures != 0 ) { color = Q .
    retrieveTextureColor ( intersection , N ) ; }
13 else { color = Q . color ; }
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( isnan ( color . r ) ) { color = Q . color ; }
2 I = I + Ia * Q . Ka ;
3 I = min ( 1.0 , I ) ;
4 color = difusseColor ( I , color ) ;
5 E = min ( 1.0 , E ) ;
6 color = specularHighlight ( E , color ) ;
7 if ( rLevel > 0 ) {
8 long double pNV = pointProduct ( N , V ) ;
9 R . x = ( 2 * N . x * pNV ) - V . x ;
10 R . y = ( 2 * N . y * pNV ) - V . y ;
11 R . z = ( 2 * N . z * pNV ) - V . z ;
12 R = normalize ( R ) ;
13 struct Vector otherV = { - R . x , - R . y , - R . z }
    ;
14 struct
```


Código Preprocesado (Sin Pretty Print)

```
1 Color reflectionColor = getColor ( intersectVector , R
    , otherV , rLevel - 1 ) ;
2 color = ponderColor ( color , reflectionColor , Q . o1
    , Q . o2 ) ;
3 }
4 struct Color transparencyColor = background ;
5 int levelsAllowed = maxTransparency ;
6 while ( levelsAllowed > 0 && intersection . object . o3
    > 0 ) {
7     transparencyColor = getColor ( intersectVector ,
        direction , V , maxReflection ) ;
8     levelsAllowed — ;
9     if ( transparencyColor . r == background . r &&
        transparencyColor . g == background . g &&
        transparencyColor . b == background . b ) {
10 break ;
11 }
12 }
13 color = ponderColor ( color , transparencyColor , 1 ,
```

Código Preprocesado (Sin Pretty Print)

```
1
2 return ( color ) ;
3 }
4 void printPlaneCuts ( struct Object objeto ) {
5 if ( objeto . planeCuts == NULL ) {
6 printf ( "\n Este objeto no tiene planos de corte
    asociados. \n" ) ;
7 return ;
8 } else {
9 int i = 0 ;
10 struct Vector normal ;
11 struct Vector punto ;
12 for ( i = 0 ; i < objeto . numberPlaneCuts ; i ++ ) {
13 printf ( "Plano %i: \n" , i ) ;
14 normal
```

Código Preprocesado (Sin Pretty Print)

```
1 = objeto . planeCuts [ i ] . normal ;
2 punto = objeto . planeCuts [ i ] . point ;
3 printf ( "\t Normal unitaria: %LF, %LF, %LF \n" ,
    normal . x , normal . y , normal . z ) ;
4 printf ( "\t Punto base: %LF, %LF, %LF \n\n" , punto .
    x , punto . y , punto . z ) ;
5 }
6 }
7 }
8 void printTextures ( struct Object objeto , int
    currentTypeObjectReading ) {
9 if ( objeto . textures == NULL ) {
10 printf ( "\n Este objeto no tiene texturas asociados. \
    n" ) ;
11 return ;
12 } else {
13 int i = 0 ;
14 struct
```

Código Preprocesado (Sin Pretty Print)

```
1 Vector norte ;
2 struct Vector greenwich ;
3 for ( i = 0 ; i < objeto . numberTextures ; i ++ ) {
4     printf ( "Textura %i: \n" , i ) ;
5     printf ( "Resoluci n Textura: %ix%i \n" , objeto .
        textures [ i ] . hRes , objeto . textures [ i ] .
        vRes ) ;
6     printf ( "Primer texel de la textura: (%LF, %LF, %LF)"
        , objeto . textures [ i ] . textureMap [ 0 ] [ 0 ]
        . r * 255 , objeto . textures [ i ] . textureMap [
        0 ] [ 0 ] . g * 255 , objeto . textures [ i ] .
        textureMap [ 0 ] [ 0 ] . b * 255 ) ;
7     int lastX = objeto . textures [ i ] . hRes - 1 ;
8     int lastY = objeto . textures [ i ] . vRes - 1 ;
9     printf ( "ltimo texel de la textura: (%LF, %LF, %LF)"
        , objeto . textures [ i ] . textureMap [ lastX ] [
        lastY ] . r * 255 , objeto . textures [ i ] .
        textureMap [ lastX ] [ lastY ] . g * 255 , objeto .
        textures [ i ] . textureMap [ lastX ] [ lastY ] .
```

Código Preprocesado (Sin Pretty Print)

```
1
2 if ( currentTypeObjectReading == 2 ||
    currentTypeObjectReading == 4 ||
    currentTypeObjectReading == 5 ||
    currentTypeObjectReading == 8 ) {
3 greenwich = objeto . textures [ i ] . greenwich ;
4 printf ( "\t Greenwich unitario: %LF, %LF, %LF \n" ,
    greenwich . x , greenwich . y , greenwich . z ) ;
5 if ( currentTypeObjectReading == 2 ||
    currentTypeObjectReading == 8 ) {
6 norte = objeto . textures [ i ] . north ;
7 printf ( "\t Norte unitario: %LF, %LF, %LF \n" , norte
    . x , norte . y , norte . z ) ;
8 }
9 }
10 }
11 }
12 }
13 void printDraftPlanes ( struct Object objeto , int
```

Código Preprocesado (Sin Pretty Print)

```
1 ( objeto . draftPlanes == NULL ) {
2 printf ( "\n Este objeto no tiene planos de calado
    asociados. \n" ) ;
3 return ;
4 } else {
5 int i = 0 ;
6 struct Vector norte ;
7 struct Vector greenwich ;
8 for ( i = 0 ; i < objeto . numberDraftPlanes ; i ++ ) {
9 printf ( "N mero de planos de calado: %i \n" , objeto
    . numberDraftPlanes ) ;
10 printf ( "plano de calado %i: \n" , i ) ;
11 printf ( "Resoluci n plano de calado: %ix%i \n" ,
    objeto . draftPlanes [ i ] . hRes , objeto .
    draftPlanes [ i ] . vRes ) ;
12 printf ( "Primer texel del plano de calado: (%LF, %LF,
    %LF)" , objeto . draftPlanes [ i ] . textureMap [ 0
    ] [ 0 ] . r , objeto . draftPlanes [ i ] .
    textureMap [ 0 ] [ 0 ] . g * 255 , objeto .
```

Código Preprocesado (Sin Pretty Print)

```
1 lastY = objeto . draftPlanes [ i ] . vRes - 1 ;
2 printf ( " ltimo texel del plano de calado: (%LF, %LF,
    %LF)" , objeto . draftPlanes [ i ] . textureMap [
    lastX ] [ lastY ] . r * 255 , objeto . draftPlanes
    [ i ] . textureMap [ lastX ] [ lastY ] . g * 255 ,
    objeto . draftPlanes [ i ] . textureMap [ lastX ] [
    lastY ] . b * 255 ) ;
3 }
4 if ( currentTypeObjectReading == 2 ||
    currentTypeObjectReading == 4 ||
    currentTypeObjectReading == 5 ||
    currentTypeObjectReading == 8 ) {
5 greenwich = objeto . draftPlanes [ i ] . greenwich ;
6 printf ( "\t Greenwich unitario: %LF, %LF, %LF \n" ,
    greenwich . x , greenwich . y , greenwich . z ) ;
7 if ( currentTypeObjectReading == 2 ||
    currentTypeObjectReading == 8 ) {
8 norte = objeto . draftPlanes [ i ] . north ;
9 printf ( "\t Norte unitario: %LF, %LF, %LF \n" , norte
```

Código Preprocesado (Sin Pretty Print)

```
1 createObjectFromData ( long double * data , int
    whichObjectCreate , int quantityData , struct
    PlaneCut * planeCutsFound , struct Texture *
    texturesFound , struct DraftPlane *
    draftPlanesFound , int numberPlaneCuts , int
    numberTextures , int numberDraftPlanes ) {
2 switch ( whichObjectCreate ) {
3 case 0 : {
4     if ( debug == 1 ) {
5         printf ( "Insertando datos de escena \n" ) ;
6         printf ( "Reflexiones: %LF, Transparencia: %LF, Anti-
            aliasing: %LF \n" , data [ 0 ] , data [ 1 ] , data
            [ 2 ] ) ;
7         printf ( "Iluminaci n ambiente: %LF \n" , data [ 3 ] )
            ;
8         printf ( "Plano de proyecci n (Xmin, Ymin) (Xmax, Ymax
            ) : (%LF, %LF) (%LF, %LF) \n" , data [ 4 ] , data [
            5 ] , data [ 6 ] , data [ 7 ] ) ;
9         printf ( "Resoluci n: %LFx%LF \n" , data [ 8 ] , data
```


Código Preprocesado (Sin Pretty Print)

```
1 = data [ 0 ] ;  
2 maxReflection = data [ 1 ] ;  
3 maxTransparency = data [ 2 ] ;  
4 Ia = data [ 3 ] ;  
5 Xmin = data [ 4 ] ;  
6 Ymin = data [ 5 ] ;  
7 Xmax = data [ 6 ] ;  
8 Ymax = data [ 7 ] ;  
9 Hres = data [ 8 ] ;  
10 Vres = data [ 9 ] ;  
11 e = data [ 10 ] ;  
12 eye . x = data [ 11 ] ;  
13 eye . y = data [ 12 ] ;  
14 eye
```

Código Preprocesado (Sin Pretty Print)

```
1 . z = data [ 13 ] ;
2 background . r = data [ 14 ] ;
3 background . g = data [ 15 ] ;
4 background . b = data [ 16 ] ;
5 Framebuffer [ Hres ] [ Vres ] ;
6 Framebuffer = ( struct Color * * ) malloc ( Vres *
    sizeof ( struct Color * ) ) ;
7 for ( int i = 0 ; i < Vres ; i ++ ) {
8 Framebuffer [ i ] = ( struct Color * ) malloc ( Hres *
    sizeof ( struct Color ) ) ;
9 }
10 return ;
11 }
12 case 1 : {
13 if ( debug == 1 ) {
14 printf
```

Código Preprocesado (Sin Pretty Print)

```
1 ( "Insertando Luz...\n" ) ;
2 printf ( "Pos luz (%LF, %LF, %LF) \n" , data [ 0 ] ,
    data [ 1 ] , data [ 2 ] ) ;
3 printf ( "c1: %LF, c2: %LF, c3 %LF \n" , data [ 3 ] ,
    data [ 4 ] , data [ 5 ] ) ;
4 printf ( "Ip luz: %LF \n" , data [ 6 ] ) ;
5 }
6 struct Object polygon ;
7 struct Color colorPolygon ;
8 struct Light luz ;
9 luz . Xp = data [ 0 ] ;
10 luz . Yp = data [ 1 ] ;
11 luz . Zp = data [ 2 ] ;
12 luz . c1 = data [ 3 ] ;
13 luz . c2 = data [ 4 ] ;
14 luz
```

Código Preprocesado (Sin Pretty Print)

```
1 . c3 = data [ 5 ] ;
2 luz . lp = data [ 6 ] ;
3 Lights [ lightIndex ] = luz ;
4 lightIndex ++ ;
5 return ;
6 }
7 case 2 : {
8 if ( debug == 1 ) {
9 printf ( "Insertando Esfera..." ) ;
10 printf ( "Pos esfera (%LF, %LF, %LF) \n" , data [ 0 ] ,
    data [ 1 ] , data [ 2 ] ) ;
11 printf ( "o1: %LF, o2: %LF, o3: %LF \n" , data [ 3 ] ,
    data [ 4 ] , data [ 5 ] ) ;
12 printf ( "Radio esfera: %LF \n" , data [ 6 ] ) ;
13 printf ( "Esfera Kd: %LF \n" , data [ 6 ] ) ;
14 printf
```

Código Preprocesado (Sin Pretty Print)

```
1 ( "Esfera Ka: %LF \n" , data [ 8 ] ) ;
2 printf ( "Esfera Kn: %LF \n" , data [ 9 ] ) ;
3 printf ( "Esfera Ks: %LF \n" , data [ 10 ] ) ;
4 printf ( "Color esfera (%LF, %LF, %LF) \n" , data [ 11
    ] , data [ 12 ] , data [ 13 ] ) ;
5 }
6 struct Object polygon ;
7 struct Color colorPolygon ;
8 struct Object esfera ;
9 esfera . Xc = data [ 0 ] ;
10 esfera . Yc = data [ 1 ] ;
11 esfera . Zc = data [ 2 ] ;
12 esfera . o1 = data [ 3 ] ;
13 esfera . o2 = data [ 4 ] ;
14 esfera
```

Código Preprocesado (Sin Pretty Print)

```
1 . o3 = data [ 5 ] ;
2 esfera . other = data [ 6 ] ;
3 esfera . Kd = data [ 7 ] ;
4 esfera . Ka = data [ 8 ] ;
5 esfera . Kn = data [ 9 ] ;
6 esfera . Ks = data [ 10 ] ;
7 esfera . normalVector = sphereNormal ;
8 esfera . intersectionFuncion = sphereIntersection ;
9 esfera . retrieveTextureColor = sphereTexture ;
10 struct Color colorSphere ;
11 colorSphere . r = data [ 11 ] ;
12 colorSphere . g = data [ 12 ] ;
13 colorSphere . b = data [ 13 ] ;
14 esfera
```

Código Preprocesado (Sin Pretty Print)

```
1 . color = colorSphere ;
2 esfera . planeCuts = planeCutsFound ;
3 esfera . numberPlaneCuts = numberPlaneCuts ;
4 esfera . textures = texturesFound ;
5 esfera . numberTextures = numberTextures ;
6 Objects [ objectIndex ] = esfera ;
7 if ( debug == 1 ) {
8   printPlaneCuts ( Objects [ objectIndex ] ) ;
9   printTextures ( Objects [ objectIndex ] ,
10                  whichObjectCreate ) ;
11 }
12 objectIndex ++ ;
13 return ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1 3 : {  
2 int vertexPolygonIndex = 0 ;  
3 int numVertexesPolygon = ( quantityData - 10 - 12 ) / 3  
  + 1 ;  
4 int inicioPlano = 10 + ( numVertexesPolygon - 1 ) * 3 ;  
5 if ( debug == 1 ) {  
6 printf ( "quantityData: %i \n" , quantityData ) ;  
7 printf ( "numVertexesPolygon: %i \n" ,  
  numVertexesPolygon ) ;  
8 printf ( "%i inicioPlano \n" , inicioPlano ) ;  
9 printf ( "Insertando pol gono ..." ) ;  
10 printf ( "Color pol gono (%LF, %LF, %LF) \n" , data [ 0 ] , data [ 1 ] , data [ 2 ] ) ;  
11 printf ( "o1: %LF, o2: %LF, o3: %LF \n" , data [ 3 ] ,  
  data [ 4 ] , data [ 5 ] ) ;  
12 printf ( "Poligono Kd: %LF \n" , data [ 6 ] ) ;  
13 printf ( "Poligono Ka: %LF \n" , data [ 7 ] ) ;  
14 printf
```


Código Preprocesado (Sin Pretty Print)

```
1 ( "Poligono Kn: %LF \n" , data [ 8 ] ) ;
2 printf ( "Poligono Ks: %LF \n" , data [ 9 ] ) ;
3 printf ( "Esquina inferior izquierda (%LF, %LF, %LF) \n"
    , data [ inicioPlano ] , data [ inicioPlano + 1 ]
    , data [ inicioPlano + 2 ] ) ;
4 printf ( "Esquina inferior derecha (%LF, %LF, %LF) \n"
    , data [ inicioPlano + 3 ] , data [ inicioPlano + 4 ]
    , data [ inicioPlano + 5 ] ) ;
5 printf ( "Esquina superior derecha (%LF, %LF, %LF) \n"
    , data [ inicioPlano + 6 ] , data [ inicioPlano + 7 ]
    , data [ inicioPlano + 8 ] ) ;
6 printf ( "Esquina superior izquierda (%LF, %LF, %LF) \n"
    , data [ inicioPlano + 9 ] , data [ inicioPlano +
    10 ] , data [ inicioPlano + 11 ] ) ;
7 }
8 struct Point3D vertex ;
9 struct Point2D squashedVertex ;
10 struct Object temp ;
11 struct Vector x0y0z0 ;
```

Código Preprocesado (Sin Pretty Print)

```
1 . z = data [ inicioPlano + 2 ] ;
2 struct Vector x1y1z1 ;
3 x1y1z1 . x = data [ inicioPlano + 3 ] ;
4 x1y1z1 . y = data [ inicioPlano + 4 ] ;
5 x1y1z1 . z = data [ inicioPlano + 5 ] ;
6 struct Vector x2y2z2 ;
7 x2y2z2 . x = data [ inicioPlano + 6 ] ;
8 x2y2z2 . y = data [ inicioPlano + 7 ] ;
9 x2y2z2 . z = data [ inicioPlano + 8 ] ;
10 struct Vector x3y3z3 ;
11 x3y3z3 . x = data [ inicioPlano + 9 ] ;
12 x3y3z3 . y = data [ inicioPlano + 10 ] ;
13 x3y3z3 . z = data [ inicioPlano + 11 ] ;
14 temp
```

Código Preprocesado (Sin Pretty Print)

```
1 . points3D = malloc ( sizeof ( struct Point3D ) * 3 ) ;  
2 for ( int i = 0 ; i + 10 < quantityData - 12 ; ) {  
3   if ( vertexPolygonIndex == 3 ) {  
4     break ;  
5   }  
6   vertex . x = data [ 10 + i ] ;  
7   i ++ ;  
8   vertex . y = data [ 10 + i ] ;  
9   i ++ ;  
10  vertex . z = data [ 10 + i ] ;  
11  i ++ ;  
12  temp . points3D [ vertexPolygonIndex ] = vertex ;  
13  vertexPolygonIndex ++ ;  
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 struct Object polygon ;
3 vertexPolygonIndex = 0 ;
4 polygon = getABCD ( temp ) ;
5 if ( debug == 1 ) {
6     printf ( "A del poligono %LF\n" , polygon . Xc ) ;
7     printf ( "B del poligono %LF\n" , polygon . Yc ) ;
8     printf ( "C del poligono %LF\n" , polygon . Zc ) ;
9     printf ( "D del poligono %LF\n" , polygon . other ) ;
10 }
11 polygon . points3D = malloc ( sizeof ( struct Point3D )
    * numVertexesPolygon ) ;
12 polygon . points2D = malloc ( sizeof ( struct Point2D )
    * numVertexesPolygon ) ;
13 struct Color colorPolygon ;
14 colorPolygon
```

Código Preprocesado (Sin Pretty Print)

```
1 . r = data [ 0 ] ;
2 colorPolygon . g = data [ 1 ] ;
3 colorPolygon . b = data [ 2 ] ;
4 polygon . color = colorPolygon ;
5 polygon . o1 = data [ 3 ] ;
6 polygon . o2 = data [ 4 ] ;
7 polygon . o3 = data [ 5 ] ;
8 polygon . Kd = data [ 6 ] ;
9 polygon . Ka = data [ 7 ] ;
10 polygon . Kn = data [ 8 ] ;
11 polygon . Ks = data [ 9 ] ;
12 polygon . pointAmount = numVertexesPolygon ;
13 polygon . normalVector = polygonNormal ;
14 polygon
```

Código Preprocesado (Sin Pretty Print)

```
1 . intersectionFuncion = polygonIntersection ;
2 polygon . retrieveTextureColor = planeTexture ;
3 long double u ;
4 long double v ;
5 long double maxA_B = max ( fabs ( polygon . Xc ) , fabs
    ( polygon . Yc ) ) ;
6 long double maxA_B_C = max ( maxA_B , fabs ( polygon .
    Zc ) ) ;
7 int choice = 0 ;
8 if ( maxA_B_C == fabs ( polygon . Xc ) ) { choice = 0 ;
    }
9 else if ( maxA_B_C == fabs ( polygon . Yc ) ) { choice
    = 1 ; }
10 else if ( maxA_B_C == fabs ( polygon . Zc ) ) { choice
    = 2 ; }
11 for ( int i = 0 ; i + 10 < quantityData - 12 ; ) {
12 vertex . x = data [ 10 + i ] ;
13 i ++ ;
14 vertex
```

Código Preprocesado (Sin Pretty Print)

```
1 . y = data [ 10 + i ] ;
2 i ++ ;
3 vertex . z = data [ 10 + i ] ;
4 i ++ ;
5 if ( debug == 1 ) {
6     printf ( "Vertice: (%LF,%LF,%LF) \n" , vertex . x ,
7         vertex . y , vertex . z ) ;
8 }
9 if ( choice == 0 ) { u = vertex . z ; v = vertex . y ;
10 }
11 else if ( choice == 1 ) { u = vertex . x ; v = vertex .
12     z ; }
13 else if ( choice == 2 ) { u = vertex . x ; v = vertex .
14     y ; }
15 squashedVertex . u = u ;
16 squashedVertex . v = v ;
17 polygon . points3D [ vertexPolygonIndex ] = vertex ;
18 polygon
```

Código Preprocesado (Sin Pretty Print)

```
1 . points2D [ vertexPolygonIndex ] = squashedVertex ;
2 vertexPolygonIndex ++ ;
3 }
4 vertex . x = data [ 10 ] ;
5 vertex . y = data [ 11 ] ;
6 vertex . z = data [ 12 ] ;
7 if ( choice == 0 ) { u = vertex . z ; v = vertex . y ;
8     }
9 else if ( choice == 1 ) { u = vertex . x ; v = vertex .
10     z ; }
11 else if ( choice == 2 ) { u = vertex . x ; v = vertex .
12     y ; }
13 squashedVertex . u = u ;
14 squashedVertex . v = v ;
15 polygon . points3D [ vertexPolygonIndex ] = vertex ;
16 polygon . points2D [ vertexPolygonIndex ] =
    squashedVertex ;
17 polygon
```


Código Preprocesado (Sin Pretty Print)

```
1 . planeCuts = planeCutsFound ;
2 polygon . numberPlaneCuts = numberPlaneCuts ;
3 polygon . textures = texturesFound ;
4 polygon . numberTextures = numberTextures ;
5 polygon . x0y0z0 = x0y0z0 ;
6 polygon . x1y1z1 = x1y1z1 ;
7 polygon . x2y2z2 = x2y2z2 ;
8 polygon . x3y3z3 = x3y3z3 ;
9 Objects [ objectIndex ] = polygon ;
10 if ( debug == 1 ) {
11   printPlaneCuts ( Objects [ objectIndex ] ) ;
12   printTextures ( Objects [ objectIndex ] ,
13     whichObjectCreate ) ;
14 }
15 objectIndex
```

Código Preprocesado (Sin Pretty Print)

```
1 ++ ;
2 return ;
3 }
4 case 4 : {
5 if ( debug == 1 ) {
6 printf ( "Insertando cilindro ..." ) ;
7 printf ( "Ancla: (%LF, %LF, %LF) \n" , data [ 0 ] ,
8         data [ 1 ] , data [ 2 ] ) ;
9 printf ( "Vector: (%LF, %LF, %LF) \n" , data [ 3 ] ,
10         data [ 4 ] , data [ 5 ] ) ;
11 printf ( "o1: %LF, o2: %LF, o3: %LF \n" , data [ 6 ] ,
12         data [ 7 ] , data [ 8 ] ) ;
13 printf ( "Cilindro Radio: %LF \n" , data [ 9 ] ) ;
14 printf ( "Cilindro d1: %LF Cilindro d2: %LF \n" , data
15         [ 10 ] , data [ 11 ] ) ;
16 printf ( "Cilindro Kd: %LF \n" , data [ 12 ] ) ;
17 printf ( "Cilindro Ka: %LF \n" , data [ 13 ] ) ;
18 printf
```

Código Preprocesado (Sin Pretty Print)

```
1 ( " Cilindro Kn: %LF \n" , data [ 14 ] ) ;
2 printf ( " Cilindro Ks: %LF \n" , data [ 15 ] ) ;
3 printf ( "RGB Cilindro: (%LF, %LF, %LF) \n" , data [ 16
    ] , data [ 17 ] , data [ 18 ] ) ;
4 }
5 struct Object cilinder ;
6 cilinder . Xc = data [ 0 ] ;
7 cilinder . Yc = data [ 1 ] ;
8 cilinder . Zc = data [ 2 ] ;
9 struct Vector cilinderVector ;
10 cilinderVector . x = data [ 3 ] ;
11 cilinderVector . y = data [ 4 ] ;
12 cilinderVector . z = data [ 5 ] ;
13 cilinderVector = normalize ( cilinderVector ) ;
14 cilinder
```

Código Preprocesado (Sin Pretty Print)

```
1 . directionVector = cilinderVector ;
2 cilinder . o1 = data [ 6 ] ;
3 cilinder . o2 = data [ 7 ] ;
4 cilinder . o3 = data [ 8 ] ;
5 cilinder . other = data [ 9 ] ;
6 cilinder . D1 = data [ 10 ] ;
7 cilinder . D2 = data [ 11 ] ;
8 cilinder . Kd = data [ 12 ] ;
9 cilinder . Ka = data [ 13 ] ;
10 cilinder . Kn = data [ 14 ] ;
11 cilinder . Ks = data [ 15 ] ;
12 cilinder . height = cilinder . D2 - cilinder . D1 ;
13 cilinder . normalVector = cilinderNormal ;
14 cilinder
```

Código Preprocesado (Sin Pretty Print)

```
1 . intersectionFuncion = cilinderIntersection ;
2 cilinder . retrieveTextureColor = cylinderTexture ;
3 struct Color cilinderColor ;
4 cilinderColor . r = data [ 16 ] ;
5 cilinderColor . g = data [ 17 ] ;
6 cilinderColor . b = data [ 18 ] ;
7 cilinder . color = cilinderColor ;
8 cilinder . planeCuts = planeCutsFound ;
9 cilinder . numberPlaneCuts = numberPlaneCuts ;
10 cilinder . textures = texturesFound ;
11 cilinder . numberTextures = numberTextures ;
12 Objects [ objectIndex ] = cilinder ;
13 if ( debug == 1 ) {
14 printPlaneCuts
```

Código Preprocesado (Sin Pretty Print)

```
1 ( Objects [ objectIndex ] ) ;
2 printTextures ( Objects [ objectIndex ] ,
   whichObjectCreate ) ;
3 }
4 objectIndex ++ ;
5 return ;
6 }
7 case 5 : {
8 if ( debug == 1 ) {
9 printf ( "Insertando cono..." ) ;
10 printf ( "Ancla: (%LF, %LF, %LF) \n" , data [ 0 ] ,
   data [ 1 ] , data [ 2 ] ) ;
11 printf ( "Vector: (%LF, %LF, %LF) \n" , data [ 3 ] ,
   data [ 4 ] , data [ 5 ] ) ;
12 printf ( "o1: %LF, o2: %LF, o3: %LF \n" , data [ 6 ] ,
   data [ 7 ] , data [ 8 ] ) ;
13 printf ( "Cono k1: %LF COno k2: %LF \n" , data [ 9 ] ,
   data [ 10 ] ) ;
14 printf
```

Código Preprocesado (Sin Pretty Print)

```
1 ( "Cono d1: %LF COno d2: %LF \n" , data [ 11 ] , data [
    12 ] ) ;
2 printf ( "Cono Kd: %LF \n" , data [ 13 ] ) ;
3 printf ( "Cono Ka: %LF \n" , data [ 14 ] ) ;
4 printf ( "Cono Kn: %LF \n" , data [ 15 ] ) ;
5 printf ( "Cono Ks: %LF \n" , data [ 16 ] ) ;
6 printf ( "RGB Cono: (%LF, %LF, %LF) \n" , data [ 17 ] ,
    data [ 18 ] , data [ 19 ] ) ;
7 }
8 struct Object cone ;
9 cone . Xc = data [ 0 ] ;
10 cone . Yc = data [ 1 ] ;
11 cone . Zc = data [ 2 ] ;
12 struct Vector coneVector ;
13 coneVector . x = data [ 3 ] ;
14 coneVector
```

Código Preprocesado (Sin Pretty Print)

```
1 . y = data [ 4 ] ;  
2 coneVector . z = data [ 5 ] ;  
3 coneVector = normalize ( coneVector ) ;  
4 cone . directionVector = coneVector ;  
5 cone . o1 = data [ 6 ] ;  
6 cone . o2 = data [ 7 ] ;  
7 cone . o3 = data [ 8 ] ;  
8 cone . K1 = data [ 9 ] ;  
9 cone . K2 = data [ 10 ] ;  
10 cone . D1 = data [ 11 ] ;  
11 cone . D2 = data [ 12 ] ;  
12 cone . height = cone . D2 - cone . D1 ;  
13 cone . Kd = data [ 13 ] ;  
14 cone
```


Código Preprocesado (Sin Pretty Print)

```
1 . Ka = data [ 14 ] ;
2 cone . Kn = data [ 15 ] ;
3 cone . Ks = data [ 16 ] ;
4 cone . intersectionFuncion = coneIntersection ;
5 cone . retrieveTextureColor = coneTexture ;
6 cone . normalVector = coneNormal ;
7 struct Color coneColor ;
8 coneColor . r = data [ 17 ] ;
9 coneColor . g = data [ 18 ] ;
10 coneColor . b = data [ 19 ] ;
11 cone . color = coneColor ;
12 cone . planeCuts = planeCutsFound ;
13 cone . numberPlaneCuts = numberPlaneCuts ;
14 cone
```

Código Preprocesado (Sin Pretty Print)

```
1 . textures = texturesFound ;
2 cone . numberTextures = numberTextures ;
3 Objects [ objectIndex ] = cone ;
4 if ( debug == 1 ) {
5 printPlaneCuts ( Objects [ objectIndex ] ) ;
6 printTextures ( Objects [ objectIndex ] ,
    whichObjectCreate ) ;
7 }
8 objectIndex ++ ;
9 return ;
10 }
11 case 6 : {
12 if ( debug == 1 ) {
13 printf ( "Insertando disco ..." ) ;
14 printf
```

Código Preprocesado (Sin Pretty Print)

```
1 ( "Punto Central: (%LF, %LF, %LF) \n" , data [ 0 ] ,  
    data [ 1 ] , data [ 2 ] ) ;  
2 printf ( "Normal: (%LF, %LF, %LF) \n" , data [ 3 ] ,  
    data [ 4 ] , data [ 5 ] ) ;  
3 printf ( "Color: (%LF, %LF, %LF) \n" , data [ 6 ] ,  
    data [ 7 ] , data [ 8 ] ) ;  
4 printf ( "Disco Radio: %LF \n" , data [ 9 ] ) ;  
5 printf ( "o1: %LF, o2: %LF, o3: %LF \n" , data [ 10 ]  
    , data [ 11 ] , data [ 12 ] ) ;  
6 printf ( "Disco Kd: %LF \n" , data [ 13 ] ) ;  
7 printf ( "Disco Ka: %LF \n" , data [ 14 ] ) ;  
8 printf ( "Disco Kn: %LF \n" , data [ 15 ] ) ;  
9 printf ( "Disco Ks: %LF \n" , data [ 16 ] ) ;  
10 printf ( "Esquina inferior izquierda (%LF, %LF, %LF) \n"  
    " , data [ 17 ] , data [ 18 ] , data [ 19 ] ) ;  
11 printf ( "Esquina inferior derecha (%LF, %LF, %LF) \n"  
    , data [ 20 ] , data [ 21 ] , data [ 22 ] ) ;  
12 printf ( "Esquina superior derecha (%LF, %LF, %LF) \n"  
    , data [ 23 ] , data [ 24 ] , data [ 25 ] ) ;
```

Código Preprocesado (Sin Pretty Print)

```
1
2 struct Object disco ;
3 struct Vector x0y0z0 ;
4 x0y0z0 . x = data [ 17 ] ;
5 x0y0z0 . y = data [ 18 ] ;
6 x0y0z0 . z = data [ 19 ] ;
7 struct Vector x1y1z1 ;
8 x1y1z1 . x = data [ 20 ] ;
9 x1y1z1 . y = data [ 21 ] ;
10 x1y1z1 . z = data [ 22 ] ;
11 struct Vector x2y2z2 ;
12 x2y2z2 . x = data [ 23 ] ;
13 x2y2z2 . y = data [ 24 ] ;
14 x2y2z2
```

Código Preprocesado (Sin Pretty Print)

```
1 . z = data [ 25 ] ;
2 struct Vector x3y3z3 ;
3 x3y3z3 . x = data [ 26 ] ;
4 x3y3z3 . y = data [ 27 ] ;
5 x3y3z3 . z = data [ 28 ] ;
6 disco . x0y0z0 = x0y0z0 ;
7 disco . x1y1z1 = x1y1z1 ;
8 disco . x2y2z2 = x2y2z2 ;
9 disco . x3y3z3 = x3y3z3 ;
10 disco . Xc = data [ 0 ] ;
11 disco . Yc = data [ 1 ] ;
12 disco . Zc = data [ 2 ] ;
13 disco . intersectionFuncion = discIntersection ;
14 disco
```

Código Preprocesado (Sin Pretty Print)

```
1 . normalVector = discNormal ;
2 disco . retrieveTextureColor = planeTexture ;
3 struct Vector puntoCentral ;
4 puntoCentral . x = data [ 0 ] ;
5 puntoCentral . y = data [ 1 ] ;
6 puntoCentral . z = data [ 2 ] ;
7 struct Vector normalNotNormalized ;
8 normalNotNormalized . x = data [ 3 ] ;
9 normalNotNormalized . y = data [ 4 ] ;
10 normalNotNormalized . z = data [ 5 ] ;
11 struct Color colorDisco ;
12 colorDisco . r = data [ 6 ] ;
13 colorDisco . g = data [ 7 ] ;
14 colorDisco
```

Código Preprocesado (Sin Pretty Print)

```
1 . b = data [ 8 ] ;
2 disco . color = colorDisco ;
3 long double dPlano = whatsTheDGeneral (
    normalNotNormalized , puntoCentral ) ;
4 dPlano = dPlano / getNorm ( normalNotNormalized ) ;
5 disco . extraD = dPlano ;
6 normalNotNormalized = normalize ( normalNotNormalized )
    ;
7 disco . directionVector = normalNotNormalized ;
8 disco . other = data [ 9 ] ;
9 disco . o1 = data [ 10 ] ;
10 disco . o2 = data [ 11 ] ;
11 disco . o3 = data [ 12 ] ;
12 disco . Kd = data [ 13 ] ;
13 disco . Ka = data [ 14 ] ;
14 disco
```

Código Preprocesado (Sin Pretty Print)

```
1 . Kn = data [ 15 ] ;
2 disco . Ks = data [ 16 ] ;
3 disco . planeCuts = planeCutsFound ;
4 disco . numberPlaneCuts = numberPlaneCuts ;
5 disco . textures = texturesFound ;
6 disco . numberTextures = numberTextures ;
7 Objects [ objectIndex ] = disco ;
8 if ( debug == 1 ) {
9   printPlaneCuts ( Objects [ objectIndex ] ) ;
10  printTextures ( Objects [ objectIndex ] ,
11                 whichObjectCreate ) ;
12 }
13 objectIndex ++ ;
14 return ;
15 }
```


Código Preprocesado (Sin Pretty Print)

```
1
2 case 7 : {
3 if ( debug == 1 ) {
4 printf ( "Insertando Elipses..." ) ;
5 printf ( "Foco 1: (%LF, %LF, %LF) \n" , data [ 0 ] ,
        data [ 1 ] , data [ 2 ] ) ;
6 printf ( "Foco 2: (%LF, %LF, %LF) \n" , data [ 3 ] ,
        data [ 4 ] , data [ 5 ] ) ;
7 printf ( "Normal no normalizada: (%LF, %LF, %LF) \n" ,
        data [ 6 ] , data [ 7 ] , data [ 8 ] ) ;
8 printf ( "Color: (%LF, %LF, %LF) \n" , data [ 9 ] ,
        data [ 8 ] , data [ 9 ] ) ;
9 printf ( "K del ellipse: %LF \n" , data [ 12 ] ) ;
10 printf ( "o1: %LF, o2: %LF, o3: %LF \n" , data [ 13 ]
        , data [ 14 ] , data [ 15 ] ) ;
11 printf ( "Ellipse Kd: %LF \n" , data [ 16 ] ) ;
12 printf ( "Ellipse Ka: %LF \n" , data [ 17 ] ) ;
13 printf ( "Ellipse Kn: %LF \n" , data [ 18 ] ) ;
14 printf
```

Código Preprocesado (Sin Pretty Print)

```
1 ( "Ellipse Ks: %LF \n" , data [ 19 ] ) ;
2 printf ( "Esquina inferior izquierda (%LF, %LF, %LF) \n"
3         , data [ 20 ] , data [ 21 ] , data [ 22 ] ) ;
4 printf ( "Esquina inferior derecha (%LF, %LF, %LF) \n"
5         , data [ 23 ] , data [ 24 ] , data [ 25 ] ) ;
6 printf ( "Esquina superior derecha (%LF, %LF, %LF) \n"
7         , data [ 26 ] , data [ 27 ] , data [ 28 ] ) ;
8 printf ( "Esquina superior izquierda (%LF, %LF, %LF) \n"
9         , data [ 29 ] , data [ 30 ] , data [ 31 ] ) ;
10 }
11 struct Object ellipse ;
12 struct Vector x0y0z0 ;
13 x0y0z0 . x = data [ 20 ] ;
14 x0y0z0 . y = data [ 21 ] ;
15 x0y0z0 . z = data [ 22 ] ;
16 struct Vector x1y1z1 ;
17 x1y1z1 . x = data [ 23 ] ;
18 x1y1z1
```

Código Preprocesado (Sin Pretty Print)

```
1 . y = data [ 24 ] ;  
2 x1y1z1 . z = data [ 25 ] ;  
3 struct Vector x2y2z2 ;  
4 x2y2z2 . x = data [ 26 ] ;  
5 x2y2z2 . y = data [ 27 ] ;  
6 x2y2z2 . z = data [ 28 ] ;  
7 struct Vector x3y3z3 ;  
8 x3y3z3 . x = data [ 29 ] ;  
9 x3y3z3 . y = data [ 30 ] ;  
10 x3y3z3 . z = data [ 31 ] ;  
11 ellipse . x0y0z0 = x0y0z0 ;  
12 ellipse . x1y1z1 = x1y1z1 ;  
13 ellipse . x2y2z2 = x2y2z2 ;  
14 ellipse
```

Código Preprocesado (Sin Pretty Print)

```
1 . x3y3z3 = x3y3z3 ;
2 ellipse . intersectionFuncion = ellipseIntersection ;
3 ellipse . normalVector = ellipseNormal ;
4 ellipse . retrieveTextureColor = planeTexture ;
5 struct Vector foco1 ;
6 foco1 . x = data [ 0 ] ;
7 foco1 . y = data [ 1 ] ;
8 foco1 . z = data [ 2 ] ;
9 ellipse . Xc = data [ 0 ] ;
10 ellipse . Yc = data [ 1 ] ;
11 ellipse . Zc = data [ 2 ] ;
12 ellipse . Xother = data [ 3 ] ;
13 ellipse . Yother = data [ 4 ] ;
14 ellipse
```

Código Preprocesado (Sin Pretty Print)

```
1 . Zother = data [ 5 ] ;
2 struct Vector normalNotNormalized ;
3 normalNotNormalized . x = data [ 6 ] ;
4 normalNotNormalized . y = data [ 7 ] ;
5 normalNotNormalized . z = data [ 8 ] ;
6 struct Color colorEllipse ;
7 colorEllipse . r = data [ 9 ] ;
8 colorEllipse . g = data [ 10 ] ;
9 colorEllipse . b = data [ 11 ] ;
10 ellipse . color = colorEllipse ;
11 long double dPlano = whatsTheDGeneral (
    normalNotNormalized , foco1 ) ;
12 dPlano = dPlano / getNorm ( normalNotNormalized ) ;
13 ellipse . extraD = dPlano ;
14 normalNotNormalized
```

Código Preprocesado (Sin Pretty Print)

```
1 = normalize ( normalNotNormalized ) ;
2 ellipse . directionVector = normalNotNormalized ;
3 ellipse . other = data [ 12 ] ;
4 ellipse . o1 = data [ 13 ] ;
5 ellipse . o2 = data [ 14 ] ;
6 ellipse . o3 = data [ 15 ] ;
7 ellipse . Kd = data [ 16 ] ;
8 ellipse . Ka = data [ 17 ] ;
9 ellipse . Kn = data [ 18 ] ;
10 ellipse . Ks = data [ 19 ] ;
11 ellipse . planeCuts = planeCutsFound ;
12 ellipse . numberPlaneCuts = numberPlaneCuts ;
13 ellipse . textures = texturesFound ;
14 ellipse
```

Código Preprocesado (Sin Pretty Print)

```
1 . numberTextures = numberTextures ;
2 Objects [ objectIndex ] = ellipse ;
3 if ( debug == 1 ) {
4 printPlaneCuts ( Objects [ objectIndex ] ) ;
5 printTextures ( Objects [ objectIndex ] ,
6               whichObjectCreate ) ;
7 }
8 objectIndex ++ ;
9 return ;
10 }
11 case 8 : {
12 if ( debug == 1 ) {
13 printf ( "Insertando Cuadrática ..." ) ;
14 printf ( "Coeficientes: \n\t A: %LF \n\t B: %LF \n\t C:
    %LF\n\t D: %LF\n\t E: %LF \n\t F: %LF\n\t G: %LF \n\t
    H: %LF \n\t I: %LF \n" , data [ 1 ] , data [ 2 ] ,
    data [ 3 ] , data [ 4 ] , data [ 5 ] , data [ 6 ] ,
    data [ 7 ] , data [ 8 ] , data [ 9 ] ) ;
15 printf
```

Código Preprocesado (Sin Pretty Print)

```
1 ( "Constante K: %LF \n" , data [ 10 ] ) ;
2 printf ( "o1:  %LF, o2: %LF, o3: %LF \n" , data [ 11 ]
    , data [ 12 ] , data [ 13 ] ) ;
3 printf ( "Elipse Kd: %LF \n" , data [ 14 ] ) ;
4 printf ( "Elipse Ka: %LF \n" , data [ 15 ] ) ;
5 printf ( "Elipse Kn: %LF \n" , data [ 16 ] ) ;
6 printf ( "Elipse Ks: %LF \n" , data [ 17 ] ) ;
7 printf ( "Color: (%LF, %LF, %LF) \n" , data [ 18 ] ,
    data [ 19 ] , data [ 20 ] ) ;
8 }
9 struct Object cuadratica ;
10 cuadratica . A = data [ 0 ] ;
11 cuadratica . B = data [ 1 ] ;
12 cuadratica . C = data [ 2 ] ;
13 cuadratica . D = data [ 3 ] ;
14 cuadratica
```


Código Preprocesado (Sin Pretty Print)

```
1 . E = data [ 4 ] ;
2 cuadratica . F = data [ 5 ] ;
3 cuadratica . G = data [ 6 ] ;
4 cuadratica . H = data [ 7 ] ;
5 cuadratica . I = data [ 8 ] ;
6 cuadratica . J = data [ 9 ] ;
7 cuadratica . other = data [ 10 ] ;
8 cuadratica . o1 = data [ 11 ] ;
9 cuadratica . o2 = data [ 12 ] ;
10 cuadratica . o3 = data [ 13 ] ;
11 cuadratica . Kd = data [ 14 ] ;
12 cuadratica . Ka = data [ 15 ] ;
13 cuadratica . Kn = data [ 16 ] ;
14 cuadratica
```

Código Preprocesado (Sin Pretty Print)

```
1 . Ks = data [ 17 ] ;
2 struct Color colorCuadratica ;
3 colorCuadratica . r = data [ 18 ] ;
4 colorCuadratica . g = data [ 19 ] ;
5 colorCuadratica . b = data [ 20 ] ;
6 cuadratica . color = colorCuadratica ;
7 cuadratica . intersectionFuncion =
    quadraticIntersection ;
8 cuadratica . normalVector = quadraticNormal ;
9 cuadratica . planeCuts = planeCutsFound ;
10 cuadratica . numberPlaneCuts = numberPlaneCuts ;
11 cuadratica . textures = texturesFound ;
12 cuadratica . numberTextures = numberTextures ;
13 Objects [ objectIndex ] = cuadratica ;
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( debug == 1 ) {  
2 printPlaneCuts ( Objects [ objectIndex ] ) ;  
3 printTextures ( Objects [ objectIndex ] ,  
    whichObjectCreate ) ;  
4 printf ( "sup" ) ;  
5 }  
6 objectIndex ++ ;  
7 return ;  
8 }  
9 }  
10 }  
11 long double obtainSingleValueFromLine ( char line [ ] )  
    {  
12 char * token ;  
13 char * search = "=" ;  
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double numericValue ;
2 token = strtok ( line , search ) ;
3 token = strtok ( NULL , search ) ;
4 sscanf ( token , "%LF" , & numericValue ) ;
5 return numericValue ;
6 }
7 long double * obtainPointFromString ( char stringPoint
    [ ] ) {
8 char * token ;
9 char * search = "=" ;
10 long double numericValue ;
11 token = strtok ( stringPoint , search ) ;
12 token = strtok ( NULL , search ) ;
13 char * pch ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double * pointDimensions = malloc ( sizeof ( long
    double ) * 3 ) ;
2 int currentDimension = 0 ;
3 pch = strtok ( token , "," ) ;
4 while ( pch != NULL )
5 {
6     sscanf ( pch , "%LF" , & pointDimensions [
        currentDimension ] ) ;
7     pch = strtok ( NULL , "," ) ;
8     currentDimension ++ ;
9 }
10 return pointDimensions ;
11 }
12 void strip ( char * s ) {
13     char * p2 = s ;
14     while
```

Código Preprocesado (Sin Pretty Print)

```
1 ( * s != '\0' ) {  
2 if ( * s != '\t' && * s != '\n' ) {  
3 * p2 ++ = * s ++ ;  
4 } else {  
5 ++ s ;  
6 }  
7 }  
8 * p2 = '\0' ; }  
9 char * obtainFilenameTexture ( char stringLine [ ] ) {  
10 char * token = malloc ( sizeof ( char ) * 200 ) ;  
11 char * search = "=" ;  
12 token = strtok ( stringLine , search ) ;  
13 token = strtok ( NULL , search ) ;  
14 strip
```

Código Preprocesado (Sin Pretty Print)

```
1 ( token ) ;
2 return token ; }
3 struct PlaneCut * readPlaneCuts ( long int pos , int *
    numberPlanes , long int * posAfterReading ) {
4 char temporalBuffer [ 300 ] ;
5 struct PlaneCut * planeCutsFound = NULL ;
6 long double * datosPlanos ;
7 int indexPlaneCut = - 1 ;
8 FILE * file ;
9 if ( file = fopen ( escenaFile , "r" ) ) {
10 fseek ( file , pos , SEEK_SET ) ;
11 while ( fgets ( temporalBuffer , 300 , file ) != NULL )
    {
12 if ( temporalBuffer [ 0 ] == '\n' ) {
13 continue ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 if ( strstr ( temporalBuffer , "#" ) != NULL ) {
3     continue ;
4 }
5 if ( strstr ( temporalBuffer , "NumberPlanes" ) != NULL
        ) {
6     long double numberPlanes = obtainSingleValueFromLine (
            temporalBuffer ) ;
7     planeCutsFound = malloc ( sizeof ( struct PlaneCut ) *
            numberPlanes ) ;
8     continue ;
9 } else if ( strstr ( temporalBuffer , "Plano_" ) !=
        NULL ) {
10     indexPlaneCut ++ ;
11     continue ;
12 } else if ( strstr ( temporalBuffer , "END_Planos" ) !=
        NULL ) {
13     * numberPlanes = indexPlaneCut + 1 ;
14     *
```


Código Preprocesado (Sin Pretty Print)

```
1 posAfterReading = ftell ( file ) ;
2 return planeCutsFound ;
3 } else if ( strstr ( temporalBuffer , "Punto" ) != NULL
4 ) {
5   datosPlanos = obtainPointFromString ( temporalBuffer )
6   ;
7   struct Vector temp ;
8   temp . x = datosPlanos [ 0 ] ;
9   temp . y = datosPlanos [ 1 ] ;
10  temp . z = datosPlanos [ 2 ] ;
11  planeCutsFound [ indexPlaneCut ] . point = temp ;
12  free ( datosPlanos ) ;
13  continue ;
14 } else if ( strstr ( temporalBuffer , "Normal" ) !=
15   NULL ) {
16   datosPlanos = obtainPointFromString ( temporalBuffer )
17   ;
18   struct
```

Código Preprocesado (Sin Pretty Print)

```
1 Vector temp ;
2 temp . x = datosPlanos [ 0 ] ;
3 temp . y = datosPlanos [ 1 ] ;
4 temp . z = datosPlanos [ 2 ] ;
5 long double dEquation = whatsTheDGeneral ( temp ,
    planeCutsFound [ indexPlaneCut ] . point ) ;
6 dEquation = dEquation / getNorm ( temp ) ;
7 temp = normalize ( temp ) ;
8 planeCutsFound [ indexPlaneCut ] . normal = temp ;
9 planeCutsFound [ indexPlaneCut ] . d = dEquation ;
10 free ( datosPlanos ) ;
11 continue ;
12 }
13 continue ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 }
3 }
4 struct Color * * getTexels ( char * pFile , int * hRes
    , int * vRes ) {
5 int counter , x , y , i , j ;
6 char dump [ 100 ] ;
7 time_t t ;
8 struct Color * * temp ;
9 srand ( ( unsigned ) time ( & t ) ) ;
10 FILE * file ;
11 if ( file = fopen ( pFile , "r" ) ) {
12 for ( i = 0 ; i < 11 ; ++ i ) {
13 fscanf ( file , "%s" , & dump [ 0 ] ) ;
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( i == 8 || i == 9 ) {  
2   if ( i == 8 ) {  
3     sscanf ( & dump [ 0 ] , "%i" , hRes ) ;  
4   } else {  
5     sscanf ( & dump [ 0 ] , "%i" , vRes ) ;  
6   }  
7 }  
8 }  
9 temp = malloc ( sizeof ( struct Color * ) * ( * hRes )  
10               ) ;  
11 for ( int r = 0 ; r < ( * hRes ) ; r ++ ) {  
12   temp [ r ] = malloc ( sizeof ( struct Color ) * ( *  
13     vRes ) ) ;  
14 }  
15 if ( temp == NULL ) {  
16   printf
```

Código Preprocesado (Sin Pretty Print)

```
1 ( " Devolvi  NULL \n" ) ;  
2 }  
3 char temporalBuffer [ 2000 ] ;  
4 int i = 0 , x = 0 , y = 0 , counter = 0 ;  
5 while ( fgets ( temporalBuffer , 200 , file ) != NULL )  
6 {  
7     if ( temporalBuffer [ 0 ] == '\n' ) {  
8         continue ;  
9     }  
10    struct Color texel ;  
11    long double number ;  
12    sscanf ( temporalBuffer , "%LF" , & number ) ;  
13    int xs = * hRes - x - 1 ;  
14    if ( i == 0 ) {  
15        temp
```

Código Preprocesado (Sin Pretty Print)

```
1 [ y ] [ xs ] . r = ( number ) / 255 ;  
2 } else if ( i == 1 ) {  
3 temp [ y ] [ xs ] . g = ( number ) / 255 ;  
4 } else if ( i == 2 ) {  
5 temp [ y ] [ xs ] . b = ( number ) / 255 ;  
6 }  
7 i = ( i + 1 ) % 3 ;  
8 if ( i == 0 ) {  
9 y = ( y + 1 ) ;  
10 y = y % ( * vRes ) ;  
11 if ( y == 0 ) {  
12 x = ( x + 1 ) ;  
13 x = x % ( * hRes ) ;  
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( x == 0 ) {  
2 break ;  
3 }  
4 }  
5 }  
6 counter = 1 ;  
7 }  
8 y = 0 ;  
9 x = 0 ;  
10 while ( counter != 5 ) {  
11 counter ++ ;  
12 y ++ ;  
13 }  
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 else {
3   ( * vRes ) = 128 ;
4   ( * hRes ) = 128 ;
5   temp = malloc ( sizeof ( struct Color * ) * 128 ) ;
6   for ( int r = 0 ; r < ( * hRes ) ; r ++ ) {
7     temp [ r ] = malloc ( sizeof ( struct Color ) * 128 ) ;
8   }
9   if ( temp == NULL ) {
10    printf ( " Devolvi  NULL \n" ) ;
11  }
12  printf ( "La textura de %s no pudo abrirse. Se
          sustituir por est tica\n" , pFile ) ;
13  for ( x = 0 ; x < 128 ; x ++ ) {
14    for
```


Código Preprocesado (Sin Pretty Print)

```
1 ( y = 0 ; y < 128 ; y ++ ) {  
2 struct Color estatica ;  
3 estatica . r = ( ( long double ) ( rand ( ) % 255 ) ) /  
    255 ;  
4 estatica . g = ( ( long double ) ( rand ( ) % 255 ) ) /  
    255 ;  
5 estatica . b = ( ( long double ) ( rand ( ) % 255 ) ) /  
    255 ;  
6 temp [ x ] [ y ] = estatica ;  
7 }  
8 }  
9 }  
10 return temp ;  
11 }  
12 struct Texture * readTextures ( int currentTypeReading  
    , long int pos , int * numberTextures , long int *  
    posAfterReading ) {  
13 char temporalBuffer [ 300 ] ;  
14 struct
```

Código Preprocesado (Sin Pretty Print)

```
1 Texture * texturesFound = NULL ;
2 long double * datosTexture ;
3 int indexTexture = - 1 ;
4 FILE * file ;
5 if ( file = fopen ( escenaFile , "r" ) ) {
6 fseek ( file , pos , SEEK_SET ) ;
7 while ( fgets ( temporalBuffer , 300 , file ) != NULL )
8 {
9 if ( temporalBuffer [ 0 ] == '\n' ) {
10 continue ;
11 }
12 if ( temporalBuffer [ 0 ] == '\t' ) {
13 continue ;
14 }
15 }
```

Código Preprocesado (Sin Pretty Print)

```
1 ( strstr ( temporalBuffer , "#" ) != NULL ) {
2 continue ;
3 }
4 if ( strstr ( temporalBuffer , "NumberTextures" ) !=
    NULL || strstr ( temporalBuffer , "NumberTexturas"
    ) != NULL ) {
5 long double numberTextures = obtainSingleValueFromLine
    ( temporalBuffer ) ;
6 texturesFound = malloc ( sizeof ( struct Texture ) *
    numberTextures ) ;
7 continue ;
8 } else if ( strstr ( temporalBuffer , "Texture_" ) !=
    NULL || strstr ( temporalBuffer , "Textura_" ) !=
    NULL ) {
9 indexTexture ++ ;
10 continue ;
11 } else if ( strstr ( temporalBuffer , "END_Textures" )
    != NULL || strstr ( temporalBuffer , "END_Texturas"
    ) != NULL ) {
```

Código Preprocesado (Sin Pretty Print)

```
1 texturesFound ;
2 } else if ( strstr ( temporalBuffer , "Filename" ) !=
    NULL || strstr ( temporalBuffer , "filename" ) !=
    NULL ) {
3 char * filename = obtainFilenameTexture (
    temporalBuffer ) ;
4 int hRes , vRes ;
5 texturesFound [ indexTexture ] . filename = filename ;
6 struct Color * * textureMap = getTexels ( texturesFound
    [ indexTexture ] . filename , & hRes , & vRes ) ;
7 texturesFound [ indexTexture ] . textureMap =
    textureMap ;
8 texturesFound [ indexTexture ] . hRes = hRes ;
9 texturesFound [ indexTexture ] . vRes = vRes ;
10 continue ;
11 }
12 if ( currentTypeReading == 2 || currentTypeReading == 4
    || currentTypeReading == 5 || currentTypeReading
    == 8 ) {
```

Código Preprocesado (Sin Pretty Print)

```
1 = obtainPointFromString ( temporalBuffer ) ;
2 struct Vector temp ;
3 temp . x = datosTexture [ 0 ] ;
4 temp . y = datosTexture [ 1 ] ;
5 temp . z = datosTexture [ 2 ] ;
6 temp = normalize ( temp ) ;
7 texturesFound [ indexTexture ] . greenwich = temp ;
8 free ( datosTexture ) ;
9 continue ;
10 }
11 if ( currentTypeReading == 2 || currentTypeReading == 8
    ) {
12 if ( strstr ( temporalBuffer , "Norte" ) != NULL ||
    strstr ( temporalBuffer , "North" ) != NULL ) {
13 datosTexture = obtainPointFromString ( temporalBuffer )
    ;
14 struct
```

Código Preprocesado (Sin Pretty Print)

```
1 Vector temp ;
2 temp . x = datosTexture [ 0 ] ;
3 temp . y = datosTexture [ 1 ] ;
4 temp . z = datosTexture [ 2 ] ;
5 temp = normalize ( temp ) ;
6 texturesFound [ indexTexture ] . north = temp ;
7 free ( datosTexture ) ;
8 continue ;
9 }
10 }
11 }
12 continue ;
13 }
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  
2 }  
3 struct DraftPlane * readDraftPlanes ( int  
    currentTypeReading , long int pos , int *  
    numberDraftPlanes , long int * posAfterReading ) {  
4 char temporalBuffer [ 300 ] ;  
5 struct DraftPlane * draftPlanesFound = NULL ;  
6 long double * datosDraftPlane ;  
7 int indexDraftPlane = - 1 ;  
8 FILE * file ;  
9 if ( file = fopen ( escenaFile , "r" ) ) {  
10 fseek ( file , pos , SEEK_SET ) ;  
11 while ( fgets ( temporalBuffer , 300 , file ) != NULL )  
    {  
12 if ( temporalBuffer [ 0 ] == '\n' ) {  
13 continue ;  
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 if ( temporalBuffer [ 0 ] == '\t' ) {
3     continue ;
4 }
5 if ( strstr ( temporalBuffer , "#" ) != NULL ) {
6     continue ;
7 }
8 if ( strstr ( temporalBuffer , "NumberPlanosCalado" )
      != NULL || strstr ( temporalBuffer , "
      NumberDraftPlanes" ) != NULL ) {
9     long double numberDraftPlanes =
        obtainSingleValueFromLine ( temporalBuffer ) ;
10    draftPlanesFound = malloc ( sizeof ( struct DraftPlane
        ) * numberDraftPlanes ) ;
11    continue ;
12 } else if ( strstr ( temporalBuffer , "Plano_Calado_" )
        != NULL || strstr ( temporalBuffer , "PlanoCalado_"
        ) != NULL ) {
13    indexDraftPlane ++ ;
```


Código Preprocesado (Sin Pretty Print)

```
1 ;  
2 } else if ( ( strstr ( temporalBuffer , "  
    END_Planos_Calado" ) != NULL ) || ( strstr (  
    temporalBuffer , "END_PlanosCalado" ) != NULL ) ||  
    ( strstr ( temporalBuffer , "END_DraftPlanes" ) !=  
    NULL ) || ( strstr ( temporalBuffer , "  
    END_Draft_Planes" ) != NULL ) ) {  
3 * numberDraftPlanes = indexDraftPlane + 1 ;  
4 * posAfterReading = ftell ( file ) ;  
5 return draftPlanesFound ;  
6 } else if ( strstr ( temporalBuffer , "Filename" ) !=  
    NULL || strstr ( temporalBuffer , "filename" ) !=  
    NULL ) {  
7 char * filename = obtainFilenameTexture (  
    temporalBuffer ) ;  
8 int hRes , vRes ;  
9 draftPlanesFound [ indexDraftPlane ] . filename =  
    filename ;  
10 struct Color * * textureMap = getTexels (
```

Código Preprocesado (Sin Pretty Print)

```
1 ;  
2 }  
3 if ( currentTypeReading == 2 || currentTypeReading == 4  
    || currentTypeReading == 5 || currentTypeReading  
    == 8 ) {  
4 if ( strstr ( temporalBuffer , "Greenwich" ) != NULL )  
    {  
5 datosDraftPlane = obtainPointFromString (  
    temporalBuffer ) ;  
6 struct Vector temp ;  
7 temp . x = datosDraftPlane [ 0 ] ;  
8 temp . y = datosDraftPlane [ 1 ] ;  
9 temp . z = datosDraftPlane [ 2 ] ;  
10 temp = normalize ( temp ) ;  
11 draftPlanesFound [ indexDraftPlane ] . greenwich = temp  
    ;  
12 free ( datosDraftPlane ) ;  
13 continue ;  
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 if ( currentTypeReading == 2 || currentTypeReading == 8
   ) {
3   if ( strstr ( temporalBuffer , "Norte" ) != NULL ||
       strstr ( temporalBuffer , "North" ) != NULL ) {
4     datosDraftPlane = obtainPointFromString (
       temporalBuffer ) ;
5     struct Vector temp ;
6     temp . x = datosDraftPlane [ 0 ] ;
7     temp . y = datosDraftPlane [ 1 ] ;
8     temp . z = datosDraftPlane [ 2 ] ;
9     temp = normalize ( temp ) ;
10    draftPlanesFound [ indexDraftPlane ] . north = temp ;
11    free ( datosDraftPlane ) ;
12    continue ;
13  }
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  
2 }  
3 continue ;  
4 }  
5 }  
6 }  
7 long double * readValueFromLine ( int state , int *  
    counterValueSegment , char * lineRead , int *  
    numberValuesRead ) {  
8 long double * values ;  
9 switch ( state ) {  
10 case 0 :  
11 if ( ( * counterValueSegment ) >= 0 && ( *  
    counterValueSegment ) <= 10 ) {  
12 values = malloc ( sizeof ( long double ) ) ;  
13 values [ 0 ] = obtainSingleValueFromLine ( lineRead ) ;  
14 (
```

Código Preprocesado (Sin Pretty Print)

```
1 * counterValueSegment ) ++ ;
2 * numberValuesRead = 1 ;
3 return values ;
4 } else if ( ( * counterValueSegment ) >= 11 && ( *
    counterValueSegment ) <= 12 ) {
5 long double * point = obtainPointFromString ( lineRead
    ) ;
6 values = malloc ( sizeof ( long double ) * 3 ) ;
7 values [ 0 ] = point [ 0 ] ;
8 values [ 1 ] = point [ 1 ] ;
9 values [ 2 ] = point [ 2 ] ;
10 * numberValuesRead = 3 ;
11 free ( point ) ;
12 if ( ( * counterValueSegment ) == 12 ) {
13 ( * counterValueSegment ) = 0 ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  else {
2  ( * counterValueSegment ) ++ ;
3  }
4  return values ;
5  }
6  case 1 :
7  if ( ( * counterValueSegment ) == 0 ) {
8  long double * positionLight = obtainPointFromString (
   lineRead ) ;
9  values = malloc ( sizeof ( long double ) * 3 ) ;
10 values [ 0 ] = positionLight [ 0 ] ;
11 values [ 1 ] = positionLight [ 1 ] ;
12 values [ 2 ] = positionLight [ 2 ] ;
13 ( * counterValueSegment ) ++ ;
14 *
```

Código Preprocesado (Sin Pretty Print)

```
1 numberValuesRead = 3 ;
2 free ( positionLight ) ;
3 return values ;
4 } else if ( ( * counterValueSegment ) >= 1 && ( *
    counterValueSegment <= 4 ) ) {
5 values = malloc ( sizeof ( long double ) ) ;
6 values [ 0 ] = obtainSingleValueFromLine ( lineRead ) ;
7 if ( ( * counterValueSegment ) == 4 ) {
8 ( * counterValueSegment ) = 0 ;
9 } else {
10 ( * counterValueSegment ) ++ ;
11 }
12 * numberValuesRead = 1 ;
13 return values ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 case 2 :
3 if ( ( * counterValueSegment ) == 0 || ( *
    counterValueSegment ) == 9 ) {
4 long double * positionSphere = obtainPointFromString (
    lineRead ) ;
5 values = malloc ( sizeof ( long double ) * 3 ) ;
6 values [ 0 ] = positionSphere [ 0 ] ;
7 values [ 1 ] = positionSphere [ 1 ] ;
8 values [ 2 ] = positionSphere [ 2 ] ;
9 free ( positionSphere ) ;
10 * numberValuesRead = 3 ;
11 if ( ( * counterValueSegment ) == 9 ) {
12 ( * counterValueSegment ) = 0 ;
13 } else {
14 (
```


Código Preprocesado (Sin Pretty Print)

```
1 * counterValueSegment ) ++ ;
2 }
3 return values ;
4 } else if ( ( * counterValueSegment ) >= 1 && ( *
    counterValueSegment ) <= 8 ) {
5 values = malloc ( sizeof ( long double ) ) ;
6 values [ 0 ] = obtainSingleValueFromLine ( lineRead ) ;
7 ( * counterValueSegment ) ++ ;
8 * numberValuesRead = 1 ;
9 return values ;
10 }
11 case 3 :
12 if ( ( * counterValueSegment ) == 0 ) {
13 values = malloc ( sizeof ( long double ) * 3 ) ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double * rgbColors = obtainPointFromString ( lineRead )  
    ;  
2 values [ 0 ] = rgbColors [ 0 ] ;  
3 values [ 1 ] = rgbColors [ 1 ] ;  
4 values [ 2 ] = rgbColors [ 2 ] ;  
5 free ( rgbColors ) ;  
6 * numberValuesRead = 3 ;  
7 ( * counterValueSegment ) ++ ;  
8 return values ;  
9 } else if ( ( * counterValueSegment ) >= 1 && ( *  
    counterValueSegment ) <= 7 ) {  
10 values = malloc ( sizeof ( long double ) ) ;  
11 values [ 0 ] = obtainSingleValueFromLine ( lineRead ) ;  
12 ( * counterValueSegment ) ++ ;  
13 * numberValuesRead = 1 ;  
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1 values ;
2 } else if ( ( * counterValueSegment ) == 8 ) {
3 if ( strstr ( lineRead , "END_Vertices" ) != NULL ) {
4 ( * counterValueSegment ) ++ ;
5 return values ;
6 } else {
7 values = malloc ( sizeof ( long double ) * 3 ) ;
8 long double * vertexPolygon = obtainPointFromString (
    lineRead ) ;
9 values [ 0 ] = vertexPolygon [ 0 ] ;
10 values [ 1 ] = vertexPolygon [ 1 ] ;
11 values [ 2 ] = vertexPolygon [ 2 ] ;
12 free ( vertexPolygon ) ;
13 * numberValuesRead = 3 ;
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( ( * counterValueSegment ) == 12 ) {  
2 ( * counterValueSegment ) = 0 ;  
3 return values ;  
4 }  
5 if ( ( * counterValueSegment ) != 8 ) {  
6 ( * counterValueSegment ) ++ ;  
7 }  
8 return values ;  
9 }  
10 } else if ( ( * counterValueSegment ) >= 9 ) {  
11 values = malloc ( sizeof ( long double ) * 3 ) ;  
12 long double * vertexPolygon = obtainPointFromString (   
    lineRead ) ;  
13 values [ 0 ] = vertexPolygon [ 0 ] ;  
14 values
```

Código Preprocesado (Sin Pretty Print)

```
1 [ 1 ] = vertexPolygon [ 1 ] ;
2 values [ 2 ] = vertexPolygon [ 2 ] ;
3 free ( vertexPolygon ) ;
4 * numberValuesRead = 3 ;
5 if ( ( * counterValueSegment ) == 12 ) {
6 ( * counterValueSegment ) = 0 ;
7 return values ;
8 }
9 ( * counterValueSegment ) ++ ;
10 return values ;
11 }
12 case 4 :
13 if ( * counterValueSegment == 0 || *
    counterValueSegment == 1 || * counterValueSegment
    == 12 ) {
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double * positionCilinder = obtainPointFromString (
    lineRead ) ;
2 values = malloc ( sizeof ( long double ) * 3 ) ;
3 values [ 0 ] = positionCilinder [ 0 ] ;
4 values [ 1 ] = positionCilinder [ 1 ] ;
5 values [ 2 ] = positionCilinder [ 2 ] ;
6 if ( * counterValueSegment == 12 ) {
7     ( * counterValueSegment ) = 0 ;
8 } else {
9     ( * counterValueSegment ) ++ ;
10 }
11 * numberValuesRead = 3 ;
12 free ( positionCilinder ) ;
13 return values ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  else if ( * counterValueSegment >= 2 && *  
    counterValueSegment <= 11 ) {  
2  values = malloc ( sizeof ( long double ) ) ;  
3  values [ 0 ] = obtainSingleValueFromLine ( lineRead ) ;  
4  ( * counterValueSegment ) ++ ;  
5  * numberValuesRead = 1 ;  
6  return values ;  
7  }  
8  case 5 :  
9  if ( * counterValueSegment == 0 || *  
    counterValueSegment == 1 || * counterValueSegment  
    == 13 ) {  
10 long double * positionCone = obtainPointFromString (  
    lineRead ) ;  
11 values = malloc ( sizeof ( long double ) * 3 ) ;  
12 values [ 0 ] = positionCone [ 0 ] ;  
13 values [ 1 ] = positionCone [ 1 ] ;  
14 values
```

Código Preprocesado (Sin Pretty Print)

```
1 [ 2 ] = positionCone [ 2 ] ;
2 if ( * counterValueSegment == 13 ) {
3 ( * counterValueSegment ) = 0 ;
4 } else {
5 ( * counterValueSegment ) ++ ;
6 }
7 * numberValuesRead = 3 ;
8 free ( positionCone ) ;
9 return values ;
10 } else if ( * counterValueSegment >= 2 && *
    counterValueSegment <= 12 ) {
11 values = malloc ( sizeof ( long double ) ) ;
12 values [ 0 ] = obtainSingleValueFromLine ( lineRead ) ;
13 ( * counterValueSegment ) ++ ;
14 *
```


Código Preprocesado (Sin Pretty Print)

```
1 numberValuesRead = 1 ;
2 return values ;
3 }
4 case 6 :
5 if ( ( * counterValueSegment >= 0 && *
    counterValueSegment <= 2 ) || ( *
    counterValueSegment >= 11 && * counterValueSegment
    <= 14 ) ) {
6 long double * tripleta = obtainPointFromString (
    lineRead ) ;
7 values = malloc ( sizeof ( long double ) * 3 ) ;
8 values [ 0 ] = tripleta [ 0 ] ;
9 values [ 1 ] = tripleta [ 1 ] ;
10 values [ 2 ] = tripleta [ 2 ] ;
11 if ( * counterValueSegment == 14 ) {
12 ( * counterValueSegment ) = 0 ;
13 } else {
14 (
```

Código Preprocesado (Sin Pretty Print)

```
1 * counterValueSegment ) ++ ;
2 }
3 * numberValuesRead = 3 ;
4 free ( tripleta ) ;
5 return values ;
6 } else if ( ( * counterValueSegment >= 3 && *
    counterValueSegment <= 10 ) ) {
7 values = malloc ( sizeof ( long double ) ) ;
8 values [ 0 ] = obtainSingleValueFromLine ( lineRead ) ;
9 ( * counterValueSegment ) ++ ;
10 * numberValuesRead = 1 ;
11 return values ;
12 }
13 case 7 :
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( ( * counterValueSegment >= 0 && * counterValueSegment
    <= 3 ) || ( * counterValueSegment >= 12 && *
    counterValueSegment <= 15 ) ) {
2 long double * tripleta = obtainPointFromString (
    lineRead ) ;
3 values = malloc ( sizeof ( long double ) * 3 ) ;
4 values [ 0 ] = tripleta [ 0 ] ;
5 values [ 1 ] = tripleta [ 1 ] ;
6 values [ 2 ] = tripleta [ 2 ] ;
7 if ( * counterValueSegment == 15 ) {
8 ( * counterValueSegment ) = 0 ;
9 } else {
10 ( * counterValueSegment ) ++ ;
11 }
12 * numberValuesRead = 3 ;
13 free ( tripleta ) ;
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1 values ;
2 } else if ( ( * counterValueSegment >= 4 && *
    counterValueSegment <= 11 ) ) {
3 values = malloc ( sizeof ( long double ) ) ;
4 values [ 0 ] = obtainSingleValueFromLine ( lineRead ) ;
5 ( * counterValueSegment ) ++ ;
6 * numberValuesRead = 1 ;
7 return values ;
8 }
9 case 8 :
10 if ( ( * counterValueSegment ) == 18 ) {
11 long double * tripleta = obtainPointFromString (
    lineRead ) ;
12 values = malloc ( sizeof ( long double ) * 3 ) ;
13 values [ 0 ] = tripleta [ 0 ] ;
14 values
```

Código Preprocesado (Sin Pretty Print)

```
1 [ 1 ] = tripleta [ 1 ] ;
2 values [ 2 ] = tripleta [ 2 ] ;
3 ( * counterValueSegment ) = 0 ;
4 * numberValuesRead = 3 ;
5 free ( tripleta ) ;
6 return values ;
7 } else if ( ( * counterValueSegment >= 0 && *
    counterValueSegment <= 17 ) ) {
8 values = malloc ( sizeof ( long double ) ) ;
9 values [ 0 ] = obtainSingleValueFromLine ( lineRead ) ;
10 ( * counterValueSegment ) ++ ;
11 * numberValuesRead = 1 ;
12 return values ;
13 }
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  
2 }  
3 int plainCutsFound ( long int pos ) {  
4 char temporalBuffer [ 300 ] ;  
5 FILE * file ;  
6 if ( file = fopen ( escenaFile , "r" ) ) {  
7 fseek ( file , pos , SEEK_SET ) ;  
8 while ( fgets ( temporalBuffer , 300 , file ) != NULL )  
9 {  
10 if ( temporalBuffer [ 0 ] == '\n' ) {  
11 continue ;  
12 }  
13 if ( temporalBuffer [ 0 ] == '\t' ) {  
14 continue ;  
15 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 if ( strstr ( temporalBuffer , "#" ) != NULL ) {
3     continue ;
4 } else if ( strstr ( temporalBuffer , "Planos_Corte:" )
5             != NULL ) {
6     return 1 ;
7 } else if ( strstr ( temporalBuffer , "Texturas:" ) !=
8             NULL ) {
9     return 0 ;
10 } else if ( strstr ( temporalBuffer , "Planos_Calado:"
11                  ) != NULL ) {
12     return 0 ;
13 } else if ( strstr ( temporalBuffer , "Sphere_Object" )
14             != NULL ) {
15     return 0 ;
16 } else if ( strstr ( temporalBuffer , "Polygon_Object"
17                  ) != NULL ) {
18     return 0 ;
19 }
20 }
```

Código Preprocesado (Sin Pretty Print)

```
1  else if ( strstr ( temporalBuffer , " Cylinder_Object" )
      != NULL ) {
2  return 0 ;
3  } else if ( strstr ( temporalBuffer , " Cone_Object" )
      != NULL ) {
4  return 0 ;
5  } else if ( strstr ( temporalBuffer , " Disc_Object" )
      != NULL ) {
6  return 0 ;
7  } else if ( strstr ( temporalBuffer , " Elipse_Object" )
      != NULL ) {
8  return 0 ;
9  } else if ( strstr ( temporalBuffer , " Quadratic_Object
      " ) != NULL ) {
10 return 0 ;
11 } else if ( strstr ( temporalBuffer , " Scene_Data" ) !=
      NULL ) {
12 return 0 ;
13 } else if ( strstr ( temporalBuffer , " Light_Object" )
```


Código Preprocesado (Sin Pretty Print)

```
1 0 ;  
2 }  
3 }  
4 }  
5 return 0 ; }  
6 int texturesFound ( long int pos ) {  
7 char temporalBuffer [ 300 ] ;  
8 FILE * file ;  
9 if ( file = fopen ( escenaFile , "r" ) ) {  
10 fseek ( file , pos , SEEK_SET ) ;  
11 while ( fgets ( temporalBuffer , 300 , file ) != NULL )  
12 {  
13 if ( temporalBuffer [ 0 ] == '\n' ) {  
14 continue ;  
15 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 if ( temporalBuffer [ 0 ] == '\t' ) {
3     continue ;
4 }
5 if ( strstr ( temporalBuffer , "#" ) != NULL ) {
6     continue ;
7 } else if ( strstr ( temporalBuffer , "Texturas:" ) !=
            NULL || strstr ( temporalBuffer , "Textures:" ) !=
            NULL ) {
8     return 1 ;
9 } else if ( strstr ( temporalBuffer , "Planos_Calado:"
            ) != NULL ) {
10    return 0 ;
11 } else if ( strstr ( temporalBuffer , "Sphere_Object" )
            != NULL ) {
12    return 0 ;
13 } else if ( strstr ( temporalBuffer , "Polygon_Object"
            ) != NULL ) {
14    return
```

Código Preprocesado (Sin Pretty Print)

```
1 0 ;
2 } else if ( strstr ( temporalBuffer , "Cylinder_Object"
    ) != NULL ) {
3 return 0 ;
4 } else if ( strstr ( temporalBuffer , "Cone_Object" )
    != NULL ) {
5 return 0 ;
6 } else if ( strstr ( temporalBuffer , "Disc_Object" )
    != NULL ) {
7 return 0 ;
8 } else if ( strstr ( temporalBuffer , "Ellipse_Object" )
    != NULL ) {
9 return 0 ;
10 } else if ( strstr ( temporalBuffer , "Quadratic_Object
    " ) != NULL ) {
11 return 0 ;
12 } else if ( strstr ( temporalBuffer , "Scene_Data" ) !=
    NULL ) {
13 return 0 ;
```

Código Preprocesado (Sin Pretty Print)

```
1  else if ( strstr ( temporalBuffer , "Light_Object" ) !=  
    NULL ) {  
2  return 0 ;  
3  }  
4  }  
5  }  
6  return 0 ;  
7  }  
8  int draftPlanesFound ( long int pos ) {  
9  char temporalBuffer [ 300 ] ;  
10 FILE * file ;  
11 if ( file = fopen ( escenaFile , "r" ) ) {  
12 fseek ( file , pos , SEEK_SET ) ;  
13 while ( fgets ( temporalBuffer , 300 , file ) != NULL )  
    {  
14 if
```

Código Preprocesado (Sin Pretty Print)

```
1 ( temporalBuffer [ 0 ] == '\n' ) {
2 continue ;
3 }
4 if ( temporalBuffer [ 0 ] == '\t' ) {
5 continue ;
6 }
7 if ( strstr ( temporalBuffer , "#" ) != NULL ) {
8 continue ;
9 } else if ( ( strstr ( temporalBuffer , "Planos_Calado:"
    " ) != NULL ) || ( strstr ( temporalBuffer , "
    PlanosCalado:" ) != NULL ) || ( strstr (
    temporalBuffer , "DraftPlanes:" ) != NULL ) || (
    strstr ( temporalBuffer , "Draft_Planes" ) != NULL
    ) ) {
10 return 1 ;
11 } else if ( strstr ( temporalBuffer , "Sphere_Object" )
    != NULL ) {
12 return 0 ;
13 } else if ( strstr ( temporalBuffer , "Polygon_Object"
```

Código Preprocesado (Sin Pretty Print)

```
1 0 ;
2 } else if ( strstr ( temporalBuffer , "Cylinder_Object"
    ) != NULL ) {
3 return 0 ;
4 } else if ( strstr ( temporalBuffer , "Cone_Object" )
    != NULL ) {
5 return 0 ;
6 } else if ( strstr ( temporalBuffer , "Disc_Object" )
    != NULL ) {
7 return 0 ;
8 } else if ( strstr ( temporalBuffer , "Ellipse_Object" )
    != NULL ) {
9 return 0 ;
10 } else if ( strstr ( temporalBuffer , "Quadratic_Object
    " ) != NULL ) {
11 return 0 ;
12 } else if ( strstr ( temporalBuffer , "Scene_Data" ) !=
    NULL ) {
13 return 0 ;
```

Código Preprocesado (Sin Pretty Print)

```
1  else if ( strstr ( temporalBuffer , "Light_Object" ) !=  
    NULL ) {  
2  return 0 ;  
3  }  
4  }  
5  }  
6  return 0 ;  
7  }  
8  void getSceneObjects ( ) {  
9  int i , j , c ;  
10 int state = 0 ;  
11 int counterValueSegment = 0 ;  
12 char temporalBuffer [ 300 ] ;  
13 long double * valuesRead ;  
14 int
```

Código Preprocesado (Sin Pretty Print)

```
1 indexValuesRead = 0 ;
2 int currentTypeObjectReading = 1 ;
3 struct PlaneCut * arrayPlaneCuts = NULL ;
4 struct Texture * arrayTextures = NULL ;
5 struct DraftPlane * arrayDraftPlanes = NULL ;
6 FILE * file ;
7 if ( file = fopen ( escenaFile , "r" ) ) {
8 while ( fgets ( temporalBuffer , 300 , file ) != NULL )
9 {
10 if ( temporalBuffer [ 0 ] == '\n' ) {
11 continue ;
12 }
13 if ( temporalBuffer [ 0 ] == '\t' ) {
14 continue ;
15 }
```


Código Preprocesado (Sin Pretty Print)

```
1
2 if ( strstr ( temporalBuffer , "#" ) != NULL ) {
3 continue ;
4 }
5 if ( strstr ( temporalBuffer , "Scene_Data" ) != NULL )
6 {
7 state = 0 ;
8 counterValueSegment = 0 ;
9 indexValuesRead = 0 ;
10 valuesRead = NULL ;
11 valuesRead = malloc ( sizeof ( long double ) * 22 ) ;
12 currentTypeObjectReading = 0 ;
13 continue ;
14 } else if ( strstr ( temporalBuffer , "Light_Object" )
15             != NULL ) {
16 state
```

Código Preprocesado (Sin Pretty Print)

```
1 = 1 ;
2 counterValueSegment = 0 ;
3 indexValuesRead = 0 ;
4 free ( valuesRead ) ;
5 valuesRead = malloc ( sizeof ( long double ) * 7 ) ;
6 currentTypeObjectReading = 1 ;
7 continue ;
8 } else if ( strstr ( temporalBuffer , "Sphere_Object" )
    != NULL ) {
9 state = 2 ;
10 indexValuesRead = 0 ;
11 free ( valuesRead ) ;
12 valuesRead = malloc ( sizeof ( long double ) * 22 ) ;
13 counterValueSegment = 0 ;
14 currentTypeObjectReading
```

Código Preprocesado (Sin Pretty Print)

```
1 = 2 ;
2 continue ;
3 } else if ( strstr ( temporalBuffer , "Polygon_Object"
    ) != NULL ) {
4 state = 3 ;
5 counterValueSegment = 0 ;
6 indexValuesRead = 0 ;
7 free ( valuesRead ) ;
8 valuesRead = malloc ( sizeof ( long double ) * 2000000
    ) ;
9 currentTypeObjectReading = 3 ;
10 continue ;
11 } else if ( strstr ( temporalBuffer , "Cylinder_Object"
    ) != NULL ) {
12 state = 4 ;
13 counterValueSegment = 0 ;
14 indexValuesRead
```

Código Preprocesado (Sin Pretty Print)

```
1 = 0 ;
2 free ( valuesRead ) ;
3 valuesRead = malloc ( sizeof ( long double ) * 55 ) ;
4 currentTypeObjectReading = 4 ;
5 continue ;
6 } else if ( strstr ( temporalBuffer , "Cone_Object" )
    != NULL ) {
7 state = 5 ;
8 counterValueSegment = 0 ;
9 indexValuesRead = 0 ;
10 free ( valuesRead ) ;
11 valuesRead = malloc ( sizeof ( long double ) * 55 ) ;
12 currentTypeObjectReading = 5 ;
13 continue ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  else if ( strstr ( temporalBuffer , "Disc_Object" ) !=  
    NULL ) {  
2  state = 6 ;  
3  counterValueSegment = 0 ;  
4  indexValuesRead = 0 ;  
5  free ( valuesRead ) ;  
6  valuesRead = malloc ( sizeof ( long double ) * 55 ) ;  
7  currentTypeObjectReading = 6 ;  
8  continue ;  
9  } else if ( strstr ( temporalBuffer , "Elipse_Object" )  
    != NULL ) {  
10 state = 7 ;  
11 counterValueSegment = 0 ;  
12 indexValuesRead = 0 ;  
13 free ( valuesRead ) ;  
14 valuesRead
```

Código Preprocesado (Sin Pretty Print)

```
1 = malloc ( sizeof ( long double ) * 55 ) ;
2 currentTypeObjectReading = 7 ;
3 continue ;
4 } else if ( strstr ( temporalBuffer , "Quadratic_Object
   " ) != NULL ) {
5 state = 8 ;
6 counterValueSegment = 0 ;
7 indexValuesRead = 0 ;
8 free ( valuesRead ) ;
9 valuesRead = malloc ( sizeof ( long double ) * 55 ) ;
10 currentTypeObjectReading = 8 ;
11 continue ;
12 }
13 int numberValuesRead = 0 ;
14 long
```

Código Preprocesado (Sin Pretty Print)

```
1 double * valuesReadTemp = readValueFromLine ( state , &
    counterValueSegment , temporalBuffer , &
    numberValuesRead ) ;
2 if ( valuesReadTemp == NULL ) {
3     continue ;
4 }
5 int i = 0 ;
6 for ( i = 0 ; i < numberValuesRead ; i ++ ) {
7     valuesRead [ indexValuesRead + i ] = valuesReadTemp [ i
        ] ;
8 }
9 indexValuesRead += numberValuesRead ;
10 if ( counterValueSegment == 0 ) {
11     int numberPlaneCuts = 0 ;
12     int numberTextures = 0 ;
13     int numberDraftPlanes = 0 ;
14     long
```

Código Preprocesado (Sin Pretty Print)

```
1  int posAfterReading ;
2  long int pos ;
3  pos = ftell ( file ) ;
4  int areTherePlainCuts = plainCutsFound ( pos ) ;
5  if ( areTherePlainCuts == 1 ) {
6  pos = ftell ( file ) ;
7  arrayPlaneCuts = readPlaneCuts ( pos , &
      numberPlaneCuts , & posAfterReading ) ;
8  fseek ( file , posAfterReading , SEEK_SET ) ;
9  }
10 pos = ftell ( file ) ;
11 int areThereTextures = texturesFound ( pos ) ;
12 if ( areThereTextures == 1 ) {
13 pos = ftell ( file ) ;
14 arrayTextures
```


Código Preprocesado (Sin Pretty Print)

```
1 = readTextures ( currentTypeObjectReading , pos , &
    numberTextures , & posAfterReading ) ;
2 fseek ( file , posAfterReading , SEEK_SET ) ;
3 }
4 int areThereDraftPlanes = draftPlanesFound ( pos ) ;
5 if ( areThereDraftPlanes == 1 ) {
6 pos = ftell ( file ) ;
7 arrayDraftPlanes = readDraftPlanes (
    currentTypeObjectReading , pos , &
    numberDraftPlanes , & posAfterReading ) ;
8 fseek ( file , posAfterReading , SEEK_SET ) ;
9 }
10 createObjectFromData ( valuesRead ,
    currentTypeObjectReading , indexValuesRead ,
    arrayPlaneCuts , arrayTextures , arrayDraftPlanes ,
    numberPlaneCuts , numberTextures ,
    numberDraftPlanes ) ;
11 }
12 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 fclose ( file ) ;
3 }
4 void howManyObjectsLights ( ) {
5 char temporalBuffer [ 100 ] ;
6 FILE * file ;
7 if ( file = fopen ( escenaFile , "r" ) ) {
8 while ( fgets ( temporalBuffer , 100 , file ) != NULL )
9     {
10    if ( temporalBuffer [ 0 ] == '\n' ) {
11        continue ;
12    }
13    if ( strstr ( temporalBuffer , "#" ) != NULL ) {
14        continue ;
15    }
16    }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 if ( strstr ( temporalBuffer , "Light_Object" ) != NULL
   ) {
3 numberLights ++ ;
4 continue ;
5 } else if ( strstr ( temporalBuffer , "Sphere_Object" )
   != NULL ) {
6 numberObjects ++ ;
7 continue ;
8 } else if ( strstr ( temporalBuffer , "Polygon_Object"
   ) != NULL ) {
9 numberObjects ++ ;
10 continue ;
11 } else if ( strstr ( temporalBuffer , "Cone_Object" )
   != NULL ) {
12 numberObjects ++ ;
13 continue ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  else if ( strstr ( temporalBuffer , "Cylinder_Object" )  
    != NULL ) {  
2  numberObjects ++ ;  
3  continue ;  
4  } else if ( strstr ( temporalBuffer , "Disc_Object" )  
    != NULL ) {  
5  numberObjects ++ ;  
6  continue ;  
7  } else if ( strstr ( temporalBuffer , "Ellipse_Object" )  
    != NULL ) {  
8  numberObjects ++ ;  
9  continue ;  
10 } else if ( strstr ( temporalBuffer , "Quadratic_Object  
    " ) != NULL ) {  
11 numberObjects ++ ;  
12 continue ;  
13 }  
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1  
2 }  
3 fclose ( file ) ;  
4 Objects = malloc ( sizeof ( struct Object ) *  
    numberObjects ) ;  
5 Lights = malloc ( sizeof ( struct Light ) *  
    numberLights ) ;  
6 }  
7 struct Vector throwRay ( long double x , long double y  
    ) {  
8     struct Vector direction ;  
9     long double Xw , Yw ;  
10    Xw = ( long double ) ( ( x ) * Xdif ) / Hres + Xmin ;  
11    Yw = ( long double ) ( ( y ) * Ydif ) / Vres + Ymin ;  
12    direction . x = Xw - eye . x ;  
13    direction . y = Yw - eye . y ;  
14    direction
```

Código Preprocesado (Sin Pretty Print)

```
1 . z = - eye . z ;
2 direction = normalize ( direction ) ;
3 return direction ;
4 }
5 struct Color ponderAAcolors ( struct Color c1 , struct
    Color c2 , struct Color c3 , struct Color c4 ) {
6 struct Color color ;
7 color . r = ( c1 . r + c2 . r + c3 . r + c4 . r ) / 4 ;
8 color . g = ( c1 . g + c2 . g + c3 . g + c4 . g ) / 4 ;
9 color . b = ( c1 . b + c2 . b + c3 . b + c4 . b ) / 4 ;
10 return color ;
11 }
12 long double getDistanceColors ( struct Color c1 ,
    struct Color c2 ) {
13 return sqrt ( pow ( c1 . r - c2 . r , 2 ) + pow ( c1 .
    g - c2 . g , 2 ) + pow ( c1 . b - c2 . b , 2 ) ) ;
14 }
```

Código Preprocesado (Sin Pretty Print)

```
1
2 int theyOK ( struct Color c1 , struct Color c2 , struct
   Color c3 , struct Color c4 ) {
3 long double dist , dist1 , dist2 , dist3 , dist4 ,
   dist5 , dist6 ;
4 dist1 = getDistanceColors ( c1 , c2 ) ;
5 dist2 = getDistanceColors ( c1 , c3 ) ;
6 dist3 = getDistanceColors ( c1 , c4 ) ;
7 dist4 = getDistanceColors ( c2 , c3 ) ;
8 dist5 = getDistanceColors ( c2 , c4 ) ;
9 dist6 = getDistanceColors ( c3 , c4 ) ;
10 dist = ( dist1 + dist2 + dist3 + dist4 + dist5 + dist6
   ) / 6 ;
11 if ( dist <= similar ) {
12 return 1 ;
13 } else {
14 return
```

Código Preprocesado (Sin Pretty Print)

```
1 0 ;
2 }
3 }
4 struct Color getAAColor ( long double x , long double y
    , int aaLevel ) {
5 int areOK ;
6 int level = aaLevel ;
7 struct Color color , color1 , color2 , color3 , color4
    ;
8 struct Vector direction , V ;
9 long double sum = 1 / pow ( 2 , level ) ;
10 level ++ ;
11 long double nextSum = 1 / pow ( 2 , level ) ;
12 direction = throwRay ( x , y ) ;
13 V . x = - direction . x ;
14 V
```


Código Preprocesado (Sin Pretty Print)

```
1 . y = - direction . y ;  
2 V . z = - direction . z ;  
3 color1 = getColor ( eye , direction , V , maxReflection  
    ) ;  
4 direction = throwRay ( x , y + sum ) ;  
5 V . x = - direction . x ;  
6 V . y = - direction . y ;  
7 V . z = - direction . z ;  
8 color2 = getColor ( eye , direction , V , maxReflection  
    ) ;  
9 direction = throwRay ( x + sum , y ) ;  
10 V . x = - direction . x ;  
11 V . y = - direction . y ;  
12 V . z = - direction . z ;  
13 color3 = getColor ( eye , direction , V , maxReflection  
    ) ;  
14 direction
```

Código Preprocesado (Sin Pretty Print)

```
1 = throwRay ( x + sum , y + sum ) ;
2 V . x = - direction . x ;
3 V . y = - direction . y ;
4 V . z = - direction . z ;
5 color4 = getColor ( eye , direction , V , maxReflection
    ) ;
6 areOK = theyOK ( color1 , color2 , color3 , color4 ) ;
7 if ( areOK == 0 && level <= maxAA ) {
8 color1 = getAAColor ( x , y , level ) ;
9 color2 = getAAColor ( x , y + nextSum , level ) ;
10 color3 = getAAColor ( x + nextSum , y , level ) ;
11 color4 = getAAColor ( x + nextSum , y + nextSum , level
    ) ;
12 color = ponderAAColors ( color1 , color2 , color3 ,
    color4 ) ;
13 } else {
14 color
```

Código Preprocesado (Sin Pretty Print)

```
1 = ponderAAcolors ( color1 , color2 , color3 , color4 )  
2 ;  
3 }  
4 return color ;  
5 }  
6 void * runRT ( void * x ) {  
7 int start , i , j ;  
8 struct Color color ;  
9 i = * ( ( int * ) x ) ;  
10 printf ( "%i\n" , i ) ;  
11 for ( i ; i < Vres ; i += 4 ) {  
12 for ( j = 0 ; j < Hres ; j ++ ) {  
13 color = getAAColor ( ( long double ) j , ( long double  
14 ) i , 0 ) ;  
15 Framebuffer [ i ] [ j ] = color ;  
16 }  
17 }
```

Código Preprocesado (Sin Pretty Print)

```
1  
2 }  
3 return NULL ;  
4 }  
5 int main ( int argc , char * argv [ ] ) {  
6   howManyObjectsLights ( ) ;  
7   printf ( " Lights: %i \n" , numberLights ) ;  
8   printf ( " Objects: %i \n" , numberObjects ) ;  
9   getSceneObjects ( ) ;  
10  int i ;  
11  pthread_t threads [ 4 ] ;  
12  Xdif = Xmax - Xmin ;  
13  Ydif = Ymax - Ymin ;  
14  similar
```

Código Preprocesado (Sin Pretty Print)

```
1 = sqrt ( 3 ) / 32 ;
2 printf ( "\nRay Tracing\n...\n...\n" ) ;
3 for ( i = 0 ; i < 4 ; i ++ ) {
4 pthread_create ( & ( threads [ i ] ) , NULL , & runRT ,
    & i ) ;
5 sleep ( 1 ) ;
6 }
7 for ( i = 0 ; i < 4 ; i ++ ) {
8 pthread_join ( threads [ i ] , NULL ) ;
9 }
10 printf ( "Rays: %LF\n" , rays ) ;
11 saveFile ( ) ;
12 free ( Objects ) ;
13 free ( Lights ) ;
14 free
```

Código Preprocesado (Sin Pretty Print)

```
1 ( Framebuffer ) ;  
2 printf ( "\nDONE.\n" ) ;  
3 }
```

Código Pretty Print GNU

```
1 static int Hres;  
2 static int Vres;  
3 static int maxAA;  
4 static int maxReflection;  
5 static int maxTransparency;  
6 static long double rays = 0;  
7 static long double similar = 0;  
8 static long double Xmax;  
9 static long double Ymax;  
10 static long double Xmin;  
11 static long double Ymin;  
12 static long double Xdif;  
13 static long double Ydif;
```

Código Pretty Print GNU

```
1 static long double la;  
2 static long double e;  
3 static int debug = 0;  
4 static int rec = 0;  
5 struct Color  
6 {  
7     long double r;  
8     long double g;  
9     long double b;  
10 };  
11 struct Point2D  
12 {  
13     long double u;
```


Código Pretty Print GNU

```
1      long double v;  
2  };  
3  struct Point3D  
4  {  
5      long double x;  
6      long double y;  
7      long double z;  
8  };  
9  struct Vector  
10 {  
11     long double x;  
12     long double y;  
13     long double z;
```

Código Pretty Print GNU

```
1  };  
2  struct Light  
3  {  
4      long double Xp;  
5      long double Yp;  
6      long double Zp;  
7      long double c1;  
8      long double c2;  
9      long double c3;  
10     long double lp;  
11 };  
12 struct Object  
13 {  
14
```

Código Pretty Print GNU

```
1  long double Xc;  
2  long double Yc;  
3  long double Zc;  
4  long double other;  
5  struct Vector directionVector;  
6  long double extraD;  
7  long double Xother;  
8  long double Yother;  
9  long double Zother;  
10 long double Kd;  
11 long double Ka;  
12 long double Kn;  
13 long double Ks;
```

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```
1  long double o1;  
2  long double o2;  
3  long double o3;  
4  long double A;  
5  long double B;  
6  long double C;  
7  long double D;  
8  long double E;  
9  long double F;  
10 long double G;  
11 long double H;  
12 long double I;  
13 long double J;
```

Código Pretty Print GNU

```
1  int pointAmount;  
2  long double D1;  
3  long double D2;  
4  long double K1;  
5  long double K2;  
6  long double height;  
7  struct Color color;  
8  struct Point2D * points2D;  
9  struct Point3D * points3D;  
10 struct Vector (* normalVector) ();  
11 struct Intersection (* intersectionFuncion) ();  
12 struct Color (* retrieveTextureColor) ();  
13 struct Vector x0y0z0;
```

Código Pretty Print GNU

```
1  struct Vector x1y1z1;  
2  struct Vector x2y2z2;  
3  struct Vector x3y3z3;  
4  int numberPlaneCuts;  
5  int numberTextures;  
6  int numberDraftPlanes;  
7  struct PlaneCut * planeCuts;  
8  struct Texture * textures;  
9  struct DraftPlane * draftPlanes;  
10 };  
11 struct PlaneCut  
12 {  
13     struct Vector normal;
```

Código Pretty Print GNU

```
1      struct Vector point;  
2      long double d;  
3  };  
4  struct Texture  
5  {  
6      char * filename;  
7      struct Color * * textureMap;  
8      int vRes;  
9      int hRes;  
10     struct Vector greenwich;  
11     struct Vector north;  
12 };  
13 struct DraftPlane  
14 {  
15
```

Código Pretty Print GNU

```
1  char * filename;  
2  struct Color * * textureMap;  
3  int vRes;  
4  int hRes;  
5  struct Vector greenwich;  
6  struct Vector north;  
7  };  
8  struct Intersection  
9  {  
10     long double Xi;  
11     long double Yi;  
12     long double Zi;  
13     long double distance;
```


Código Pretty Print GNU

```
1      struct Object object;  
2      long double null;  
3  };  
4  static struct Light * Lights;  
5  static struct Object * Objects;  
6  static struct Vector eye;  
7  static struct Color * * Framebuffer;  
8  static struct Color background;  
9  static int numberObjects = 0;  
10 static int numberLights = 0;  
11 static int lightIndex = 0;  
12 static int objectIndex = 0;  
13 static char * escenaFile = "escena1.txt";
```

Código Pretty Print GNU

```
1 long double min (long double a, long double b)
2 {
3     if (a < b)
4     {
5         return a;
6     }
7     else
8     {
9         return b;
10    }
11 }
12 long double max (long double a, long double b)
13 {
14
```

Código Pretty Print GNU

```
1      if (a > b)
2          {
3              return a;
4          }
5      else
6          {
7              return b;
8          }
9  }
10 int testPlaneCut (struct PlaneCut plane, long double x,
11                  long double y, long double z)
12 {
13     int val = (plane.normal.x * x) + (plane.normal.y * y)
14             + (plane.normal.z * z) + plane.d;
15     if (val > 0)
16     {
```

Código Pretty Print GNU

```
1      return 1;
2    }
3  else
4    {
5      return 0;
6    }
7  }
8  int testIntersection (long double x, long double y,
9    long double z, struct Object object)
10 {
11   int k, sign;
12   int accept = 1;
13   int amount = object.numberPlaneCuts;
14   for (k = 0 ; k < amount ; k ++)
15     {
```

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```
1      sign = testPlaneCut (object.planeCuts[k], x, y,  
2      z);  
3      if (sign == 1)  
4      {  
5          accept = 0;  
6      }  
7      return accept;  
8  }  
9  long double pointProduct (struct Vector a, struct  
10     Vector b)  
11  {  
12      long double pp = 0;  
13      pp += (a.x * b.x);  
14      pp += (a.y * b.y);
```

Código Pretty Print GNU

```
1     pp += (a.z * b.z);
2     return pp;
3 }
4 struct Vector crossProduct (struct Vector a, struct
   Vector b)
5 {
6     struct Vector newVector;
7     newVector.x = (a.y * b.z) - (a.z * b.y);
8     newVector.y = (a.z * b.x) - (a.x * b.z);
9     newVector.z = (a.x * b.y) - (a.y * b.x);
10    return newVector;
11 }
12 long double getNorm (struct Vector vector)
13 {
14
```

Código Pretty Print GNU

```
1  long double norm = sqrt (pow (vector.x, 2)+ pow (
2  vector.y, 2)+ pow (vector.z, 2));
3  return norm;
4  }
5  struct Vector normalize (struct Vector vector)
6  {
7  long double norm = getNorm (vector);
8  struct Vector unitVector;
9  if (norm != 0)
10     {
11         unitVector.x = vector.x / norm;
12         unitVector.y = vector.y / norm;
13         unitVector.z = vector.z / norm;
14     }
```

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```
1      else
2      {
3          unitVector.x = vector.x;
4          unitVector.y = vector.y;
5          unitVector.z = vector.z;
6      }
7      return unitVector;
8  }
9  void saveFile ()
10 {
11     int i, j;
12     FILE * file;
13     file = fopen ("scene.ppm", "w");
```


Código Pretty Print GNU

```
1  if (file == NULL)
2      {
3          printf ("Error creating/opening file!\n");
4          exit (1);
5      }
6  fprintf (file , "%s\n" , "P3");
7  fprintf (file , "%i %i\n" , Hres , Vres);
8  fprintf (file , "%i\n" , 255);
9  for (i = Vres - 1 ; i >= 0 ; i --)
10     {
11         for (j = 0 ; j < Hres ; j ++ )
12             {
13                 int R = (int)255 * Framebuffer[i][j].r;
```

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```
1      int G = (int)255 * Framebuffer[i][j].g;
2      int B = (int)255 * Framebuffer[i][j].b;
3      fprintf (file , "%i %i %i   " , R, G, B);
4      }
5      fprintf (file , "\n");
6      }
7      fclose (file);
8      }
9  long double getAttenuationFactor (struct Light light ,
10     long double distance)
11  {
12     long double value = 1 / (light.c1 + (light.c2 *
13     distance)+ (light.c3 * pow (distance , 2)));
14     return min (1.0 , value);
15 }
```

Código Pretty Print GNU

```
1 struct Color difusseColor (long double l, struct Color
   color)
2 {
3     struct Color newColor;
4     newColor.r = l * color.r;
5     newColor.g = l * color.g;
6     newColor.b = l * color.b;
7     return newColor;
8 }
9 struct Color specularHighlight (long double E, struct
   Color color)
10 {
11     struct Color newColor;
12     newColor.r = color.r + (E * (1 - color.r));
13     newColor.g = color.g + (E * (1 - color.g));
```

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```
1    newColor.b = color.b + (E * (1 - color.b));
2    return newColor;
3 }
4 struct Intersection sphereIntersection (struct Vector
    anchor, struct Vector direction, struct Object
    object)
5 {
6     long double t, t1, t2;
7     long double Xdif = anchor.x - object.Xc;
8     long double Ydif = anchor.y - object.Yc;
9     long double Zdif = anchor.z - object.Zc;
10    struct Intersection templIntersect;
11    templIntersect.null = 0;
12    long double B = 2 * ((direction.x * Xdif)+ (
    direction.y * Ydif)+ (direction.z * Zdif));
13    long double C = pow (Xdif, 2)+ pow (Ydif, 2)+ pow (
    Zdif, 2)- pow (object.other, 2);
```

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```
1  long double discriminant = pow (B, 2) - (4 * C);
2  if (discriminant >= 0)
3      {
4      long double root = sqrt (discriminant);
5      B *= - 1;
6      t1 = (B + root) / 2;
7      t2 = (B - root) / 2;
8      if (t1 > e)
9          {
10             if (t2 > e)
11                 {
12                     t = min (t1, t2);
13                     tempIntersect.distance = t;
```

Código Pretty Print GNU

```
1         templIntersect.object = object;  
2         templIntersect.Xi = anchor.x + (t *  
direction.x);  
3         templIntersect.Yi = anchor.y + (t *  
direction.y);  
4         templIntersect.Zi = anchor.z + (t *  
direction.z);  
5         int accept = testIntersection (  
templIntersect.Xi, templIntersect.Yi, templIntersect.  
Zi, object);  
6         if (accept == 0)  
7         {  
8             t = max (t1, t2);  
9             templIntersect.distance = t;  
10            templIntersect.object = object;  
11            templIntersect.Xi = anchor.x + (t *  
direction.x);  
12            templIntersect.Yi = anchor.y + (t *  
direction.y);
```

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```
1      int accept = testIntersection (
templIntersect.Xi, templIntersect.Yi, templIntersect.
Zi, object);
2      if (accept == 0)
3      {
4          templIntersect.null = 1;
5      }
6      }
7      }
8      else
9      {
10         t = t1;
11         templIntersect.distance = t;
12         templIntersect.object = object;
13         templIntersect.Xi = anchor.x + (t *
direction.x);
```

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```
1      templIntersect.Yi = anchor.y + (t *  
    direction.y);  
2      templIntersect.Zi = anchor.z + (t *  
    direction.z);  
3      int accept = testIntersection (  
    templIntersect.Xi, templIntersect.Yi, templIntersect.  
    Zi, object);  
4      if (accept == 0)  
5      {  
6          templIntersect.null = 1;  
7      }  
8      }  
9      }  
10     else  
11     {  
12         if (t2 > e)  
13         {  
14
```


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```
1         t = t2;  
2         templIntersect.distance = t;  
3         templIntersect.object = object;  
4         templIntersect.Xi = anchor.x + (t *  
direction.x);  
5         templIntersect.Yi = anchor.y + (t *  
direction.y);  
6         templIntersect.Zi = anchor.z + (t *  
direction.z);  
7         int accept = testIntersection (  
templIntersect.Xi, templIntersect.Yi, templIntersect.  
Zi, object);  
8         if (accept == 0)  
9             {  
10                templIntersect.null = 1;  
11            }  
12        }  
13        else  
14            {
```

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```
1         templIntersect.null = 1;
2     }
3 }
4     return templIntersect;
5 }
6 else
7 {
8     templIntersect.null = 1;
9     return templIntersect;
10 }
11 }
12 struct Vector sphereNormal (struct Object object ,
13     struct Vector vector)
14 {
```

Código Pretty Print GNU

```
1      struct Vector normal;  
2      normal.x = vector.x - object.Xc;  
3      normal.y = vector.y - object.Yc;  
4      normal.z = vector.z - object.Zc;  
5      return normal;  
6  }  
7  int getSign (long double v)  
8  {  
9      if (v >= 0)  
10     {  
11         return 1;  
12     }  
13     else  
14     {  
15
```

Código Pretty Print GNU

```
1         return 0;
2     }
3 }
4 struct Intersection polygonIntersection (struct Vector
    anchor, struct Vector direction, struct Object
    object)
5 {
6     long double denominator = (direction.x * object.Xc)
    + (direction.y * object.Yc) + (direction.z * object.
    Zc);
7     struct Intersection tempIntersect;
8     tempIntersect.null = 0;
9     if (denominator == 0)
10    {
11        tempIntersect.null = 1;
12        return tempIntersect;
13    }
```

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```
1  else
2      {
3          long double numerator = - (anchor.x * object.Xc
4      + anchor.y * object.Yc + anchor.z * object.Zc +
5      object.other);
6          long double t = numerator / denominator;
7          templIntersect.distance = t;
8          templIntersect.object = object;
9          templIntersect.Xi = anchor.x + (t * direction.x)
10         ;
11         templIntersect.Yi = anchor.y + (t * direction.y)
12         ;
13         templIntersect.Zi = anchor.z + (t * direction.z)
14         ;
15         long double maxA_B = max (fabs (object.Xc),
16         fabs (object.Yc));
17         long double maxA_B_C = max (maxA_B, fabs (
18         object.Zc));
19         long double u, v;
```

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```
1      u = templIntersect.Zi;  
2      v = templIntersect.Yi;  
3  }  
4  else if (maxA_B_C == fabs (object.Yc))  
5  {  
6      u = templIntersect.Xi;  
7      v = templIntersect.Zi;  
8  }  
9  else if (maxA_B_C == fabs (object.Zc))  
10 {  
11     u = templIntersect.Xi;  
12     v = templIntersect.Yi;  
13 }
```

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```
1      int NC = 0;
2      int NV = object.pointAmount;
3      struct Point2D * points2DArrayTemp = malloc (
4      sizeof (struct Point2D)* NV);
5      for (int i = 0 ; i < NV ; i ++ )
6      {
7          points2DArrayTemp[i].u = object.points2D[i]
8          ].u - u;
9          points2DArrayTemp[i].v = object.points2D[i]
10         ].v - v;
11     }
12     int SH = getSign (points2DArrayTemp[0].v);
13     int NSH;
14     int a = 0;
15     int b = (a + 1)% NV;
16     for (a = 0 ; a < NV - 1 ;)
17     {
```

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```
1      NSH = getSign (points2DArrayTemp[b].v);  
2      if (SH != NSH)  
3      {  
4          if (points2DArrayTemp[a].u > 0 &&  
points2DArrayTemp[b].u > 0)  
5              {  
6                  NC ++;  
7              }  
8          else if (points2DArrayTemp[a].u > 0 ||  
points2DArrayTemp[b].u > 0)  
9              {  
10                 long double N = (points2DArrayTemp[  
b].u - points2DArrayTemp[a].u);  
11                 long double D = (points2DArrayTemp[  
b].v - points2DArrayTemp[a].v);  
12                 if (D != 0)  
13                     {  
14
```


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```
1      if (points2DArrayTemp[a].u - ((  
points2DArrayTemp[a].v * N)/ D)> 0)  
2          {  
3              NC ++;  
4          }  
5      }  
6  }  
7  }  
8  SH = NSH;  
9  a ++;  
10 b ++;  
11 }  
12 if (NC % 2 == 0)  
13 {  
14
```

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```
1      tempIntersect.null = 1;
2    }
3    else
4    {
5        tempIntersect.null = 0;
6    }
7    int accept = testIntersection (tempIntersect.Xi
, tempIntersect.Yi, tempIntersect.Zi, object);
8    if (accept == 0)
9    {
10        tempIntersect.null = 1;
11    }
12    free (points2DArrayTemp);
13    return tempIntersect;
```

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```
1      }  
2  }  
3  struct Vector polygonNormal (struct Object object)  
4  {  
5      struct Point3D point0 = object.points3D[0];  
6      struct Point3D point1 = object.points3D[1];  
7      struct Point3D point2 = object.points3D[2];  
8      struct Vector vector1 =  
9          {  
10         point1.x - point0.x, point1.y - point0.y,  
11         point1.z - point0.z  
12         };  
13     struct Vector vector2 =  
14     {
```

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```
1      point2.x - point1.x, point2.y - point1.y,  
    point2.z - point1.z  
2      };  
3      struct Vector normal = crossProduct (vector1,  
    vector2);  
4      return normal;  
5  }  
6  struct Intersection cylinderIntersection (struct Vector  
    anchor, struct Vector direction, struct Object  
    object)  
7  {  
8      struct Intersection tempIntersect;  
9      tempIntersect.null = 0;  
10     long double xo = object.Xc;  
11     long double yo = object.Yc;  
12     long double zo = object.Zc;  
13     long double xq = object.directionVector.x;
```

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```
1  long double yq = object.directionVector.y;  
2  long double zq = object.directionVector.z;  
3  long double xd = direction.x;  
4  long double yd = direction.y;  
5  long double zd = direction.z;  
6  long double xe = anchor.x;  
7  long double ye = anchor.y;  
8  long double ze = anchor.z;  
9  long double radius = object.other;  
10 long double xdxq = xd * xq;  
11 long double ydyq = yd * yq;  
12 long double zdzq = zd * zq;  
13 long double xexq = xe * xq;
```

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```
1  long double yeyq = ye * yq;  
2  long double zezq = ze * zq;  
3  long double xoxq = xo * xq;  
4  long double yoyq = yo * yq;  
5  long double zozq = zo * zq;  
6  long double coef1 = xdxq * xq + ydyq * xq + zdzq *  
  xq - xd;  
7  long double coef2 = xdxq * yq + ydyq * yq + zdzq *  
  yq - yd;  
8  long double coef3 = xdxq * zq + ydyq * zq + zdzq *  
  zq - zd;  
9  long double coef4 = xo + xexq * xq - xoxq * xq +  
  yeyq * xq - yoyq * xq + zezq * xq - zozq * xq - xe;  
10 long double coef5 = yo + xexq * yq - xoxq * yq +  
  yeyq * yq - yoyq * yq + zezq * yq - zozq * yq - ye;  
11 long double coef6 = zo + xexq * zq - xoxq * zq +  
  yeyq * zq - yoyq * zq + zezq * zq - zozq * zq - ze;  
12 long double A = pow (coef1 , 2)+ pow (coef2 , 2)+ pow  
  (coef3 , 2);
```

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```
1  long double C = pow (coef4 , 2)+ pow (coef5 , 2)+ pow  
   (coef6 , 2)- pow (radius , 2);  
2  long double discriminant = pow (B, 2)- (4 * A * C);  
3  long double t, t1, t2;  
4  if (discriminant >= 0)  
5      {  
6          long double root = sqrt (discriminant);  
7          B *= - 1;  
8          t1 = (B - root)/ (2 * A);  
9          t2 = (B + root)/ (2 * A);  
10     long double Xi;  
11     long double Yi;  
12     long double Zi;  
13     long double d1 = object.D1;
```

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```
1      long double d2 = object.D2;
2      if (t1 > e)
3      {
4          if (t2 > e)
5          {
6              t = min (t1 , t2);
7              Xi = xe + (t * xd);
8              Yi = ye + (t * yd);
9              Zi = ze + (t * zd);
10             if (d2 >= ((Xi - xo)* xq + (Yi - yo)*
11                yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi - yo)*
12                yq + (Zi - zo)* zq)>= d1)
13             {
14                 templIntersect.Xi = Xi;
15                 templIntersect.Yi = Yi;
```


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```
1      templIntersect.Zi = Zi;
2      templIntersect.distance = t;
3      templIntersect.object = object;
4      int accept = testIntersection (
templIntersect.Xi, templIntersect.Yi, templIntersect.
Zi, object);
5      if (accept == 0)
6      {
7          t = max (t1, t2);
8          Xi = xe + (t * xd);
9          Yi = ye + (t * yd);
10         Zi = ze + (t * zd);
11         if (d2 >= ((Xi - xo)* xq + (Yi
- yo)* yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi -
yo)* yq + (Zi - zo)* zq)>= d1)
12             {
13                 templIntersect.Xi = Xi;
```

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```
1      templIntersect.Yi = Yi;  
2      templIntersect.Zi = Zi;  
3      templIntersect.distance = t;  
4      templIntersect.object =  
object;  
5      int accept =  
testIntersection (templIntersect.Xi, templIntersect.  
Yi, templIntersect.Zi, object);  
6      if (accept == 0)  
7      {  
8          templIntersect.null = 1;  
9      }  
10     return templIntersect;  
11 }  
12 else  
13 {  
14
```

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```
1           templIntersect.null = 1;
2           return templIntersect;
3       }
4   }
5   return templIntersect;
6 }
7 else
8 {
9     t = max (t1 , t2);
10    Xi = xe + (t * xd);
11    Yi = ye + (t * yd);
12    Zi = ze + (t * zd);
13    if (d2 >= ((Xi - xo)* xq + (Yi - yo
14    )* yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi - yo)
15    * yq + (Zi - zo)* zq)>= d1)
16    {
```

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```
1      templIntersect.Xi = Xi;  
2      templIntersect.Yi = Yi;  
3      templIntersect.Zi = Zi;  
4      templIntersect.distance = t;  
5      templIntersect.object = object;  
6      }  
7      else  
8      {  
9          templIntersect.null = 1;  
10     }  
11     int accept = testIntersection (  
templIntersect.Xi, templIntersect.Yi, templIntersect.  
Zi, object);  
12     if (accept == 0)  
13     {  
14
```

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```
1         templIntersect.null = 1;
2     }
3     return templIntersect;
4 }
5 }
6 else
7 {
8     t = t1;
9     Xi = xe + (t * xd);
10    Yi = ye + (t * yd);
11    Zi = ze + (t * zd);
12    if (d2 >= ((Xi - xo)* xq + (Yi - yo)*
yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi - yo)*
yq + (Zi - zo)* zq)>= d1)
13    {
14
```

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```
1      templIntersect.Xi = Xi;  
2      templIntersect.Yi = Yi;  
3      templIntersect.Zi = Zi;  
4      templIntersect.distance = t;  
5      templIntersect.object = object;  
6      int accept = testIntersection (  
templIntersect.Xi, templIntersect.Yi, templIntersect.  
Zi, object);  
7          if (accept == 0)  
8              {  
9                  templIntersect.null = 1;  
10             }  
11         return templIntersect;  
12     }  
13     else  
14     {  
15
```

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```
1           templIntersect.null = 1;
2           return templIntersect;
3       }
4   }
5 }
6 else
7 {
8     if (t2 > e)
9     {
10         t = t2;
11         Xi = xe + (t * xd);
12         Yi = ye + (t * yd);
13         Zi = ze + (t * zd);
```

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```
1      if (d2 >= ((Xi - xo)* xq + (Yi - yo)*  
yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi - yo)*  
yq + (Zi - zo)* zq)>= d1)  
2      {  
3          templIntersect.Xi = Xi;  
4          templIntersect.Yi = Yi;  
5          templIntersect.Zi = Zi;  
6          templIntersect.distance = t;  
7          templIntersect.object = object;  
8          int accept = testIntersection (  
templIntersect.Xi, templIntersect.Yi, templIntersect.  
Zi, object);  
9          if (accept == 0)  
10             {  
11                 templIntersect.null = 1;  
12             }  
13         return templIntersect;
```


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```
1         }  
2     else  
3     {  
4         templIntersect.null = 1;  
5         return templIntersect;  
6     }  
7 }  
8 else  
9 {  
10    templIntersect.null = 1;  
11    return templIntersect;  
12 }  
13 }
```

Código Pretty Print GNU

```
1      }
2      else
3      {
4          tempIntersect.null = 1;
5          return tempIntersect;
6      }
7  }
8  struct Vector cilindNormal (struct Object object ,
9      struct Vector intersectionPoint)
10 {
11     struct Vector normalCilinder;
12     long double x = intersectionPoint.x;
13     long double y = intersectionPoint.y;
14     long double z = intersectionPoint.z;
```

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```
1  long double xo = object.Xc;  
2  long double yo = object.Yc;  
3  long double zo = object.Zc;  
4  long double xq = object.directionVector.x;  
5  long double yq = object.directionVector.y;  
6  long double zq = object.directionVector.z;  
7  long double xxoxq = (x - xo)* xq;  
8  long double yyoyq = (y - yo)* yq;  
9  long double zzozq = (z - zo)* zq;  
10 long double parenth = (xxoxq + yyoyq + zzozq);  
11 long double pxq = 2 * (xo + parenth * xq - x);  
12 long double pyq = 2 * (yo + parenth * yq - y);  
13 long double pzq = 2 * (zo + parenth * zq - z);
```

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```
1    normalCilinder.x = pxq * (pow (xq, 2)- 1)+ pyq * (
    yq * xq)+ pzq * (zq * xq);
2    normalCilinder.y = pxq * (xq * yq)+ pyq * (pow (yq ,
    2)- 1)+ pzq * (zq * yq);
3    normalCilinder.z = pxq * (xq * zq)+ pyq * (yq * zq)
    + pzq * (pow (zq, 2)- 1);
4    normalCilinder = normalize (normalCilinder);
5    return normalCilinder;
6 }
7 struct Intersection coneIntersection (struct Vector
    anchor, struct Vector direction , struct Object
    object)
8 {
9     struct Intersection tempIntersect;
10    tempIntersect.null = 0;
11    long double xo = object.Xc;
12    long double yo = object.Yc;
13    long double zo = object.Zc;
```

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```
1  long double xq = object.directionVector.x;  
2  long double yq = object.directionVector.y;  
3  long double zq = object.directionVector.z;  
4  long double xd = direction.x;  
5  long double yd = direction.y;  
6  long double zd = direction.z;  
7  long double k1 = object.K1;  
8  long double k2 = object.K2;  
9  long double xe = anchor.x;  
10 long double ye = anchor.y;  
11 long double ze = anchor.z;  
12 long double xdxq = xd * xq;  
13 long double ydyq = yd * yq;
```

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```
1  long double zdzq = zd * zq ;
2  long double xexq = xe * xq ;
3  long double yeyq = ye * yq ;
4  long double zezq = ze * zq ;
5  long double xoxq = xo * xq ;
6  long double yoyq = yo * yq ;
7  long double zozq = zo * zq ;
8  long double coef1 = xdxq * xq + ydyq * xq + zdzq *
   xq - xd ;
9  long double coef2 = xdxq * yq + ydyq * yq + zdzq *
   yq - yd ;
10 long double coef3 = xdxq * zq + ydyq * zq + zdzq *
   zq - zd ;
11 long double coef4 = xo + xexq * xq - xoxq * xq +
   yeyq * xq - yoyq * xq + zezq * xq - zozq * xq - xe ;
12 long double coef5 = yo + xexq * yq - xoxq * yq +
   yeyq * yq - yoyq * yq + zezq * yq - zozq * yq - ye ;
13 long double coef6 = zo + xexq * zq - xoxq * zq +
   yeyq * zq - yoyq * zq + zezq * zq - zozq * zq - ze ;
```

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```
1  long double coefk = pow (k2 / k1, 2);
2  long double coef7 = xdxq + ydyq + zdzq;
3  long double coef8 = xexq - xoxq + yeyq - yoyq +
   zezq - zozq;
4  long double A = pow (coef1, 2)+ pow (coef2, 2)+ pow
   (coef3, 2)- (coefk * pow (coef7, 2));
5  long double B = 2 * ((coef1 * coef4 + coef2 * coef5
   + coef3 * coef6)- (coefk * coef7 * coef8));
6  long double C = pow (coef4, 2)+ pow (coef5, 2)+ pow
   (coef6, 2)- (coefk * pow (coef8, 2));
7  long double discriminant = pow (B, 2)- (4 * A * C);
8  long double t, t1, t2;
9  if (discriminant >= 0)
10     {
11         long double root = sqrt (discriminant);
12         B *= - 1;
13         t1 = (B + root)/ (2 * A);
```

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```
1      t2 = (B - root)/ (2 * A);
2      long double Xi;
3      long double Yi;
4      long double Zi;
5      long double d1 = object.D1;
6      long double d2 = object.D2;
7      if (t1 > e)
8      {
9          if (t2 > e)
10         {
11             t = min (t1 , t2);
12             Xi = xe + (t * xd);
13             Yi = ye + (t * yd);
```


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```
1      Zi = ze + (t * zd);
2      if (d2 >= ((Xi - xo)* xq + (Yi - yo)*
yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi - yo)*
yq + (Zi - zo)* zq)>= d1)
3      {
4          templIntersect.Xi = Xi;
5          templIntersect.Yi = Yi;
6          templIntersect.Zi = Zi;
7          templIntersect.distance = t;
8          templIntersect.object = object;
9          int accept = testIntersection (
templIntersect.Xi, templIntersect.Yi, templIntersect.
Zi, object);
10         if (accept == 0)
11         {
12             t = max (t1, t2);
13             Xi = xe + (t * xd);
```

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```
1      Yi = ye + (t * yd);
2      Zi = ze + (t * zd);
3      if (d2 >= ((Xi - xo)* xq + (Yi
- yo)* yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi -
- yo)* yq + (Zi - zo)* zq)>= d1)
4          {
5              templIntersect.Xi = Xi;
6              templIntersect.Yi = Yi;
7              templIntersect.Zi = Zi;
8              templIntersect.distance = t;
9              templIntersect.object =
object;
10             int accept =
testIntersection (templIntersect.Xi, templIntersect.
Yi, templIntersect.Zi, object);
11             if (accept == 0)
12                 {
13                 templIntersect.null = 1;
```

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```
1      }
2      return templIntersect;
3  }
4  else
5  {
6      templIntersect.null = 1;
7      return templIntersect;
8  }
9  }
10     return templIntersect;
11 }
12 else
13 {
14
```

Código Pretty Print GNU

```
1         t = max (t1 , t2);
2         Xi = xe + (t * xd);
3         Yi = ye + (t * yd);
4         Zi = ze + (t * zd);
5         if (d2 >= ((Xi - xo)* xq + (Yi - yo
)* yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi - yo)
* yq + (Zi - zo)* zq)>= d1)
6             {
7                 templIntersect.Xi = Xi;
8                 templIntersect.Yi = Yi;
9                 templIntersect.Zi = Zi;
10                templIntersect.distance = t;
11                templIntersect.object = object;
12                int accept = testIntersection (
templIntersect.Xi, templIntersect.Yi, templIntersect.
Zi, object);
13                if (accept == 0)
14                    {
15
```

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```
1         templIntersect.null = 1;  
2     }  
3     return templIntersect;  
4 }  
5 else  
6 {  
7     templIntersect.null = 1;  
8     return templIntersect;  
9 }  
10 }  
11 }  
12 else  
13 {  
14
```

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```
1         t = t1;  
2         Xi = xe + (t * xd);  
3         Yi = ye + (t * yd);  
4         Zi = ze + (t * zd);  
5         if (d2 >= ((Xi - xo)* xq + (Yi - yo)*  
yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi - yo)*  
yq + (Zi - zo)* zq)>= d1)  
6         {  
7             templIntersect.Xi = Xi;  
8             templIntersect.Yi = Yi;  
9             templIntersect.Zi = Zi;  
10            templIntersect.distance = t;  
11            templIntersect.object = object;  
12            int accept = testIntersection (  
templIntersect.Xi, templIntersect.Yi, templIntersect.  
Zi, object);  
13            if (accept == 0)  
14                {  
15
```

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```
1         templIntersect.null = 1;
2     }
3     return templIntersect;
4 }
5 else
6 {
7     templIntersect.null = 1;
8     return templIntersect;
9 }
10 }
11 }
12 else
13 {
14
```

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```
1      if (t2 > e)
2      {
3          t = t2;
4          Xi = xe + (t * xd);
5          Yi = ye + (t * yd);
6          Zi = ze + (t * zd);
7          if (d2 >= ((Xi - xo)* xq + (Yi - yo)*
yq + (Zi - zo)* zq)&& ((Xi - xo)* xq + (Yi - yo)*
yq + (Zi - zo)* zq)>= d1)
8          {
9              templIntersect.Xi = Xi;
10             templIntersect.Yi = Yi;
11             templIntersect.Zi = Zi;
12             templIntersect.distance = t;
13             templIntersect.object = object;
```


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```
1      int accept = testIntersection (
2      templIntersect.Xi, templIntersect.Yi, templIntersect.
3      Zi, object);
4          if (accept == 0)
5          {
6              templIntersect.null = 1;
7          }
8      return templIntersect;
9  }
10 else
11 {
12     templIntersect.null = 1;
13     return templIntersect;
14 }
```

Código Pretty Print GNU

```
1      else
2      {
3          templIntersect.null = 1;
4          return templIntersect;
5      }
6  }
7  }
8  else
9  {
10     templIntersect.null = 1;
11     return templIntersect;
12 }
13 }
```

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```
1 struct Vector coneNormal (struct Object object , struct
  Vector intersectionPoint)
2 {
3     struct Vector normalCone;
4     long double x = intersectionPoint.x;
5     long double y = intersectionPoint.y;
6     long double z = intersectionPoint.z;
7     long double xo = object.Xc;
8     long double yo = object.Yc;
9     long double zo = object.Zc;
10    long double xq = object.directionVector.x;
11    long double yq = object.directionVector.y;
12    long double zq = object.directionVector.z;
13    long double k1 = object.K1;
```

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```
1  long double k2 = object.K2;
2  long double xxoxq = (x - xo)* xq;
3  long double yyoyq = (y - yo)* yq;
4  long double zzozq = (z - zo)* zq;
5  long double parenth = (xxoxq + yyoyq + zzozq);
6  long double pxq = 2 * (xo + parenth * xq - x);
7  long double pyq = 2 * (yo + parenth * yq - y);
8  long double pzq = 2 * (zo + parenth * zq - z);
9  long double k1sq = pow (k1, 2);
10 long double k2sq2 = 2 * pow (k2, 2);
11 long double lastFactorDerivedX = (k2sq2 * xq *
    parenth)/ k1sq;
12 long double lastFactorDerivedY = (k2sq2 * yq *
    parenth)/ k1sq;
13 long double lastFactorDerivedZ = (k2sq2 * zq *
    parenth)/ k1sq;
```

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```
1    normalCone.x = pxq * (pow (xq, 2)- 1)+ pyq * (yq *  
    xq)+ pzq * (zq * xq)- lastFactorDerivedX;  
2    normalCone.y = pxq * (xq * yq)+ pyq * (pow (yq, 2)-  
    1)+ pzq * (zq * yq)- lastFactorDerivedY;  
3    normalCone.z = pxq * (xq * zq)+ pyq * (yq * zq)+  
    pzq * (pow (zq, 2)- 1)- lastFactorDerivedZ;  
4    normalCone = normalize (normalCone);  
5    return normalCone;  
6 }  
7 long double whatsTheD (struct Object object)  
8 {  
9     struct Point3D point = object.points3D[0];  
10    long double theD = - ((object.Xc * point.x)+ (  
    object.Yc * point.y)+ (object.Zc * point.z));  
11    return theD;  
12 }  
13 long double whatsTheDGeneral (struct Vector  
    normalNotNormalized, struct Vector point)  
14 {
```

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```
1    long double theD = - ((normalNotNormalized.x *
2    point.x)+ (normalNotNormalized.y * point.y)+ (
3    normalNotNormalized.z * point.z));
4    return theD;
5    }
6    struct Object getABCD (struct Object object)
7    {
8        struct Vector normal = polygonNormal (object);
9        object.Xc = normal.x;
10       object.Yc = normal.y;
11       object.Zc = normal.z;
12       object.other = whatsTheD (object);
13       long double L = getNorm (normal);
14       object.Xc /= L;
15       object.Yc /= L;
```

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```
1    object.Zc /= L;  
2    object.other /= L;  
3    return object;  
4 }  
5 struct Intersection discIntersection (struct Vector  
   anchor, struct Vector direction, struct Object  
   object)  
6 {  
7     long double denominator = (direction.x * object.  
   directionVector.x) + (direction.y * object.  
   directionVector.y) + (direction.z * object.  
   directionVector.z);  
8     struct Intersection tempIntersect;  
9     tempIntersect.null = 1;  
10    if (denominator == 0)  
11    {  
12        tempIntersect.null = 1;  
13        return tempIntersect;
```

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```
1      }
2      else
3      {
4          long double numerator = - ((anchor.x * object.
directionVector.x)+ (anchor.y * object.
directionVector.y)+ (anchor.z * object.
directionVector.z)+ object.extraD);
5          long double t = numerator / denominator;
6          tempIntersect.distance = t;
7          tempIntersect.object = object;
8          tempIntersect.Xi = anchor.x + (t * direction.x)
;
9          tempIntersect.Yi = anchor.y + (t * direction.y)
;
10         tempIntersect.Zi = anchor.z + (t * direction.z)
;
11         long double distanceToCenter = sqrt (pow (
tempIntersect.Xi - object.Xc, 2)+ pow (
tempIntersect.Yi - object.Yc, 2)+ pow (
```


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```
1      templIntersect.null = 0;
2      }
3      int accept = testIntersection (templIntersect.Xi
4      , templIntersect.Yi, templIntersect.Zi, object);
5      if (accept == 0)
6      {
7          templIntersect.null = 1;
8      }
9      return templIntersect;
10     }
11 struct Vector discNormal (struct Object object)
12 {
13     return object.directionVector;
```

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```
1 }
2 struct Intersection elipseIntersection (struct Vector
   anchor, struct Vector direction, struct Object
   object)
3 {
4     long double denominator = (direction.x * object.
   directionVector.x)+ (direction.y * object.
   directionVector.y)+ (direction.z * object.
   directionVector.z);
5     struct Intersection tempIntersect;
6     tempIntersect.null = 1;
7     if (denominator == 0)
8     {
9         tempIntersect.null = 1;
10        return tempIntersect;
11    }
12    else
13    {
14
```

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```
1      long double numerator = - ((anchor.x * object.  
directionVector.x)+ (anchor.y * object.  
directionVector.y)+ (anchor.z * object.  
directionVector.z)+ object.extraD);  
2      long double t = numerator / denominator;  
3      templIntersect.distance = t;  
4      templIntersect.object = object;  
5      templIntersect.Xi = anchor.x + (t * direction.x)  
;  
6      templIntersect.Yi = anchor.y + (t * direction.y)  
;  
7      templIntersect.Zi = anchor.z + (t * direction.z)  
;  
8      long double distanceToD1 = sqrt (pow (   
templIntersect.Xi - object.Xc, 2)+ pow (   
templIntersect.Yi - object.Yc, 2)+ pow (   
templIntersect.Zi - object.Zc, 2));  
9      long double distanceToD2 = sqrt (pow (   
templIntersect.Xi - object.Xother, 2)+ pow (
```

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```
1      else
2      {
3          templIntersect.null = 1;
4      }
5      int accept = testIntersection (templIntersect.Xi
6      , templIntersect.Yi, templIntersect.Zi, object);
7      if (accept == 0)
8      {
9          templIntersect.null = 1;
10     }
11     return templIntersect;
12 }
13 struct Vector ellipseNormal (struct Object object)
14 {
15
```

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```
1     return object.directionVector;
2 }
3 struct Intersection quadraticIntersection (struct
    Vector anchor, struct Vector direction, struct
    Object object)
4 {
5     long double t, t1, t2;
6     struct Intersection tempIntersect;
7     tempIntersect.null = 0;
8     long double a = (object.A * pow (direction.x, 2))+
        (object.B * pow (direction.y, 2))+ (object.C * pow
        (direction.z, 2))+ 2 * ((object.D * direction.x *
        direction.y)* (object.E * direction.y * direction.z
        )* (object.F * direction.x * direction.z));
9     long double b = 2 * ((object.A * anchor.x *
        direction.x)+ (object.B * anchor.y * direction.y)+
        (object.C * anchor.z * direction.z)+ (object.D *
        anchor.x * direction.y)+ (object.D * anchor.y *
        direction.x)+ (object.E * anchor.y * direction.z)+
```

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```
1      long double root = sqrt (discriminant);
2      b *= - 1;
3      t1 = (b + root)/ (2 * a);
4      t2 = (b - root)/ (2 * a);
5      if (t1 > e)
6          {
7              if (t2 > e)
8                  {
9                      t = min (t1, t2);
10                     tempIntersect.distance = t;
11                     tempIntersect.object = object;
12                     tempIntersect.Xi = anchor.x + (t *
direction.x);
13                     tempIntersect.Yi = anchor.y + (t *
direction.y);
```

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```
1         templIntersect.Zi = anchor.z + (t *  
direction.z);  
2         int accept = testIntersection (  
templIntersect.Xi, templIntersect.Yi, templIntersect.  
Zi, object);  
3         if (accept == 0)  
4         {  
5             t = max (t1, t2);  
6             templIntersect.distance = t;  
7             templIntersect.object = object;  
8             templIntersect.Xi = anchor.x + (t *  
direction.x);  
9             templIntersect.Yi = anchor.y + (t *  
direction.y);  
10            templIntersect.Zi = anchor.z + (t *  
direction.z);  
11            int accept = testIntersection (  
templIntersect.Xi, templIntersect.Yi, templIntersect.  
Zi, object);
```

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```
1         templIntersect.null = 1;
2     }
3 }
4 }
5 else
6 {
7     t = t1;
8     templIntersect.distance = t;
9     templIntersect.object = object;
10    templIntersect.Xi = anchor.x + (t *
direction.x);
11    templIntersect.Yi = anchor.y + (t *
direction.y);
12    templIntersect.Zi = anchor.z + (t *
direction.z);
13    int accept = testIntersection (
templIntersect.Xi, templIntersect.Yi, templIntersect.
Zi, object);
```


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```
1         if (accept == 0)
2             {
3                 templIntersect.null = 1;
4             }
5     }
6 }
7 else
8 {
9     if (t2 > e)
10    {
11        t = t2;
12        templIntersect.distance = t;
13        templIntersect.object = object;
```

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```
1      templIntersect.Xi = anchor.x + (t *  
    direction.x);  
2      templIntersect.Yi = anchor.y + (t *  
    direction.y);  
3      templIntersect.Zi = anchor.z + (t *  
    direction.z);  
4      int accept = testIntersection (  
    templIntersect.Xi, templIntersect.Yi, templIntersect.  
    Zi, object);  
5      if (accept == 0)  
6      {  
7          templIntersect.null = 1;  
8      }  
9  }  
10     else  
11     {  
12         templIntersect.null = 1;  
13     }
```

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```
1      }
2      return tempIntersect;
3  }
4  else
5  {
6      tempIntersect.null = 1;
7      return tempIntersect;
8  }
9  }
10 struct Vector quadraticNormal (struct Object object ,
11     struct Vector intersectionVector)
12 {
13     long double xElement = ((object.A *
14     intersectionVector.x)+ (object.D *
15     intersectionVector.y)+ (object.F *
16     intersectionVector.z)+ (object.G));
17     long double yElement = ((object.D *
18     intersectionVector.x)+ (object.B *
19     intersectionVector.y)+ (object.E *
20     intersectionVector.z)+ (object.H));
```

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```
1  long double zElement = ((object.F *
intersectionVector.x)+ (object.E *
intersectionVector.y)+ (object.C *
intersectionVector.z)+ (object.C));
2  struct Vector normalNotNormalized =
3      {
4          xElement, yElement, zElement
5      };
6  return normalNotNormalized;
7  }
8  long double uRectangle (struct Vector x0y0z0, struct
Vector x1y1z1, struct Vector xiyizi)
9  {
10     struct Vector U;
11     U.x = x1y1z1.x - x0y0z0.x;
12     U.y = x1y1z1.y - x0y0z0.y;
13     U.z = x1y1z1.z - x0y0z0.z;
```

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```
1  struct Vector i0;  
2  i0.x = xiyizi.x - x0y0z0.x;  
3  i0.y = xiyizi.y - x0y0z0.y;  
4  i0.z = xiyizi.z - x0y0z0.z;  
5  long double H = getNorm (U);  
6  U = normalize (U);  
7  return pointProduct (i0 , U)/ H;  
8  }  
9  long double vRectangle (struct Vector x0y0z0 , struct  
10     Vector x3y3z3 , struct Vector xiyizi)  
11  {  
12     struct Vector V;  
13     V.x = x3y3z3.x - x0y0z0.x;  
14     V.y = x3y3z3.y - x0y0z0.y;
```

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```
1      V.z = x3y3z3.z - x0y0z0.z;  
2      struct Vector i0;  
3      i0.x = xiyizi.x - x0y0z0.x;  
4      i0.y = xiyizi.y - x0y0z0.y;  
5      i0.z = xiyizi.z - x0y0z0.z;  
6      long double L = getNorm (V);  
7      V = normalize (V);  
8      return pointProduct (i0 , V)/ L;  
9  }  
10 struct Color planeTexture (struct Intersection in ,  
11     struct Vector normal)  
12 {  
13     struct Object object = in.object;  
14     struct Vector ipoint;
```

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```
1  ipoint.x = in.Xi;
2  ipoint.y = in.Yi;
3  ipoint.z = in.Zi;
4  long double u = uRectangle (object.x0y0z0 , object.
x1y1z1, ipoint);
5  long double v = vRectangle (object.x0y0z0 , object.
x3y3z3, ipoint);
6  struct Color color;
7  for (int i = 0 ; i < object.numberTextures ; i ++ )
8      {
9          int xs = object.textures[i].hRes * u;
10         int ys = object.textures[i].vRes * v;
11         color = object.textures[i].textureMap[xs][ys];
12     }
13  return color;
```

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```
1 }
2 long double uCylinder (struct Vector anchor, struct
   Vector Q, struct Vector normal, struct Vector
   greenwich, struct Vector xiyizi)
3 {
4     long double tempu = acos (pointProduct (normal,
   greenwich))/ (2 * 3.14159265);
5     struct Vector darkSide = crossProduct (Q, greenwich
   );
6     long double d = whatsTheDGeneral (darkSide, anchor)
   ;
7     long double test = darkSide.x * xiyizi.x + darkSide
   .y * xiyizi.y + darkSide.z * xiyizi.z + d;
8     if (test < 0)
9     {
10         tempu = 1 - tempu;
11     }
12     return tempu;
13 }
```


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```
1 long double vCylinder (struct Vector anchor, struct
    Vector Q, struct Vector xiyizi, long double den)
2 {
3     struct Vector i0;
4     i0.x = xiyizi.x - anchor.x;
5     i0.y = xiyizi.y - anchor.y;
6     i0.z = xiyizi.z - anchor.z;
7     return pointProduct (Q, i0)/ den;
8 }
9 struct Color cylinderTexture (struct Intersection in,
    struct Vector normal)
10 {
11     struct Object object = in.object;
12     struct Vector gw = object.textures[0].greenwich;
13     struct Vector ipoint;
```

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```
1  ipoint.x = in.Xi;
2  ipoint.y = in.Yi;
3  ipoint.z = in.Zi;
4  struct Vector anchor;
5  anchor.x = object.Xc;
6  anchor.y = object.Yc;
7  anchor.z = object.Zc;
8  long double u = uCylinder (anchor, object.
directionVector, normal, gw, ipoint);
9  long double v = vCylinder (anchor, object.
directionVector, ipoint, object.D2 - object.D1);
10 struct Color color;
11 for (int i = 0 ; i < object.numberTextures ; i ++)
12     {
13         int xs = object.textures[i].hRes * u;
```

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```
1         int ys = object.textures[i].vRes * v;  
2         color = object.textures[i].textureMap[xs][ys];  
3     }  
4     return color;  
5 }  
6 long double uSphere (struct Vector center, struct  
    Vector north, long double radius, struct Vector  
    xiyizi, struct Vector greenwich)  
7 {  
8     struct Vector ic;  
9     ic.x = xiyizi.x - center.x;  
10    ic.y = xiyizi.y - center.y;  
11    ic.z = xiyizi.z - center.z;  
12    long double icnorth = pointProduct (north, ic);  
13    struct Vector inprime;
```

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```
1  inprime.x = xiyizi.x - north.x * icnorth;  
2  inprime.y = xiyizi.y - north.y * icnorth;  
3  inprime.z = xiyizi.z - north.z * icnorth;  
4  struct Vector nprime;  
5  nprime.x = inprime.x - center.x;  
6  nprime.y = inprime.y - center.y;  
7  nprime.z = inprime.z - center.z;  
8  nprime = normalize (nprime);  
9  long double tempu = acos (pointProduct (nprime,  
10 greenwich))/ (2 * 3.14159265);  
11 struct Vector darkSide = crossProduct (north,  
12 greenwich);  
13 long double d = whatsTheDGeneral (darkSide, center)  
14 ;  
15 long double test = darkSide.x * xiyizi.x + darkSide  
16 .y * xiyizi.y + darkSide.z * xiyizi.z + d;  
17 if (test < 0)  
18     {
```

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```
1      tempu = 1 - tempu;
2  }
3  return tempu;
4  }
5  long double vSphere (struct Vector center, struct
    Vector north, long double radius, struct Vector
    xiyizi)
6  {
7      struct Vector south;
8      south.x = center.x - radius * north.x;
9      south.y = center.y - radius * north.y;
10     south.z = center.z - radius * north.z;
11     struct Vector i0;
12     i0.x = xiyizi.x - south.x;
13     i0.y = xiyizi.y - south.y;
```

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```
1      i0.z = xiyizi.z - south.z;  
2      return pointProduct (north, i0)/ (2 * radius);  
3  }  
4  struct Color sphereTexture (struct Intersection in,  
5                               struct Vector normal)  
6  {  
7      struct Object object = in.object;  
8      struct Vector gw = object.textures[0].greenwich;  
9      struct Vector north = object.textures[0].north;  
10     struct Vector ipoint;  
11     ipoint.x = in.Xi;  
12     ipoint.y = in.Yi;  
13     ipoint.z = in.Zi;  
14     struct Vector center;
```

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```
1   center.x = object.Xc;
2   center.y = object.Yc;
3   center.z = object.Zc;
4   long double u = uSphere (center, north, object.
other, ipoint, gw);
5   long double v = vSphere (center, north, object.
other, ipoint);
6   struct Color color;
7   for (int i = 0 ; i < object.numberTextures ; i ++ )
8       {
9           int xs = object.textures[i].hRes * u;
10          int ys = object.textures[i].vRes * v;
11          color = object.textures[i].textureMap[xs][ys];
12      }
13   return color;
```

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```
1  }
2  long double uCone (struct Vector anchor, struct Vector
   Q, struct Vector normal, struct Vector greenwich,
   struct Vector xiyizi)
3  {
4      struct Vector aux = crossProduct (normal, Q);
5      struct Vector nprime = crossProduct (aux, Q);
6      long double tempu = acos (pointProduct (nprime,
   greenwich))/ (2 * 3.14159265);
7      struct Vector darkSide = crossProduct (Q, greenwich
   );
8      long double d = whatsTheDGeneral (darkSide, anchor)
   ;
9      long double test = darkSide.x * xiyizi.x + darkSide
   .y * xiyizi.y + darkSide.z * xiyizi.z + d;
10     if (test < 0)
11     {
12         tempu = 1 - tempu;
13     }
```


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```
1     return tempu;
2 }
3 struct Color coneTexture (struct Intersection in,
4     struct Vector normal)
5 {
6     struct Object object = in.object;
7     struct Vector gw = object.textures[0].greenwich;
8     struct Vector ipoint;
9     ipoint.x = in.Xi;
10    ipoint.y = in.Yi;
11    ipoint.z = in.Zi;
12    struct Vector anchor;
13    anchor.x = object.Xc;
14    anchor.y = object.Yc;
```

Código Pretty Print GNU

```
1  anchor.z = object.Zc;
2  long double u = uCone (anchor, object.
   directionVector, normal, gw, ipoint);
3  long double v = vCylinder (anchor, object.
   directionVector, ipoint, object.D2 - object.D1);
4  struct Color color;
5  for (int i = 0 ; i < object.numberTextures ; i ++ )
6      {
7          int xs = object.textures[i].hRes * u;
8          int ys = object.textures[i].vRes * v;
9          color = object.textures[i].textureMap[xs][ys];
10     }
11     return color;
12 }
13 struct Intersection getFirstIntersection (struct Vector
   anchor, struct Vector direction)
14 {
15
```

Código Pretty Print GNU

```
1  rays += 1;
2  int k;
3  int objectsAmount = numberObjects;
4  long double tmin;
5  struct Intersection intersection;
6  struct Intersection tempIntersection;
7  intersection.null = 1;
8  tmin = 10000000;
9  tempIntersection.null = 1;
10 for (k = 0 ; k < objectsAmount ; k ++)
11     {
12         tempIntersection = Objects[k].
intersectionFuncion (anchor, direction , Objects[k])
13         ;
14         if (tempIntersection.null != 1 &&
tempIntersection.distance > e && tempIntersection.
distance < tmin)
15             {
```

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```
1         tmin = tempIntersection.distance;
2         intersection = tempIntersection;
3     }
4     tempIntersection.null = 1;
5 }
6 return intersection;
7 }
8 struct Color ponderColor (struct Color baseColor,
9     struct Color reflectionColor, long double o1, long
10    double o2)
11 {
12     struct Color color;
13     color.r = baseColor.r * o1 + reflectionColor.r * o2
14 ;
15     color.g = baseColor.g * o1 + reflectionColor.g * o2
16 ;
17     color.b = baseColor.b * o1 + reflectionColor.b * o2
18 ;
```

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```
1      return color;
2  }
3  struct Color getColor (struct Vector anchor, struct
4      Vector direction, struct Vector V, int rLevel)
5  {
6      struct Color color;
7      struct Intersection intersection;
8      struct Intersection * tempIntersection;
9      intersection = getFirstIntersection (anchor,
10     direction);
11     if (intersection.null == 1)
12     {
13         color = background;
14     }
15     else
16     {
```

Código Pretty Print GNU

```
1      int k;  
2      int lightsAmount = numberLights;  
3      struct Object Q = intersection.object;  
4      struct Vector L;  
5      struct Vector intersectVector =  
6          {  
7              intersection.Xi, intersection.Yi,  
intersection.Zi  
8          };  
9      struct Vector N = normalize (Q.normalVector (Q,  
intersectionVector));  
10     struct Vector R;  
11     if (pointProduct (N, direction)> 0)  
12         {  
13             N.x *= - 1;
```

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```
1      N.y *= - 1;
2      N.z *= - 1;
3  }
4  long double Fatt;
5  long double I = 0.0;
6  long double E = 0.0;
7  for (k = 0 ; k < numberLights ; k ++)
8  {
9      struct Intersection obstacle;
10     struct Vector light =
11         {
12             Lights[k].Xp - intersection.Xi, Lights[
13             k].Yp - intersection.Yi, Lights[k].Zp -
14             intersection.Zi
15         };
```

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```
1      L = light ;
2      L = normalize (light);
3      long double pp = pointProduct (N, L);
4      obstacle = getFirstIntersection (
intersectVector , L);
5      long double distanceToLight = getNorm (
light);
6      if (obstacle.null == 1 || (obstacle.
distance > e && obstacle.distance > distanceToLight
))
7          {
8              Fatt = getAttenuationFactor (Lights[k],
distanceToLight);
9              if (pp > 0.0)
10                 {
11                     R.x = (2 * N.x * pp) - L.x;
12                     R.y = (2 * N.y * pp) - L.y;
13                     R.z = (2 * N.z * pp) - L.z;
```


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```
1           R = normalize (R);
2           I = I + (pp * Q.Kd * Fatt * Lights[
k].Ip);
3       }
4       long double pp2 = pointProduct (R, V);
5       if (pp2 > 0.0)
6       {
7           E = E + (pow (pp2, Q.Kn)* Q.Ks *
Lights[k].Ip * Fatt);
8       }
9   }
10 }
11 if (Q.numberTextures != 0)
12 {
13     color = Q.retrieveTextureColor (
intersection , N);
```

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```
1      }  
2  else  
3      {  
4          color = Q.color;  
5      }  
6  if (isnan (color.r))  
7      {  
8          color = Q.color;  
9      }  
10     I = I + Ia * Q.Ka;  
11     I = min (1.0, I);  
12     color = difusseColor (I, color);  
13     E = min (1.0, E);
```

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```
1      color = specularHighlight (E, color);
2      if (rLevel > 0)
3      {
4          long double pNV = pointProduct (N, V);
5          R.x = (2 * N.x * pNV) - V.x;
6          R.y = (2 * N.y * pNV) - V.y;
7          R.z = (2 * N.z * pNV) - V.z;
8          R = normalize (R);
9          struct Vector otherV =
10             {
11                 - R.x, - R.y, - R.z
12             };
13          struct Color reflectionColor = getColor (
intersectVector, R, otherV, rLevel - 1);
```

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```
1         color = ponderColor (color, reflectionColor
2     , Q.o1, Q.o2);
3     }
4     struct Color transparencyColor = background;
5     int levelsAllowed = maxTransparency;
6     while (levelsAllowed > 0 && intersection.object
7 .o3 > 0)
8     {
9         transparencyColor = getColor (
10 intersectVector, direction, V, maxReflection);
11         levelsAllowed --;
12         if (transparencyColor.r == background.r &&
13 transparencyColor.g == background.g &&
14 transparencyColor.b == background.b)
15         {
16             break;
17         }
18     }
```

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```
1      color = ponderColor (color , transparencyColor ,
2      1, intersection.object.o3);
3      }
4      return (color);
5  }
6  void printPlaneCuts (struct Object objeto)
7  {
8      if (objeto.planeCuts == NULL)
9      {
10         printf ("\n Este objeto no tiene planos de
11         corte asociados. \n");
12         return;
13     }
14     else
15     {
```

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```
1      int i = 0;
2      struct Vector normal;
3      struct Vector punto;
4      for (i = 0 ; i < objeto.numberPlaneCuts ; i ++ )
5      {
6          printf ("Plano %i: \n", i);
7          normal = objeto.planeCuts[i].normal;
8          punto = objeto.planeCuts[i].point;
9          printf ("\t Normal unitaria: %LF, %LF, %LF
10         \n", normal.x, normal.y, normal.z);
11          printf ("\t Punto base: %LF, %LF, %LF \n\n"
12         , punto.x, punto.y, punto.z);
13     }
```

Código Pretty Print GNU

```
1 void printTextures (struct Object objeto , int
   currentTypeObjectReading)
2 {
3     if (objeto.textures == NULL)
4     {
5         printf ("\n Este objeto no tiene texturas
   asociados. \n");
6         return;
7     }
8     else
9     {
10        int i = 0;
11        struct Vector norte;
12        struct Vector greenwich;
13        for (i = 0 ; i < objeto.numberTextures ; i ++)
14            {
15
```

Código Pretty Print GNU

```
1         printf ("Textura %i: \n", i);
2         printf ("Resoluci n Textura: %ix%i \n",
objeto.textures[i].hRes, objeto.textures[i].vRes);
3         printf ("Primer texel de la textura: (%LF,
%LF, %LF)", objeto.textures[i].textureMap[0][0].r *
255, objeto.textures[i].textureMap[0][0].g * 255,
objeto.textures[i].textureMap[0][0].b * 255);
4         int lastX = objeto.textures[i].hRes - 1;
5         int lastY = objeto.textures[i].vRes - 1;
6         printf ("ltimo texel de la textura: (%LF,
%LF, %LF)", objeto.textures[i].textureMap[lastX][
lastY].r * 255, objeto.textures[i].textureMap[lastX
][lastY].g * 255, objeto.textures[i].textureMap[
lastX][lastY].b * 255);
7         for (int f = 0 ; f < objeto.textures[i].
hRes ; f ++)
8             {
9                 for (int j = 0 ; j < objeto.textures[i
].vRes ; j ++)
```


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```
1         if (currentTypeObjectReading == 2 ||
currentTypeObjectReading == 4 ||
currentTypeObjectReading == 5 ||
currentTypeObjectReading == 8)
2             {
3                 greenwich = objeto.textures[i].
greenwich;
4                 printf ("\t Greenwich unitario: %LF, %
LF, %LF \n", greenwich.x, greenwich.y, greenwich.z)
;
5                 if (currentTypeObjectReading == 2 ||
currentTypeObjectReading == 8)
6                     {
7                         norte = objeto.textures[i].north;
8                         printf ("\t Norte unitario: %LF, %
LF, %LF \n", norte.x, norte.y, norte.z);
9                     }
10            }
11    }
```

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```
1 void printDraftPlanes (struct Object objeto , int
  currentTypeObjectReading)
2 {
3     if (objeto.draftPlanes == NULL)
4     {
5         printf ("\n Este objeto no tiene planos de
  calado asociados. \n");
6         return;
7     }
8     else
9     {
10         int i = 0;
11         struct Vector norte;
12         struct Vector greenwich;
13         for (i = 0 ; i < objeto.numberDraftPlanes ; i
  ++))
14             {
15
```

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```
1         printf ("N mero de planos de calado: %i \n", objeto.numberDraftPlanes);
2         printf ("plano de calado %i: \n", i);
3         printf ("Resoluci n plano de calado: %ix%i \n", objeto.draftPlanes[i].hRes, objeto.draftPlanes[i].vRes);
4         printf ("Primer texel del plano de calado: (%LF, %LF, %LF)", objeto.draftPlanes[i].textureMap[0][0].r, objeto.draftPlanes[i].textureMap[0][0].g * 255, objeto.draftPlanes[i].textureMap[0][0].b * 255);
5         int lastX = objeto.draftPlanes[i].hRes - 1;
6         int lastY = objeto.draftPlanes[i].vRes - 1;
7         printf ("ltimo texel del plano de calado: (%LF, %LF, %LF)", objeto.draftPlanes[i].textureMap[lastX][lastY].r * 255, objeto.draftPlanes[i].textureMap[lastX][lastY].g * 255, objeto.draftPlanes[i].textureMap[lastX][lastY].b * 255);
8     }
```

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```
1         norte = objeto.draftPlanes[i].north;  
2         printf ("\t Norte unitario: %LF, %LF, %  
LF \n", norte.x, norte.y, norte.z);  
3     }  
4 }  
5 }  
6 }  
7 void createObjectFromData (long double * data, int  
    whichObjectCreate, int quantityData, struct  
    PlaneCut * planeCutsFound, struct Texture *  
    texturesFound, struct DraftPlane * draftPlanesFound  
    , int numberPlaneCuts, int numberTextures, int  
    numberDraftPlanes)  
8 {  
9     switch (whichObjectCreate)  
10    {  
11        case 0:  
12            {  
13                if (debug == 1)
```

Código Pretty Print GNU

```
1         printf ("Insertando datos de escena \n"  
2     );  
3         printf ("Reflexiones: %LF,  
4     Transparencia: %LF, Anti-aliasing: %LF \n", data  
5     [0], data[1], data[2]);  
6         printf ("Iluminaci n ambiente: %LF \n"  
7     , data[3]);  
8         printf ("Plano de proyecci n (Xmin,  
9     Ymin) (Xmax, Ymax) : (%LF, %LF) (%LF, %LF) \n",  
10    data[4], data[5], data[6], data[7]);  
11        printf ("Resoluci n: %LFx%LF \n",  
12    data[8], data[9]);  
13        printf ("Epsilon %LF \n", data[10]);  
14        printf ("Ojo: (%LF, %LF, %LF) \n", data  
15    [11], data[12], data[13]);  
16        printf ("Color background: (%LF, %LF, %  
17    LF) \n", data[14], data[15], data[16]);  
18    }  
19    maxAA = data[0];
```

Código Pretty Print GNU

```
1      Xmin = data[4];  
2      Ymin = data[5];  
3      Xmax = data[6];  
4      Ymax = data[7];  
5      Hres = data[8];  
6      Vres = data[9];  
7      e = data[10];  
8      eye.x = data[11];  
9      eye.y = data[12];  
10     eye.z = data[13];  
11     background.r = data[14];  
12     background.g = data[15];  
13     background.b = data[16];
```

Código Pretty Print GNU

```
1         Framebuffer[Hres][Vres];
2         Framebuffer = (struct Color * *)malloc (
Vres * sizeof (struct Color *));
3         for (int i = 0 ; i < Vres ; i ++)
4             {
5                 Framebuffer[i] = (struct Color *)malloc
(Hres * sizeof (struct Color));
6             }
7         return ;
8     }
9     case 1:
10        {
11            if (debug == 1)
12                {
13                    printf ("Insertando Luz...\n");
```

Código Pretty Print GNU

```
1         printf ("Pos luz (%LF, %LF, %LF) \n",  
data[0], data[1], data[2]);  
2         printf ("c1: %LF, c2: %LF, c3 %LF \n",  
data[3], data[4], data[5]);  
3         printf ("lp luz: %LF \n", data[6]);  
4     }  
5     struct Object polygon;  
6     struct Color colorPolygon;  
7     struct Light luz;  
8     luz.Xp = data[0];  
9     luz.Yp = data[1];  
10    luz.Zp = data[2];  
11    luz.c1 = data[3];  
12    luz.c2 = data[4];  
13    luz.c3 = data[5];
```


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```
1      luz.lp = data[6];
2      Lights[lightIndex] = luz;
3      lightIndex ++;
4      return;
5  }
6  case 2:
7  {
8      if (debug == 1)
9      {
10         printf ("Insertando Esfera...");
11         printf ("Pos esfera (%LF, %LF, %LF) \n"
, data[0], data[1], data[2]);
12         printf ("o1: %LF, o2: %LF, o3: %LF \n"
, data[3], data[4], data[5]);
13         printf ("Radio esfera: %LF \n", data
[6]);
```

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```
1         printf ("Esfera Kd: %LF \n", data[6]);
2         printf ("Esfera Ka: %LF \n", data[8]);
3         printf ("Esfera Kn: %LF \n", data[9]);
4         printf ("Esfera Ks: %LF \n", data[10]);
5         printf ("Color esfera (%LF, %LF, %LF) \n", data[11], data[12], data[13]);
6     }
7     struct Object polygon;
8     struct Color colorPolygon;
9     struct Object esfera;
10    esfera.Xc = data[0];
11    esfera.Yc = data[1];
12    esfera.Zc = data[2];
13    esfera.o1 = data[3];
```

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```
1      esfera.o2 = data[4];
2      esfera.o3 = data[5];
3      esfera.other = data[6];
4      esfera.Kd = data[7];
5      esfera.Ka = data[8];
6      esfera.Kn = data[9];
7      esfera.Ks = data[10];
8      esfera.normalVector = sphereNormal;
9      esfera.intersectionFuncion =
sphereIntersection;
10     esfera.retrieveTextureColor = sphereTexture
;
11     struct Color colorSphere;
12     colorSphere.r = data[11];
13     colorSphere.g = data[12];
```

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```
1      colorSphere.b = data[13];
2      esfera.color = colorSphere;
3      esfera.planeCuts = planeCutsFound;
4      esfera.numberPlaneCuts = numberPlaneCuts;
5      esfera.textures = texturesFound;
6      esfera.numberTextures = numberTextures;
7      Objects[objectIndex] = esfera;
8      if (debug == 1)
9      {
10         printPlaneCuts (Objects[objectIndex]);
11         printTextures (Objects[objectIndex],
whichObjectCreate);
12     }
13     objectIndex ++;
```

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```
1         return ;
2     }
3     case 3:
4     {
5         int vertexPolygonIndex = 0;
6         int numVertexesPolygon = (quantityData - 10
7         - 12)/ 3 + 1;
8         int inicioPlano = 10 + (numVertexesPolygon
9         - 1)* 3;
10        if (debug == 1)
11        {
12            printf ("quantityData: %i \n",
13            quantityData);
14            printf ("numVertexesPolygon: %i \n",
15            numVertexesPolygon);
16            printf ("%i inicioPlano \n",
17            inicioPlano);
18            printf ("Insertando pol gono ...");
```

Código Pretty Print GNU

```
1         printf ("Color pol gono (%LF, %LF, %LF
) \n", data[0], data[1], data[2]);
2         printf ("o1: %LF, o2: %LF, o3: %LF \n"
, data[3], data[4], data[5]);
3         printf ("Poligono Kd: %LF \n", data[6])
;
4         printf ("Poligono Ka: %LF \n", data[7])
;
5         printf ("Poligono Kn: %LF \n", data[8])
;
6         printf ("Poligono Ks: %LF \n", data[9])
;
7         printf ("Esquina inferior izquierda (%
LF, %LF, %LF) \n", data[inicioPlano], data[
inicioPlano + 1], data[inicioPlano + 2]);
8         printf ("Esquina inferior derecha (%LF,
%LF, %LF) \n", data[inicioPlano + 3], data[
inicioPlano + 4], data[inicioPlano + 5]);
9         printf ("Esquina superior derecha (%LF,
```

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```
1      struct Object temp;  
2      struct Vector x0y0z0;  
3      x0y0z0.x = data[inicioPlano];  
4      x0y0z0.y = data[inicioPlano + 1];  
5      x0y0z0.z = data[inicioPlano + 2];  
6      struct Vector x1y1z1;  
7      x1y1z1.x = data[inicioPlano + 3];  
8      x1y1z1.y = data[inicioPlano + 4];  
9      x1y1z1.z = data[inicioPlano + 5];  
10     struct Vector x2y2z2;  
11     x2y2z2.x = data[inicioPlano + 6];  
12     x2y2z2.y = data[inicioPlano + 7];  
13     x2y2z2.z = data[inicioPlano + 8];
```

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```
1      struct Vector x3y3z3;  
2      x3y3z3.x = data[inicioPlano + 9];  
3      x3y3z3.y = data[inicioPlano + 10];  
4      x3y3z3.z = data[inicioPlano + 11];  
5      temp.points3D = malloc (sizeof (struct  
Point3D)* 3);  
6      for (int i = 0 ; i + 10 < quantityData - 12  
    ;)  
7          {  
8              if (vertexPolygonIndex == 3)  
9                  {  
10                     break;  
11                 }  
12                 vertex.x = data[10 + i];  
13                 i ++;
```


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```
1         vertex.y = data[10 + i];
2         i ++;
3         vertex.z = data[10 + i];
4         i ++;
5         temp.points3D[vertexPolygonIndex] =
vertex;
6         vertexPolygonIndex ++;
7     }
8     struct Object polygon;
9     vertexPolygonIndex = 0;
10    polygon = getABCD (temp);
11    if (debug == 1)
12    {
13        printf ("A del poligono %LF\n", polygon
.Xc);
```

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```
1         printf ("B del poligono %LF\n", polygon
2         .Yc);
3         printf ("C del poligono %LF\n", polygon
4         .Zc);
5         printf ("D del poligono %LF\n", polygon
6         .other);
7     }
8     polygon.points3D = malloc (sizeof (struct
9     Point3D)* numVertexesPolygon);
10    polygon.points2D = malloc (sizeof (struct
11    Point2D)* numVertexesPolygon);
12    struct Color colorPolygon;
13    colorPolygon.r = data[0];
14    colorPolygon.g = data[1];
15    colorPolygon.b = data[2];
16    polygon.color = colorPolygon;
17    polygon.o1 = data[3];
18    polygon.o2 = data[4];
```

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```
1      polygon.o3 = data[5];
2      polygon.Kd = data[6];
3      polygon.Ka = data[7];
4      polygon.Kn = data[8];
5      polygon.Ks = data[9];
6      polygon.pointAmount = numVertexesPolygon;
7      polygon.normalVector = polygonNormal;
8      polygon.intersectionFuncion =
polygonIntersection;
9      polygon.retrieveTextureColor = planeTexture
;
10     long double u;
11     long double v;
12     long double maxA_B = max (fabs (polygon.Xc)
, fabs (polygon.Yc));
13     long double maxA_B_C = max (maxA_B, fabs (
polygon.Zc));
```

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```
1      int choice = 0;
2      if (maxA_B_C == fabs (polygon.Xc))
3          {
4              choice = 0;
5          }
6      else if (maxA_B_C == fabs (polygon.Yc))
7          {
8              choice = 1;
9          }
10     else if (maxA_B_C == fabs (polygon.Zc))
11         {
12             choice = 2;
13         }
```

Código Pretty Print GNU

```
1      for (int i = 0 ; i + 10 < quantityData - 12
2      ;)
3          {
4              vertex.x = data[10 + i];
5              i ++;
6              vertex.y = data[10 + i];
7              i ++;
8              vertex.z = data[10 + i];
9              i ++;
10             if (debug == 1)
11                 {
12                     printf ("Vertice: (%LF,%LF,%LF) \n"
13                     , vertex.x, vertex.y, vertex.z);
14                 }
15             if (choice == 0)
16                 {
```

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```
1         u = vertex.z;  
2         v = vertex.y;  
3     }  
4     else if (choice == 1)  
5     {  
6         u = vertex.x;  
7         v = vertex.z;  
8     }  
9     else if (choice == 2)  
10    {  
11        u = vertex.x;  
12        v = vertex.y;  
13    }
```

Código Pretty Print GNU

```
1         squashedVertex.u = u;
2         squashedVertex.v = v;
3         polygon.points3D[vertexPolygonIndex] =
vertex;
4         polygon.points2D[vertexPolygonIndex] =
squashedVertex;
5         vertexPolygonIndex++;
6     }
7     vertex.x = data[10];
8     vertex.y = data[11];
9     vertex.z = data[12];
10    if (choice == 0)
11    {
12        u = vertex.z;
13        v = vertex.y;
```

Código Pretty Print GNU

```
1      }  
2      else if (choice == 1)  
3      {  
4          u = vertex.x;  
5          v = vertex.z;  
6      }  
7      else if (choice == 2)  
8      {  
9          u = vertex.x;  
10         v = vertex.y;  
11     }  
12     squashedVertex.u = u;  
13     squashedVertex.v = v;
```


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```
1      polygon.points3D[vertexPolygonIndex] =  
vertex;  
2      polygon.points2D[vertexPolygonIndex] =  
squashedVertex;  
3      polygon.planeCuts = planeCutsFound;  
4      polygon.numberPlaneCuts = numberPlaneCuts;  
5      polygon.textures = texturesFound;  
6      polygon.numberTextures = numberTextures;  
7      polygon.x0y0z0 = x0y0z0;  
8      polygon.x1y1z1 = x1y1z1;  
9      polygon.x2y2z2 = x2y2z2;  
10     polygon.x3y3z3 = x3y3z3;  
11     Objects[objectIndex] = polygon;  
12     if (debug == 1)  
13         {  
14
```

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```
1         printPlaneCuts (Objects[objectIndex]);
2         printTextures (Objects[objectIndex],
whichObjectCreate);
3     }
4     objectIndex ++;
5     return;
6 }
7 case 4:
8 {
9     if (debug == 1)
10    {
11        printf ("Insertando cilindro...");
12        printf ("Ancla: (%LF, %LF, %LF) \n",
data[0], data[1], data[2]);
13        printf ("Vector: (%LF, %LF, %LF) \n",
data[3], data[4], data[5]);
```

Código Pretty Print GNU

```
1         printf ("o1: %LF, o2: %LF, o3: %LF \n"  
2         , data[6], data[7], data[8]);  
3         printf ("Cilindro Radio: %LF \n", data  
4         [9]);  
5         printf ("Cilindro d1: %LF Cilindro d2:  
6         %LF \n", data[10], data[11]);  
7         printf ("Cilindro Kd: %LF \n", data  
8         [12]);  
9         printf ("Cilindro Ka: %LF \n", data  
10        [13]);  
11        printf ("Cilindro Kn: %LF \n", data  
12        [14]);  
13        printf ("Cilindro Ks: %LF \n", data  
14        [15]);  
15        printf ("RGB Cilindro: (%LF, %LF, %LF)  
16        \n", data[16], data[17], data[18]);  
17    }  
18    struct Object cylinder;  
19    cylinder.Xc = data[0];  
20    ...  
21    ...  
22    ...
```

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```
1      struct Vector cilindroVector;  
2      cilindroVector.x = data[3];  
3      cilindroVector.y = data[4];  
4      cilindroVector.z = data[5];  
5      cilindroVector = normalize (cilindroVector)  
;  
6      cilindro.directionVector = cilindroVector;  
7      cilindro.o1 = data[6];  
8      cilindro.o2 = data[7];  
9      cilindro.o3 = data[8];  
10     cilindro.other = data[9];  
11     cilindro.D1 = data[10];  
12     cilindro.D2 = data[11];  
13     cilindro.Kd = data[12];
```

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```
1      cilinder.Ka = data[13];
2      cilinder.Kn = data[14];
3      cilinder.Ks = data[15];
4      cilinder.height = cilinder.D2 - cilinder.D1
;
5      cilinder.normalVector = cilinderNormal;
6      cilinder.intersectionFuncion =
cilinderIntersection;
7      cilinder.retrieveTextureColor =
cilinderTexture;
8      struct Color cilinderColor;
9      cilinderColor.r = data[16];
10     cilinderColor.g = data[17];
11     cilinderColor.b = data[18];
12     cilinder.color = cilinderColor;
13     cilinder.planeCuts = planeCutsFound;
```

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```
1      cilinder.numberPlaneCuts = numberPlaneCuts;
2      cilinder.textures = texturesFound;
3      cilinder.numberTextures = numberTextures;
4      Objects[objectIndex] = cilinder;
5      if (debug == 1)
6      {
7          printPlaneCuts (Objects[objectIndex]);
8          printTextures (Objects[objectIndex],
whichObjectCreate);
9      }
10     objectIndex ++;
11     return;
12 }
13 case 5:
14 {
15
```

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```
1         if (debug == 1)
2             {
3                 printf ("Insertando cono...");
4                 printf ("Ancla: (%LF, %LF, %LF) \n",
data[0], data[1], data[2]);
5                 printf ("Vector: (%LF, %LF, %LF) \n",
data[3], data[4], data[5]);
6                 printf ("o1: %LF, o2: %LF, o3: %LF \n",
, data[6], data[7], data[8]);
7                 printf ("Cono k1: %LF COno k2: %LF \n",
data[9], data[10]);
8                 printf ("Cono d1: %LF COno d2: %LF \n",
data[11], data[12]);
9                 printf ("Cono Kd: %LF \n", data[13]);
10                printf ("Cono Ka: %LF \n", data[14]);
11                printf ("Cono Kn: %LF \n", data[15]);
12                printf ("Cono Ks: %LF \n", data[16]);
13                printf ("RGB Cono: (%LF, %LF, %LF) \n",
data[17], data[18], data[19]);
```

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```
1      }  
2      struct Object cone;  
3      cone.Xc = data[0];  
4      cone.Yc = data[1];  
5      cone.Zc = data[2];  
6      struct Vector coneVector;  
7      coneVector.x = data[3];  
8      coneVector.y = data[4];  
9      coneVector.z = data[5];  
10     coneVector = normalize (coneVector);  
11     cone.directionVector = coneVector;  
12     cone.o1 = data[6];  
13     cone.o2 = data[7];
```


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```
1      cone.o3 = data[8];
2      cone.K1 = data[9];
3      cone.K2 = data[10];
4      cone.D1 = data[11];
5      cone.D2 = data[12];
6      cone.height = cone.D2 - cone.D1;
7      cone.Kd = data[13];
8      cone.Ka = data[14];
9      cone.Kn = data[15];
10     cone.Ks = data[16];
11     cone.intersectionFuncion = coneIntersection
;
12     cone.retrieveTextureColor = coneTexture;
13     cone.normalVector = coneNormal;
```

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```
1      struct Color coneColor;  
2      coneColor.r = data[17];  
3      coneColor.g = data[18];  
4      coneColor.b = data[19];  
5      cone.color = coneColor;  
6      cone.planeCuts = planeCutsFound;  
7      cone.numberPlaneCuts = numberPlaneCuts;  
8      cone.textures = texturesFound;  
9      cone.numberTextures = numberTextures;  
10     Objects[objectIndex] = cone;  
11     if (debug == 1)  
12     {  
13         printPlaneCuts (Objects[objectIndex]);
```

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```
1         printTextures (Objects[objectIndex],  
whichObjectCreate);  
2     }  
3     objectIndex ++;  
4     return;  
5 }  
6 case 6:  
7 {  
8     if (debug == 1)  
9     {  
10         printf ("Insertando disco...");  
11         printf ("Punto Central: (%LF, %LF, %LF)  
\\n", data[0], data[1], data[2]);  
12         printf ("Normal: (%LF, %LF, %LF) \\n",  
data[3], data[4], data[5]);  
13         printf ("Color: (%LF, %LF, %LF) \\n",  
data[6], data[7], data[8]);
```

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```
1         printf ("Disco Radio: %LF \n", data[9])
;
2         printf ("o1: %LF, o2: %LF, o3: %LF \n"
, data[10], data[11], data[12]);
3         printf ("Disco Kd: %LF \n", data[13]);
4         printf ("Disco Ka: %LF \n", data[14]);
5         printf ("Disco Kn: %LF \n", data[15]);
6         printf ("Disco Ks: %LF \n", data[16]);
7         printf ("Esquina inferior izquierda (%
LF, %LF, %LF) \n", data[17], data[18], data[19]);
8         printf ("Esquina inferior derecha (%LF,
%LF, %LF) \n", data[20], data[21], data[22]);
9         printf ("Esquina superior derecha (%LF,
%LF, %LF) \n", data[23], data[24], data[25]);
10        printf ("Esquina superior izquierda (%
LF, %LF, %LF) \n", data[26], data[27], data[28]);
11    }
12    struct Object disco;
13    struct Vector x0y0z0;
```

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```
1      x0y0z0.x = data[17];
2      x0y0z0.y = data[18];
3      x0y0z0.z = data[19];
4      struct Vector x1y1z1;
5      x1y1z1.x = data[20];
6      x1y1z1.y = data[21];
7      x1y1z1.z = data[22];
8      struct Vector x2y2z2;
9      x2y2z2.x = data[23];
10     x2y2z2.y = data[24];
11     x2y2z2.z = data[25];
12     struct Vector x3y3z3;
13     x3y3z3.x = data[26];
```

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```
1      x3y3z3.y = data[27];
2      x3y3z3.z = data[28];
3      disco.x0y0z0 = x0y0z0;
4      disco.x1y1z1 = x1y1z1;
5      disco.x2y2z2 = x2y2z2;
6      disco.x3y3z3 = x3y3z3;
7      disco.Xc = data[0];
8      disco.Yc = data[1];
9      disco.Zc = data[2];
10     disco.intersectionFuncion =
discIntersection;
11     disco.normalVector = discNormal;
12     disco.retrieveTextureColor = planeTexture;
13     struct Vector puntoCentral;
```

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```
1      puntoCentral.x = data[0];
2      puntoCentral.y = data[1];
3      puntoCentral.z = data[2];
4      struct Vector normalNotNormalized;
5      normalNotNormalized.x = data[3];
6      normalNotNormalized.y = data[4];
7      normalNotNormalized.z = data[5];
8      struct Color colorDisco;
9      colorDisco.r = data[6];
10     colorDisco.g = data[7];
11     colorDisco.b = data[8];
12     disco.color = colorDisco;
13     long double dPlano = whatsTheDGeneral (
normalNotNormalized , puntoCentral);
```

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```
1      dPlano = dPlano / getNorm (
normalNotNormalized);
2      disco.extraD = dPlano;
3      normalNotNormalized = normalize (
normalNotNormalized);
4      disco.directionVector = normalNotNormalized
;

5      disco.other = data[9];
6      disco.o1 = data[10];
7      disco.o2 = data[11];
8      disco.o3 = data[12];
9      disco.Kd = data[13];
10     disco.Ka = data[14];
11     disco.Kn = data[15];
12     disco.Ks = data[16];
13     disco.planeCuts = planeCutsFound;
```


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```
1      disco.numberPlaneCuts = numberPlaneCuts;  
2      disco.textures = texturesFound;  
3      disco.numberTextures = numberTextures;  
4      Objects[objectIndex] = disco;  
5      if (debug == 1)  
6          {  
7          printPlaneCuts (Objects[objectIndex]);  
8          printTextures (Objects[objectIndex],  
whichObjectCreate);  
9          }  
10         objectIndex ++;  
11         return;  
12     }  
13     case 7:  
14     {  
15
```

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```
1         if (debug == 1)
2             {
3                 printf ("Insertando Elipses...");
4                 printf ("Foco 1: (%LF, %LF, %LF) \n",
5 data[0], data[1], data[2]);
6                 printf ("Foco 2: (%LF, %LF, %LF) \n",
7 data[3], data[4], data[5]);
8                 printf ("Normal no normalizada: (%LF, %
9 LF, %LF) \n", data[6], data[7], data[8]);
10                printf ("Color: (%LF, %LF, %LF) \n",
11 data[9], data[8], data[9]);
12                printf ("K del ellipse: %LF \n", data
13 [12]);
14                printf ("o1: %LF, o2: %LF, o3: %LF \n"
15 , data[13], data[14], data[15]);
16                printf ("Ellipse Kd: %LF \n", data[16]);
17                printf ("Ellipse Ka: %LF \n", data[17]);
18                printf ("Ellipse Kn: %LF \n", data[18]);
19                printf ("Ellipse Ks: %LF \n", data[19]);
```

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```
1      printf ("Esquina inferior izquierda (%  
LF, %LF, %LF) \n", data[20], data[21], data[22]);  
2      printf ("Esquina inferior derecha (%LF,  
%LF, %LF) \n", data[23], data[24], data[25]);  
3      printf ("Esquina superior derecha (%LF,  
%LF, %LF) \n", data[26], data[27], data[28]);  
4      printf ("Esquina superior izquierda (%  
LF, %LF, %LF) \n", data[29], data[30], data[31]);  
5      }  
6      struct Object ellipse;  
7      struct Vector x0y0z0;  
8      x0y0z0.x = data[20];  
9      x0y0z0.y = data[21];  
10     x0y0z0.z = data[22];  
11     struct Vector x1y1z1;  
12     x1y1z1.x = data[23];  
13     x1y1z1.y = data[24];
```

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```
1      x1y1z1.z = data[25];
2      struct Vector x2y2z2;
3      x2y2z2.x = data[26];
4      x2y2z2.y = data[27];
5      x2y2z2.z = data[28];
6      struct Vector x3y3z3;
7      x3y3z3.x = data[29];
8      x3y3z3.y = data[30];
9      x3y3z3.z = data[31];
10     ellipse.x0y0z0 = x0y0z0;
11     ellipse.x1y1z1 = x1y1z1;
12     ellipse.x2y2z2 = x2y2z2;
13     ellipse.x3y3z3 = x3y3z3;
```

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```
1      ellipse.intersectionFuncion =  
    ellipseIntersection;  
2      ellipse.normalVector = ellipseNormal;  
3      ellipse.retrieveTextureColor = planeTexture;  
4      struct Vector foco1;  
5      foco1.x = data[0];  
6      foco1.y = data[1];  
7      foco1.z = data[2];  
8      ellipse.Xc = data[0];  
9      ellipse.Yc = data[1];  
10     ellipse.Zc = data[2];  
11     ellipse.Xother = data[3];  
12     ellipse.Yother = data[4];  
13     ellipse.Zother = data[5];
```

Código Pretty Print GNU

```
1      struct Vector normalNotNormalized;  
2      normalNotNormalized.x = data[6];  
3      normalNotNormalized.y = data[7];  
4      normalNotNormalized.z = data[8];  
5      struct Color colorEllipse;  
6      colorEllipse.r = data[9];  
7      colorEllipse.g = data[10];  
8      colorEllipse.b = data[11];  
9      ellipse.color = colorEllipse;  
10     long double dPlano = whatsTheDGeneral (  
11         normalNotNormalized, foco1);  
12         dPlano = dPlano / getNorm (  
13         normalNotNormalized);  
14         ellipse.extraD = dPlano;  
15         normalNotNormalized = normalize (  
16         normalNotNormalized);
```

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```
1         ellipse.directionVector =
normalNotNormalized;
2         ellipse.other = data[12];
3         ellipse.o1 = data[13];
4         ellipse.o2 = data[14];
5         ellipse.o3 = data[15];
6         ellipse.Kd = data[16];
7         ellipse.Ka = data[17];
8         ellipse.Kn = data[18];
9         ellipse.Ks = data[19];
10        ellipse.planeCuts = planeCutsFound;
11        ellipse.numberPlaneCuts = numberPlaneCuts;
12        ellipse.textures = texturesFound;
13        ellipse.numberTextures = numberTextures;
```

Código Pretty Print GNU

```
1      Objects[objectIndex] = ellipse;  
2      if (debug == 1)  
3          {  
4              printPlaneCuts (Objects[objectIndex]);  
5              printTextures (Objects[objectIndex],  
whichObjectCreate);  
6          }  
7      objectIndex ++;  
8      return;  
9  }  
10 case 8:  
11     {  
12         if (debug == 1)  
13             {  
14
```


Código Pretty Print GNU

```
1         printf ("Insertando Cuadr tica ...");
2         printf ("Coeficientes: \n\t A: %LF \n\t
    B: %LF \n\t C: %LF\n\t D: %LF\n\t E: %LF \n\t F: %
    LF\n\t G: %LF \n\t H: %LF \n\t I: %LF \n", data
    [1], data[2], data[3], data[4], data[5], data[6],
    data[7], data[8], data[9]);
3         printf ("Constante K: %LF \n", data
    [10]);
4         printf ("o1: %LF, o2: %LF, o3: %LF \n"
    , data[11], data[12], data[13]);
5         printf ("Elipse Kd: %LF \n", data[14]);
6         printf ("Elipse Ka: %LF \n", data[15]);
7         printf ("Elipse Kn: %LF \n", data[16]);
8         printf ("Elipse Ks: %LF \n", data[17]);
9         printf ("Color: (%LF, %LF, %LF) \n",
    data[18], data[19], data[20]);
10        }
11        struct Object cuadratica;
12        cuadratica.A = data[0];
```

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```
1      cuadratica.C = data[2];  
2      cuadratica.D = data[3];  
3      cuadratica.E = data[4];  
4      cuadratica.F = data[5];  
5      cuadratica.G = data[6];  
6      cuadratica.H = data[7];  
7      cuadratica.I = data[8];  
8      cuadratica.J = data[9];  
9      cuadratica.other = data[10];  
10     cuadratica.o1 = data[11];  
11     cuadratica.o2 = data[12];  
12     cuadratica.o3 = data[13];  
13     cuadratica.Kd = data[14];
```

Código Pretty Print GNU

```
1      cuadratica.Ka = data[15];
2      cuadratica.Kn = data[16];
3      cuadratica.Ks = data[17];
4      struct Color colorCuadratica;
5      colorCuadratica.r = data[18];
6      colorCuadratica.g = data[19];
7      colorCuadratica.b = data[20];
8      cuadratica.color = colorCuadratica;
9      cuadratica.intersectionFuncion =
quadraticIntersection;
10     cuadratica.normalVector = quadraticNormal;
11     cuadratica.planeCuts = planeCutsFound;
12     cuadratica.numberPlaneCuts =
numberPlaneCuts;
13     cuadratica.textures = texturesFound;
```

Código Pretty Print GNU

```
1      cuadratica.numberTextures = numberTextures;  
2      Objects[objectIndex] = cuadratica;  
3      if (debug == 1)  
4          {  
5          printPlaneCuts (Objects[objectIndex]);  
6          printTextures (Objects[objectIndex],  
whichObjectCreate);  
7          printf ("sup");  
8          }  
9      objectIndex ++;  
10     return;  
11     }  
12     }  
13 }
```

Código Pretty Print GNU

```
1 long double obtainSingleValueFromLine (char line [])
2 {
3     char * token;
4     char * search = "=";
5     long double numericValue;
6     token = strtok (line , search);
7     token = strtok (NULL, search);
8     sscanf (token , "%LF" , &numericValue);
9     return numericValue;
10 }
11 long double * obtainPointFromString (char stringPoint
12     [])
13 {
14     char * token;
```

Código Pretty Print GNU

```
1  char * search = "=";  
2  long double numericValue;  
3  token = strtok (stringPoint, search);  
4  token = strtok (NULL, search);  
5  char * pch;  
6  long double * pointDimensions = malloc (sizeof (  
7  long double)* 3);  
8  int currentDimension = 0;  
9  pch = strtok (token, ",");  
10 while (pch != NULL)  
11     {  
12         sscanf (pch, "%LF", &pointDimensions[  
13             currentDimension]);  
14         pch = strtok (NULL, ",");  
15         currentDimension ++;
```

Código Pretty Print GNU

```
1      }  
2      return pointDimensions;  
3  }  
4  void strip (char * s)  
5  {  
6      char * p2 = s;  
7      while (* s != '\0')  
8      {  
9          if (* s != '\t' && * s != '\n')  
10             {  
11                 * p2 ++ = * s ++;  
12             }  
13             else  
14                 {  
15
```

Código Pretty Print GNU

```
1         ++ s;  
2     }  
3 }  
4 * p2 = '\0';  
5 }  
6 char * obtainFilenameTexture (char stringLine[])  
7 {  
8     char * token = malloc (sizeof (char)* 200);  
9     char * search = "=";  
10    token = strtok (stringLine , search);  
11    token = strtok (NULL, search);  
12    strip (token);  
13    return token;
```


Código Pretty Print GNU

```
1  }
2  struct PlaneCut * readPlaneCuts (long int pos, int *
   numberPlanes, long int * posAfterReading)
3  {
4      char temporalBuffer[300];
5      struct PlaneCut * planeCutsFound = NULL;
6      long double * datosPlanos;
7      int indexPlaneCut = - 1;
8      FILE * file;
9      if (file = fopen (escenaFile, "r"))
10         {
11             fseek (file, pos, SEEK_SET);
12             while (fgets (temporalBuffer, 300, file) != NULL
13                 )
14                 {
```

Código Pretty Print GNU

```
1      if (temporalBuffer[0] == '\n')
2          {
3              continue;
4          }
5      if (strstr (temporalBuffer, "#") != NULL)
6          {
7              continue;
8          }
9      if (strstr (temporalBuffer, "NumberPlanes")
10         != NULL)
11          {
12              long double numberPlanes =
13              obtainSingleValueFromLine (temporalBuffer);
14              planeCutsFound = malloc (sizeof (struct
15              PlaneCut)* numberPlanes);
16              continue;
```

Código Pretty Print GNU

```
1      }
2      else if (strstr (temporalBuffer, "Plano_")
!= NULL)
3      {
4          indexPlaneCut ++;
5          continue;
6      }
7      else if (strstr (temporalBuffer, "
END_Planos")!= NULL)
8      {
9          * numberPlanes = indexPlaneCut + 1;
10         * posAfterReading = ftell (file);
11         return planeCutsFound;
12     }
13     else if (strstr (temporalBuffer, "Punto")!=
NULL)
14     {
15
```

Código Pretty Print GNU

```
1         datosPlanos = obtainPointFromString (
temporalBuffer);
2         struct Vector temp;
3         temp.x = datosPlanos[0];
4         temp.y = datosPlanos[1];
5         temp.z = datosPlanos[2];
6         planeCutsFound[indexPlaneCut].point =
temp;
7         free (datosPlanos);
8         continue;
9     }
10    else if (strstr (temporalBuffer, "Normal")
!= NULL)
11        {
12            datosPlanos = obtainPointFromString (
temporalBuffer);
13            struct Vector temp;
```

Código Pretty Print GNU

```
1         temp.x = datosPlanos [0];
2         temp.y = datosPlanos [1];
3         temp.z = datosPlanos [2];
4         long double dEquation =
whatsTheDGeneral (temp, planeCutsFound [
indexPlaneCut]. point);
5         dEquation = dEquation / getNorm (temp);
6         temp = normalize (temp);
7         planeCutsFound [indexPlaneCut]. normal =
temp;
8         planeCutsFound [indexPlaneCut]. d =
dEquation;
9         free (datosPlanos);
10        continue;
11    }
12    continue;
13 }
```

Código Pretty Print GNU

```
1      }
2  }
3  struct Color * * getTexels (char * pFile , int * hRes ,
4      int * vRes)
5  {
6      int counter , x , y , i , j ;
7      char dump[100];
8      time_t t ;
9      struct Color * * temp ;
10     srand ((unsigned)time (&t));
11     FILE * file ;
12     if (file = fopen (pFile , "r"))
13     {
14         for (i = 0 ; i < 11 ; ++ i)
15         {
```

Código Pretty Print GNU

```
1 fscanf (file , "%s" , &dump[0]);  
2 if (i == 8 || i == 9)  
3 {  
4     if (i == 8)  
5     {  
6         sscanf (&dump[0] , "%i" , hRes);  
7     }  
8     else  
9     {  
10        sscanf (&dump[0] , "%i" , vRes);  
11    }  
12 }  
13 }
```

Código Pretty Print GNU

```
1      temp = malloc (sizeof (struct Color *)* (* hRes
2  ));
3      for (int r = 0 ; r < (* hRes); r ++)
4      {
5          temp[r] = malloc (sizeof (struct Color)* (*
6  vRes));
7      }
8      if (temp == NULL)
9      {
10         printf ("Devolvi NULL \n");
11     }
12     char temporalBuffer[2000];
13     int i = 0, x = 0, y = 0, counter = 0;
14     while (fgets (temporalBuffer, 200, file)!= NULL
15 )
16     {
```


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```
1      if (temporalBuffer[0] == '\\n')
2          {
3              continue;
4          }
5      struct Color texel;
6      long double number;
7      sscanf (temporalBuffer, "%LF", &number);
8      int xs = * hRes - x - 1;
9      if (i == 0)
10         {
11             temp[y][xs].r = (number)/ 255;
12         }
13     else if (i == 1)
14         {
15
```

Código Pretty Print GNU

```
1      temp[y][xs].g = (number)/ 255;
2      }
3      else if (i == 2)
4      {
5          temp[y][xs].b = (number)/ 255;
6      }
7      i = (i + 1)% 3;
8      if (i == 0)
9      {
10         y = (y + 1);
11         y = y % (* vRes);
12         if (y == 0)
13             {
14
```

Código Pretty Print GNU

```
1          x = (x + 1);  
2          x = x % (* hRes);  
3          if (x == 0)  
4              {  
5              break;  
6              }  
7          }  
8      }  
9      counter = 1;  
10     }  
11     y = 0;  
12     x = 0;  
13     while (counter != 5)  
14     {  
15
```

Código Pretty Print GNU

```
1         counter ++;  
2         y ++;  
3     }  
4 }  
5 else  
6 {  
7     (* vRes)= 128;  
8     (* hRes)= 128;  
9     temp = malloc (sizeof (struct Color *)* 128);  
10    for (int r = 0 ; r < (* hRes); r ++)  
11        {  
12            temp[r] = malloc (sizeof (struct Color)*  
13            128);  
14        }
```

Código Pretty Print GNU

```
1      if (temp == NULL)
2          {
3              printf (" Devolvi  NULL \n");
4          }
5      printf ("La textura de %s no pudo abrirse. Se
6      substituir por est tica\n", pFile);
7      for (x = 0 ; x < 128 ; x ++)
8          {
9              for (y = 0 ; y < 128 ; y ++)
10                 {
11                     struct Color estatica;
12                     estatica.r = ((long double) (rand ()%
13                     255))/ 255;
14                     estatica.g = ((long double) (rand ()%
15                     255))/ 255;
16                     estatica.b = ((long double) (rand ()%
17                     255))/ 255;
```

Código Pretty Print GNU

```
1         temp[x][y] = estatica;
2     }
3 }
4 }
5     return temp;
6 }
7 struct Texture * readTextures (int currentTypeReading,
8     long int pos, int * numberTextures, long int *
9     posAfterReading)
10 {
11     char temporalBuffer[300];
12     struct Texture * texturesFound = NULL;
13     long double * datosTexture;
14     int indexTexture = - 1;
15     FILE * file;
```

Código Pretty Print GNU

```
1  if (file = fopen (escenaFile , "r"))
2      {
3          fseek (file , pos , SEEK_SET);
4          while (fgets (temporalBuffer , 300 , file) != NULL
5              )
6              {
7                  if (temporalBuffer[0] == '\n')
8                      {
9                          continue;
10                     }
11                 if (temporalBuffer[0] == '\t')
12                     {
13                         continue;
14                     }
```

Código Pretty Print GNU

```
1         if (strstr (temporalBuffer, "#")!= NULL)
2             {
3                 continue;
4             }
5         if (strstr (temporalBuffer, "NumberTextures
6         ")!= NULL || strstr (temporalBuffer, "
7         NumberTexturas")!= NULL)
8             {
9                 long double numberTextures =
10                obtainSingleValueFromLine (temporalBuffer);
11                texturesFound = malloc (sizeof (struct
12                Texture)* numberTextures);
13                continue;
14            }
15        else if (strstr (temporalBuffer, "Texture_"
16        )!= NULL || strstr (temporalBuffer, "Textura_"!=
17        NULL)
18            {
19                indexTexture ++;
```


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```
1         continue;
2     }
3     else if (strstr (temporalBuffer, "
END_Textures")!= NULL || strstr (temporalBuffer, "
END_Texturas")!= NULL)
4     {
5         * numberTextures = indexTexture + 1;
6         * posAfterReading = ftell (file);
7         return texturesFound;
8     }
9     else if (strstr (temporalBuffer, "Filename"
)!= NULL || strstr (temporalBuffer, "filename")!=
NULL)
10    {
11        char * filename = obtainFilenameTexture
(temporalBuffer);
12        int hRes, vRes;
13        texturesFound[indexTexture].filename =
filename;
```

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```
1      struct Color * * textureMap = getTexels
    (texturesFound[indexTexture].filename, &hRes, &
    vRes);
2      texturesFound[indexTexture].textureMap
= textureMap;
3      texturesFound[indexTexture].hRes = hRes
;
4      texturesFound[indexTexture].vRes = vRes
;
5      continue;
6  }
7  if (currentTypeReading == 2 ||
currentTypeReading == 4 || currentTypeReading == 5
|| currentTypeReading == 8)
8  {
9      if (strstr (temporalBuffer, "Greenwich"
)!= NULL)
10     {
11         datosTexture =
```

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```
1      temp.y = datosTexture[1];
2      temp.z = datosTexture[2];
3      temp = normalize (temp);
4      texturesFound[indexTexture].
greenwich = temp;
5      free (datosTexture);
6      continue;
7  }
8      if (currentTypeReading == 2 ||
currentTypeReading == 8)
9      {
10         if (strstr (temporalBuffer, "Norte"
)!= NULL || strstr (temporalBuffer, "North")!= NULL
)
11         {
12             datosTexture =
obtainPointFromString (temporalBuffer);
13             struct Vector temp;
```

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```
1      temp.x = datosTexture[0];
2      temp.y = datosTexture[1];
3      temp.z = datosTexture[2];
4      temp = normalize (temp);
5      texturesFound[indexTexture].
    north = temp;
6      free (datosTexture);
7      continue;
8      }
9      }
10     }
11     continue;
12     }
13     }
```

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```
1  }
2  struct DraftPlane * readDraftPlanes (int
    currentTypeReading, long int pos, int *
    numberDraftPlanes, long int * posAfterReading)
3  {
4      char temporalBuffer[300];
5      struct DraftPlane * draftPlanesFound = NULL;
6      long double * datosDraftPlane;
7      int indexDraftPlane = - 1;
8      FILE * file;
9      if (file = fopen (escenaFile, "r"))
10     {
11         fseek (file, pos, SEEK_SET);
12         while (fgets (temporalBuffer, 300, file) != NULL
13             )
14             {
```

Código Pretty Print GNU

```
1      if (temporalBuffer[0] == '\n')
2          {
3              continue;
4          }
5      if (temporalBuffer[0] == '\t')
6          {
7              continue;
8          }
9      if (strstr (temporalBuffer, "#") != NULL)
10         {
11             continue;
12         }
13      if (strstr (temporalBuffer, "
NumberPlanosCalado") != NULL || strstr (
NumberDraftPlanes") != NULL)
14         {
15
```

Código Pretty Print GNU

```
1         long double numberDraftPlanes =
  obtainSingleValueFromLine (temporalBuffer);
2         draftPlanesFound = malloc (sizeof (
  struct DraftPlane)* numberDraftPlanes);
3         continue;
4     }
5     else if (strstr (temporalBuffer, "
  Plano_Calado_")!= NULL || strstr (temporalBuffer, "
  PlanoCalado_")!= NULL)
6     {
7         indexDraftPlane ++;
8         continue;
9     }
10    else if ((strstr (temporalBuffer, "
  END_Planos_Calado")!= NULL) || (strstr (
  temporalBuffer, "END_PlanosCalado")!= NULL) || (
  strstr (temporalBuffer, "END_DraftPlanes")!= NULL)
  || (strstr (temporalBuffer, "END_Draft_Planes")!=
  NULL))
```

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```
1         return draftPlanesFound;
2     }
3     else if (strstr (temporalBuffer, "Filename"
4 )!= NULL || strstr (temporalBuffer, "filename")!=
5 NULL)
6     {
7         char * filename = obtainFilenameTexture
8 (temporalBuffer);
9         int hRes, vRes;
10        draftPlanesFound[indexDraftPlane].
11 filename = filename;
12        struct Color * * textureMap = getTexels
13 (draftPlanesFound[indexDraftPlane].filename, &hRes
14 , &vRes);
15        draftPlanesFound[indexDraftPlane].
16 textureMap = textureMap;
17        draftPlanesFound[indexDraftPlane].hRes
18 = hRes;
19        draftPlanesFound[indexDraftPlane].vRes
```


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```
1      if (currentTypeReading == 2 ||
currentTypeReading == 4 || currentTypeReading == 5
|| currentTypeReading == 8)
2          {
3              if (strstr (temporalBuffer, "Greenwich"
)!= NULL)
4                  {
5                      datosDraftPlane =
obtainPointFromString (temporalBuffer);
6                      struct Vector temp;
7                      temp.x = datosDraftPlane[0];
8                      temp.y = datosDraftPlane[1];
9                      temp.z = datosDraftPlane[2];
10                     temp = normalize (temp);
11                     draftPlanesFound[indexDraftPlane].
greenwich = temp;
12                     free (datosDraftPlane);
13                     continue;
```

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```
1         }
2         if (currentTypeReading == 2 ||
currentTypeReading == 8)
3         {
4             if (strstr (temporalBuffer, "Norte"
)!= NULL || strstr (temporalBuffer, "North")!= NULL
5             )
6             {
7                 datosDraftPlane =
obtainPointFromString (temporalBuffer);
8                 struct Vector temp;
9                 temp.x = datosDraftPlane[0];
10                temp.y = datosDraftPlane[1];
11                temp.z = datosDraftPlane[2];
12                temp = normalize (temp);
13                draftPlanesFound[
indexDraftPlane].north = temp;
                free (datosDraftPlane);
```

Código Pretty Print GNU

```
1         continue;
2     }
3 }
4 }
5     continue;
6 }
7 }
8 }
9 long double * readValueFromLine (int state, int *
    counterValueSegment, char * lineRead, int *
    numberValuesRead)
10 {
11     long double * values;
12     switch (state)
13     {
14
```

Código Pretty Print GNU

```
1      case 0:
2          if ((* counterValueSegment)>= 0 && (*
counterValueSegment)<= 10)
3              {
4                  values = malloc (sizeof (long double));
5                  values[0] = obtainSingleValueFromLine (
lineRead);
6                  (* counterValueSegment)++;
7                  * numberValuesRead = 1;
8                  return values;
9              }
10         else if ((* counterValueSegment)>= 11 && (*
counterValueSegment)<= 12)
11             {
12                 long double * point =
obtainPointFromString (lineRead);
13                 values = malloc (sizeof (long double)*
3);
```

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```
1      values[0] = point[0];
2      values[1] = point[1];
3      values[2] = point[2];
4      * numberValuesRead = 3;
5      free (point);
6      if ((* counterValueSegment)== 12)
7          {
8              (* counterValueSegment)= 0;
9          }
10     else
11     {
12         (* counterValueSegment)++;
13     }
```

Código Pretty Print GNU

```
1         return values;
2     }
3     case 1:
4         if ((* counterValueSegment)== 0)
5         {
6             long double * positionLight =
obtainPointFromString (lineRead);
7             values = malloc (sizeof (long double)*
3);
8             values[0] = positionLight[0];
9             values[1] = positionLight[1];
10            values[2] = positionLight[2];
11            (* counterValueSegment)++;
12            * numberValuesRead = 3;
13            free (positionLight);
```

Código Pretty Print GNU

```
1         return values;
2     }
3     else if ((* counterValueSegment)>= 1 && (*
counterValueSegment <= 4))
4     {
5         values = malloc (sizeof (long double));
6         values[0] = obtainSingleValueFromLine (
lineRead);
7         if ((* counterValueSegment)== 4)
8         {
9             (* counterValueSegment)= 0;
10        }
11        else
12        {
13            (* counterValueSegment)++;
```

Código Pretty Print GNU

```
1         }
2         * numberValuesRead = 1;
3         return values;
4     }
5     case 2:
6         if ((* counterValueSegment)== 0 || (*
counterValueSegment)== 9)
7         {
8             long double * positionSphere =
obtainPointFromString (lineRead);
9             values = malloc (sizeof (long double)*
3);
10             values[0] = positionSphere[0];
11             values[1] = positionSphere[1];
12             values[2] = positionSphere[2];
13             free (positionSphere);
```


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```
1      * numberValuesRead = 3;
2      if ((* counterValueSegment)== 9)
3      {
4          (* counterValueSegment)= 0;
5      }
6      else
7      {
8          (* counterValueSegment)++;
9      }
10     return values;
11 }
12 else if ((* counterValueSegment)>= 1 && (*
counterValueSegment)<= 8)
13 {
14
```

Código Pretty Print GNU

```
1         values = malloc (sizeof (long double));
2         values[0] = obtainSingleValueFromLine (
lineRead);
3         (* counterValueSegment)++;
4         * numberValuesRead = 1;
5         return values;
6     }
7     case 3:
8         if ((* counterValueSegment)== 0)
9         {
10             values = malloc (sizeof (long double)*
3);
11             long double * rgbColors =
obtainPointFromString (lineRead);
12             values[0] = rgbColors[0];
13             values[1] = rgbColors[1];
```

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```
1         values[2] = rgbColors[2];
2         free (rgbColors);
3         * numberValuesRead = 3;
4         (* counterValueSegment)++;
5         return values;
6     }
7     else if ((* counterValueSegment)>= 1 && (*
counterValueSegment)<= 7)
8     {
9         values = malloc (sizeof (long double));
10        values[0] = obtainSingleValueFromLine (
lineRead);
11        (* counterValueSegment)++;
12        * numberValuesRead = 1;
13        return values;
```

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```
1      }
2      else if ((* counterValueSegment)== 8)
3      {
4          if (strstr (lineRead , "END_Vertices")!=
NULL)
5          {
6              (* counterValueSegment)++;
7              return values;
8          }
9          else
10         {
11             values = malloc (sizeof (long
double)* 3);
12             long double * vertexPolygon =
obtainPointFromString (lineRead);
13             values[0] = vertexPolygon[0];
```

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```
1      values[1] = vertexPolygon[1];
2      values[2] = vertexPolygon[2];
3      free (vertexPolygon);
4      * numberValuesRead = 3;
5      if ((* counterValueSegment)== 12)
6      {
7          (* counterValueSegment)= 0;
8          return values;
9      }
10     if ((* counterValueSegment)!= 8)
11     {
12         (* counterValueSegment)++;
13     }
```

Código Pretty Print GNU

```
1         return values;
2     }
3 }
4 else if ((* counterValueSegment)>= 9)
5 {
6     values = malloc (sizeof (long double)*
7 3);
8     long double * vertexPolygon =
9 obtainPointFromString (lineRead);
10    values[0] = vertexPolygon[0];
11    values[1] = vertexPolygon[1];
12    values[2] = vertexPolygon[2];
13    free (vertexPolygon);
14    * numberValuesRead = 3;
15    if ((* counterValueSegment)== 12)
16    {
```

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```
1          (* counterValueSegment)= 0;
2          return values;
3      }
4      (* counterValueSegment)++;
5      return values;
6  }
7  case 4:
8      if (* counterValueSegment == 0 || *
counterValueSegment == 1 || * counterValueSegment
== 12)
9      {
10         long double * positionCilinder =
obtainPointFromString (lineRead);
11         values = malloc (sizeof (long double)*
12         3);
13         values[0] = positionCilinder[0];
values[1] = positionCilinder[1];
```

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```
1      values[2] = positionCilinder[2];
2      if (* counterValueSegment == 12)
3      {
4          (* counterValueSegment)= 0;
5      }
6      else
7      {
8          (* counterValueSegment)++;
9      }
10     * numberValuesRead = 3;
11     free (positionCilinder);
12     return values;
13 }
```


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```
1         else if (* counterValueSegment >= 2 && *
counterValueSegment <= 11)
2             {
3                 values = malloc (sizeof (long double));
4                 values[0] = obtainSingleValueFromLine (
lineRead);
5                 (* counterValueSegment)++;
6                 * numberValuesRead = 1;
7                 return values;
8             }
9         case 5:
10            if (* counterValueSegment == 0 || *
counterValueSegment == 1 || * counterValueSegment
== 13)
11                {
12                    long double * positionCone =
obtainPointFromString (lineRead);
13                    values = malloc (sizeof (long double)*
3);
```

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```
1      values[0] = positionCone[0];
2      values[1] = positionCone[1];
3      values[2] = positionCone[2];
4      if (* counterValueSegment == 13)
5      {
6          (* counterValueSegment)= 0;
7      }
8      else
9      {
10         (* counterValueSegment)++;
11     }
12     * numberValuesRead = 3;
13     free (positionCone);
```

Código Pretty Print GNU

```
1         return values;
2     }
3     else if (* counterValueSegment >= 2 && *
counterValueSegment <= 12)
4     {
5         values = malloc (sizeof (long double));
6         values[0] = obtainSingleValueFromLine (
lineRead);
7         (* counterValueSegment)++;
8         * numberValuesRead = 1;
9         return values;
10    }
11    case 6:
12        if ((* counterValueSegment >= 0 && *
counterValueSegment <= 2) || (* counterValueSegment
>= 11 && * counterValueSegment <= 14))
13        {
14
```

Código Pretty Print GNU

```
1      long double * tripleta =  
    obtainPointFromString (lineRead);  
2      values = malloc (sizeof (long double)*  
3);  
3      values[0] = tripleta[0];  
4      values[1] = tripleta[1];  
5      values[2] = tripleta[2];  
6      if (* counterValueSegment == 14)  
7      {  
8          (* counterValueSegment)= 0;  
9      }  
10     else  
11     {  
12         (* counterValueSegment)++;  
13     }
```

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```
1      * numberValuesRead = 3;
2      free (tripleta);
3      return values;
4  }
5      else if ((* counterValueSegment >= 3 && *
counterValueSegment <= 10))
6      {
7          values = malloc (sizeof (long double));
8          values[0] = obtainSingleValueFromLine (
lineRead);
9          (* counterValueSegment)++;
10         * numberValuesRead = 1;
11         return values;
12     }
13     case 7:
```

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```
1      if ((* counterValueSegment >= 0 && *  
2      counterValueSegment <= 3)|| (* counterValueSegment  
3      >= 12 && * counterValueSegment <= 15))  
4      {  
5          long double * tripleta =  
6          obtainPointFromString (lineRead);  
7          values = malloc (sizeof (long double)*  
8          3);  
9          values[0] = tripleta[0];  
10         values[1] = tripleta[1];  
11         values[2] = tripleta[2];  
12         if (* counterValueSegment == 15)  
13         {  
14             (* counterValueSegment)= 0;  
15         }  
16     }  
17     else  
18     {
```

Código Pretty Print GNU

```
1         (* counterValueSegment)++;
2     }
3     * numberValuesRead = 3;
4     free (tripleta);
5     return values;
6 }
7     else if ((* counterValueSegment >= 4 && *
counterValueSegment <= 11))
8     {
9         values = malloc (sizeof (long double));
10        values[0] = obtainSingleValueFromLine (
lineRead);
11        (* counterValueSegment)++;
12        * numberValuesRead = 1;
13        return values;
```

Código Pretty Print GNU

```
1      }  
2      case 8:  
3          if ((* counterValueSegment)== 18)  
4              {  
5                  long double * tripleta =  
obtainPointFromString (lineRead);  
6                  values = malloc (sizeof (long double)*  
3);  
7                  values[0] = tripleta[0];  
8                  values[1] = tripleta[1];  
9                  values[2] = tripleta[2];  
10                 (* counterValueSegment)= 0;  
11                 * numberValuesRead = 3;  
12                 free (tripleta);  
13                 return values;
```


Código Pretty Print GNU

```
1      }
2      else if ((* counterValueSegment >= 0 && *
counterValueSegment <= 17))
3      {
4          values = malloc (sizeof (long double));
5          values[0] = obtainSingleValueFromLine (
lineRead);
6          (* counterValueSegment)++;
7          * numberValuesRead = 1;
8          return values;
9      }
10     }
11 }
12 int plainCutsFound (long int pos)
13 {
14
```

Código Pretty Print GNU

```
1  char temporalBuffer[300];
2  FILE * file;
3  if (file = fopen (escenaFile , "r"))
4      {
5          fseek (file , pos , SEEK_SET);
6          while (fgets (temporalBuffer , 300 , file) != NULL
7              )
8              {
9                  if (temporalBuffer[0] == '\n')
10                     {
11                         continue;
12                     }
13                 if (temporalBuffer[0] == '\t')
14                     {
```

Código Pretty Print GNU

```
1         continue;
2     }
3     if (strstr (temporalBuffer, "#")!= NULL)
4     {
5         continue;
6     }
7     else if (strstr (temporalBuffer, "
Planos_Corte:")!= NULL)
8     {
9         return 1;
10    }
11    else if (strstr (temporalBuffer, "Texturas:
")!= NULL)
12    {
13        return 0;
```

Código Pretty Print GNU

```
1      }
2      else if (strstr (temporalBuffer, "
Planos_Calado:")!= NULL)
3      {
4          return 0;
5      }
6      else if (strstr (temporalBuffer, "
Sphere_Object")!= NULL)
7      {
8          return 0;
9      }
10     else if (strstr (temporalBuffer, "
Polygon_Object")!= NULL)
11     {
12         return 0;
13     }
```

Código Pretty Print GNU

```
1         else if (strstr (temporalBuffer , "  
Cylinder_Object")!= NULL)  
2             {  
3                 return 0;  
4             }  
5         else if (strstr (temporalBuffer , "  
Cone_Object")!= NULL)  
6             {  
7                 return 0;  
8             }  
9         else if (strstr (temporalBuffer , "  
Disc_Object")!= NULL)  
10            {  
11                return 0;  
12            }  
13        else if (strstr (temporalBuffer , "  
Ellipse_Object")!= NULL)  
14            {  
15
```

Código Pretty Print GNU

```
1         return 0;
2     }
3     else if (strstr (temporalBuffer, "
Quadratic_Object")!= NULL)
4     {
5         return 0;
6     }
7     else if (strstr (temporalBuffer, "
Scene_Data")!= NULL)
8     {
9         return 0;
10    }
11    else if (strstr (temporalBuffer, "
Light_Object")!= NULL)
12    {
13        return 0;
```

Código Pretty Print GNU

```
1         }
2     }
3 }
4 return 0;
5 }
6 int texturesFound (long int pos)
7 {
8     char temporalBuffer[300];
9     FILE * file ;
10    if ( file = fopen (escenaFile , "r"))
11    {
12        fseek (file , pos , SEEK_SET);
13        while (fgets (temporalBuffer , 300 , file) != NULL
14    )
15        {
```

Código Pretty Print GNU

```
1      if (temporalBuffer[0] == '\n')
2          {
3              continue;
4          }
5      if (temporalBuffer[0] == '\t')
6          {
7              continue;
8          }
9      if (strstr (temporalBuffer, "#") != NULL)
10         {
11             continue;
12         }
13     else if (strstr (temporalBuffer, "Texturas:
14 ") != NULL || strstr (temporalBuffer, "Textures:") !=
15 NULL)
16     {
```


Código Pretty Print GNU

```
1         return 1;
2     }
3     else if (strstr (temporalBuffer, "
Planos_Calado:")!= NULL)
4     {
5         return 0;
6     }
7     else if (strstr (temporalBuffer, "
Sphere_Object")!= NULL)
8     {
9         return 0;
10    }
11    else if (strstr (temporalBuffer, "
Polygon_Object")!= NULL)
12    {
13        return 0;
```

Código Pretty Print GNU

```
1      }
2      else if (strstr (temporalBuffer, "
Cylinder_Object")!= NULL)
3      {
4          return 0;
5      }
6      else if (strstr (temporalBuffer, "
Cone_Object")!= NULL)
7      {
8          return 0;
9      }
10     else if (strstr (temporalBuffer, "
Disc_Object")!= NULL)
11     {
12         return 0;
13     }
```

Código Pretty Print GNU

```
1         else if (strstr (temporalBuffer, "  
Ellipse_Object")!= NULL)  
2             {  
3                 return 0;  
4             }  
5         else if (strstr (temporalBuffer, "  
Quadratic_Object")!= NULL)  
6             {  
7                 return 0;  
8             }  
9         else if (strstr (temporalBuffer, "  
Scene_Data")!= NULL)  
10            {  
11                return 0;  
12            }  
13        else if (strstr (temporalBuffer, "  
Light_Object")!= NULL)  
14            {  
15
```

Código Pretty Print GNU

```
1         return 0;
2     }
3 }
4 }
5 return 0;
6 }
7 int draftPlanesFound (long int pos)
8 {
9     char temporalBuffer[300];
10    FILE * file;
11    if (file = fopen (escenaFile , "r"))
12    {
13        fseek (file , pos , SEEK_SET);
```

Código Pretty Print GNU

```
1      while (fgets (temporalBuffer, 300, file) != NULL
2      )
3      {
4          if (temporalBuffer[0] == '\n')
5              {
6                  continue;
7              }
8          if (temporalBuffer[0] == '\t')
9              {
10                 continue;
11             }
12         if (strstr (temporalBuffer, "#") != NULL)
13             {
14                 continue;
15             }
16     }
```

Código Pretty Print GNU

```
1      }
2      else if ((strstr (temporalBuffer, "
Planos_Calado:")!= NULL)|| (strstr (temporalBuffer,
" PlanosCalado:")!= NULL)|| (strstr (temporalBuffer
, " DraftPlanes:")!= NULL)|| (strstr (temporalBuffer
, " Draft_Planes")!= NULL))
3      {
4          return 1;
5      }
6      else if (strstr (temporalBuffer, "
Sphere_Object")!= NULL)
7      {
8          return 0;
9      }
10     else if (strstr (temporalBuffer, "
Polygon_Object")!= NULL)
11     {
12         return 0;
13     }
```

Código Pretty Print GNU

```
1         else if (strstr (temporalBuffer , "  
Cylinder_Object")!= NULL)  
2             {  
3                 return 0;  
4             }  
5         else if (strstr (temporalBuffer , "  
Cone_Object")!= NULL)  
6             {  
7                 return 0;  
8             }  
9         else if (strstr (temporalBuffer , "  
Disc_Object")!= NULL)  
10            {  
11                return 0;  
12            }  
13        else if (strstr (temporalBuffer , "  
Ellipse_Object")!= NULL)  
14            {  
15
```

Código Pretty Print GNU

```
1         return 0;
2     }
3     else if (strstr (temporalBuffer, "
Quadratic_Object")!= NULL)
4     {
5         return 0;
6     }
7     else if (strstr (temporalBuffer, "
Scene_Data")!= NULL)
8     {
9         return 0;
10    }
11    else if (strstr (temporalBuffer, "
Light_Object")!= NULL)
12    {
13        return 0;
```


Código Pretty Print GNU

```
1         }  
2     }  
3 }  
4     return 0;  
5 }  
6 void getSceneObjects ()  
7 {  
8     int i, j, c;  
9     int state = 0;  
10    int counterValueSegment = 0;  
11    char temporalBuffer[300];  
12    long double * valuesRead;  
13    int indexValuesRead = 0;
```

Código Pretty Print GNU

```
1  int currentTypeObjectReading = 1;
2  struct PlaneCut * arrayPlaneCuts = NULL;
3  struct Texture * arrayTextures = NULL;
4  struct DraftPlane * arrayDraftPlanes = NULL;
5  FILE * file;
6  if (file = fopen (escenaFile , "r"))
7      {
8          while (fgets (temporalBuffer , 300, file)!= NULL
9              )
10             {
11                 if (temporalBuffer[0] == '\n')
12                     {
13                         continue;
14                     }
15             }
```

Código Pretty Print GNU

```
1      if (temporalBuffer[0] == '\\t')
2          {
3              continue;
4          }
5      if (strstr (temporalBuffer, "#")!= NULL)
6          {
7              continue;
8          }
9      if (strstr (temporalBuffer, "Scene_Data")!=
NULL)
10         {
11             state = 0;
12             counterValueSegment = 0;
13             indexValuesRead = 0;
```

Código Pretty Print GNU

```
1         valuesRead = NULL;
2         valuesRead = malloc (sizeof (long
double)* 22);
3         currentTypeObjectReading = 0;
4         continue;
5     }
6     else if (strstr (temporalBuffer, "
Light_Object") != NULL)
7     {
8         state = 1;
9         counterValueSegment = 0;
10        indexValuesRead = 0;
11        free (valuesRead);
12        valuesRead = malloc (sizeof (long
double)* 7);
13        currentTypeObjectReading = 1;
```

Código Pretty Print GNU

```
1         continue;
2     }
3     else if (strstr (temporalBuffer, "
Sphere_Object")!= NULL)
4     {
5         state = 2;
6         indexValuesRead = 0;
7         free (valuesRead);
8         valuesRead = malloc (sizeof (long
double)* 22);
9         counterValueSegment = 0;
10        currentTypeObjectReading = 2;
11        continue;
12    }
13    else if (strstr (temporalBuffer, "
Polygon_Object")!= NULL)
14    {
15
```

Código Pretty Print GNU

```
1         state = 3;
2         counterValueSegment = 0;
3         indexValuesRead = 0;
4         free (valuesRead);
5         valuesRead = malloc (sizeof (long
double)* 2000000);
6         currentTypeObjectReading = 3;
7         continue;
8     }
9     else if (strstr (temporalBuffer, "
Cylinder_Object") != NULL)
10    {
11        state = 4;
12        counterValueSegment = 0;
13        indexValuesRead = 0;
```

Código Pretty Print GNU

```
1         free (valuesRead);
2         valuesRead = malloc (sizeof (long
double)* 55);
3         currentTypeObjectReading = 4;
4         continue;
5     }
6     else if (strstr (temporalBuffer, "
Cone_Object")!= NULL)
7     {
8         state = 5;
9         counterValueSegment = 0;
10        indexValuesRead = 0;
11        free (valuesRead);
12        valuesRead = malloc (sizeof (long
double)* 55);
13        currentTypeObjectReading = 5;
```

Código Pretty Print GNU

```
1         continue;
2     }
3     else if (strstr (temporalBuffer, "
Disc_Object") != NULL)
4     {
5         state = 6;
6         counterValueSegment = 0;
7         indexValuesRead = 0;
8         free (valuesRead);
9         valuesRead = malloc (sizeof (long
double)* 55);
10        currentTypeObjectReading = 6;
11        continue;
12    }
13    else if (strstr (temporalBuffer, "
Ellipse_Object") != NULL)
14    {
15
```


Código Pretty Print GNU

```
1      state = 7;
2      counterValueSegment = 0;
3      indexValuesRead = 0;
4      free (valuesRead);
5      valuesRead = malloc (sizeof (long
double)* 55);
6      currentTypeObjectReading = 7;
7      continue;
8  }
9      else if (strstr (temporalBuffer, "
Quadratic_Object") != NULL)
10     {
11         state = 8;
12         counterValueSegment = 0;
13         indexValuesRead = 0;
```

Código Pretty Print GNU

```
1         free (valuesRead);
2         valuesRead = malloc (sizeof (long
double)* 55);
3         currentTypeObjectReading = 8;
4         continue;
5     }
6     int numberValuesRead = 0;
7     long double * valuesReadTemp =
readValueFromLine (state , &counterValueSegment ,
temporalBuffer , &numberValuesRead);
8     if (valuesReadTemp == NULL)
9     {
10         continue;
11     }
12     int i = 0;
13     for (i = 0 ; i < numberValuesRead ; i ++)
14     {
15
```

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```
1         valuesRead[indexValuesRead + i] =  
valuesReadTemp[i];  
2     }  
3     indexValuesRead += numberValuesRead;  
4     if (counterValueSegment == 0)  
5     {  
6         int numberPlaneCuts = 0;  
7         int numberTextures = 0;  
8         int numberDraftPlanes = 0;  
9         long int posAfterReading;  
10        long int pos;  
11        pos = ftell (file);  
12        int areTherePlainCuts = plainCutsFound  
(pos);  
13        if (areTherePlainCuts == 1)  
14        {  
15
```

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```
1         pos = ftell ( file );
2         arrayPlaneCuts = readPlaneCuts ( pos
, &numberPlaneCuts , &posAfterReading );
3         fseek ( file , posAfterReading ,
SEEK_SET );
4     }
5     pos = ftell ( file );
6     int areThereTextures = texturesFound (
pos );
7     if ( areThereTextures == 1 )
8     {
9         pos = ftell ( file );
10        arrayTextures = readTextures (
currentTypeObjectReading , pos , &numberTextures , &
posAfterReading );
11        fseek ( file , posAfterReading ,
SEEK_SET );
12    }
13    int areThereDraftPlanes =
```

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```
1         if (areThereDraftPlanes == 1)
2             {
3                 pos = ftell (file);
4                 arrayDraftPlanes = readDraftPlanes
5 (currentTypeObjectReading, pos, &numberDraftPlanes,
6   &posAfterReading);
7                 fseek (file, posAfterReading,
8   SEEK_SET);
9             }
10            createObjectFromData (valuesRead,
11   currentTypeObjectReading, indexValuesRead,
12   arrayPlaneCuts, arrayTextures, arrayDraftPlanes,
13   numberPlaneCuts, numberTextures, numberDraftPlanes)
14            ;
15        }
16    }
17    free (valuesRead);
18 }
19 fclose (file);
```

Código Pretty Print GNU

```
1 void howManyObjectsLights ()
2 {
3     char temporalBuffer[100];
4     FILE * file ;
5     if ( file = fopen (escenaFile , "r"))
6     {
7         while (fgets (temporalBuffer , 100, file)!= NULL
8             )
9             {
10                if (temporalBuffer[0] == '\n')
11                    {
12                        continue;
13                    }
14                if (strstr (temporalBuffer , "#")!= NULL)
15                    {
```

Código Pretty Print GNU

```
1         continue;
2     }
3     if (strstr (temporalBuffer, "Light_Object")
4 != NULL)
5     {
6         numberLights ++;
7         continue;
8     }
9     else if (strstr (temporalBuffer, "
10 Sphere_Object") != NULL)
11     {
12         numberObjects ++;
13         continue;
14     }
15     else if (strstr (temporalBuffer, "
16 Polygon_Object") != NULL)
17     {
```

Código Pretty Print GNU

```
1         numberObjects ++;  
2         continue;  
3     }  
4     else if (strstr (temporalBuffer, "  
Cone_Object") != NULL)  
5     {  
6         numberObjects ++;  
7         continue;  
8     }  
9     else if (strstr (temporalBuffer, "  
Cylinder_Object") != NULL)  
10    {  
11        numberObjects ++;  
12        continue;  
13    }
```


Código Pretty Print GNU

```
1         else if (strstr (temporalBuffer , "  
Disc_Object")!= NULL)  
2         {  
3             numberObjects ++;  
4             continue;  
5         }  
6         else if (strstr (temporalBuffer , "  
Ellipse_Object")!= NULL)  
7         {  
8             numberObjects ++;  
9             continue;  
10        }  
11        else if (strstr (temporalBuffer , "  
Quadratic_Object")!= NULL)  
12        {  
13            numberObjects ++;
```

Código Pretty Print GNU

```
1         continue;
2     }
3 }
4 }
5 fclose (file);
6 Objects = malloc (sizeof (struct Object)*
7 numberObjects);
8 Lights = malloc (sizeof (struct Light)*
9 numberLights);
10 }
11 struct Vector throwRay (long double x, long double y)
12 {
13     struct Vector direction;
14     long double Xw, Yw;
15     Xw = (long double) ((x)* Xdif)/ Hres + Xmin;
```

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```
1  Yw = (long double) ((y)* Ydif)/ Vres + Ymin;  
2  direction.x = Xw - eye.x;  
3  direction.y = Yw - eye.y;  
4  direction.z = - eye.z;  
5  direction = normalize (direction);  
6  return direction;  
7  }  
8  struct Color ponderAAcolors (struct Color c1, struct  
9  Color c2, struct Color c3, struct Color c4)  
10 {  
11     struct Color color;  
12     color.r = (c1.r + c2.r + c3.r + c4.r)/ 4;  
13     color.g = (c1.g + c2.g + c3.g + c4.g)/ 4;  
14     color.b = (c1.b + c2.b + c3.b + c4.b)/ 4;
```

Código Pretty Print GNU

```
1     return color;
2 }
3 long double getDistanceColors (struct Color c1, struct
    Color c2)
4 {
5     return sqrt (pow (c1.r - c2.r, 2)+ pow (c1.g - c2.g
    , 2)+ pow (c1.b - c2.b, 2));
6 }
7 int theyOK (struct Color c1, struct Color c2, struct
    Color c3, struct Color c4)
8 {
9     long double dist, dist1, dist2, dist3, dist4, dist5
    , dist6;
10    dist1 = getDistanceColors (c1, c2);
11    dist2 = getDistanceColors (c1, c3);
12    dist3 = getDistanceColors (c1, c4);
13    dist4 = getDistanceColors (c2, c3);
```

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```
1  dist5 = getDistanceColors (c2, c4);
2  dist6 = getDistanceColors (c3, c4);
3  dist = (dist1 + dist2 + dist3 + dist4 + dist5 +
4  dist6)/ 6;
5  if (dist <= similar)
6  {
7      return 1;
8  }
9  else
10 {
11     return 0;
12 }
13 struct Color getAAColor (long double x, long double y,
14     int aaLevel)
15 {
```

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```
1  int areOK;  
2  int level = aaLevel;  
3  struct Color color, color1, color2, color3, color4;  
4  struct Vector direction, V;  
5  long double sum = 1 / pow (2, level);  
6  level ++;  
7  long double nextSum = 1 / pow (2, level);  
8  direction = throwRay (x, y);  
9  V.x = - direction.x;  
10 V.y = - direction.y;  
11 V.z = - direction.z;  
12 color1 = getColor (eye, direction, V, maxReflection  
13 );  
   direction = throwRay (x, y + sum);
```

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```
1  V.x = - direction.x;
2  V.y = - direction.y;
3  V.z = - direction.z;
4  color2 = getColor (eye, direction, V, maxReflection
5  );
6  direction = throwRay (x + sum, y);
7  V.x = - direction.x;
8  V.y = - direction.y;
9  V.z = - direction.z;
10 color3 = getColor (eye, direction, V, maxReflection
11 );
12 direction = throwRay (x + sum, y + sum);
13 V.x = - direction.x;
14 V.y = - direction.y;
15 V.z = - direction.z;
```

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```
1  color4 = getColor (eye , direction , V, maxReflection
   );
2  areOK = theyOK (color1 , color2 , color3 , color4);
3  if (areOK == 0 && level <= maxAA)
4      {
5          color1 = getAAColor (x , y , level);
6          color2 = getAAColor (x , y + nextSum , level);
7          color3 = getAAColor (x + nextSum , y , level);
8          color4 = getAAColor (x + nextSum , y + nextSum ,
   level);
9          color = ponderAAColors (color1 , color2 , color3 ,
   color4);
10     }
11 else
12     {
13         color = ponderAAColors (color1 , color2 , color3 ,
   color4);
```


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```
1      }  
2      return color;  
3  }  
4  void * runRT (void * x)  
5  {  
6      int start, i, j;  
7      struct Color color;  
8      i = * ((int *)x);  
9      printf ("%i\n", i);  
10     for (i ; i < Vres ; i += 4)  
11     {  
12         for (j = 0 ; j < Hres ; j ++)  
13             {  
14
```

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```
1         color = getAAColor ((long double)j, (long
double)i, 0);
2         Framebuffer[i][j] = color;
3     }
4 }
5 return NULL;
6 }
7 int main (int argc, char * argv[])
8 {
9     howManyObjectsLights ();
10    printf ("Lights: %i \n", numberLights);
11    printf ("Objects: %i \n", numberObjects);
12    getSceneObjects ();
13    int i;
```

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```
1  pthread_t  threads[4];
2  Xdif = Xmax - Xmin;
3  Ydif = Ymax - Ymin;
4  similar = sqrt (3)/ 32;
5  printf ("\nRay Tracing\n...\n...\n");
6  for (i = 0 ; i < 4 ; i ++ )
7      {
8          pthread_create (& (threads[i]), NULL, &runRT, &
9  i);
10         sleep (1);
11     }
12     for (i = 0 ; i < 4 ; i ++ )
13     {
14         pthread_join (threads[i], NULL);
```

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```
1     }  
2     printf (" Rays: %LF\n" , rays);  
3     saveFile ();  
4     free (Objects);  
5     free (Lights);  
6     free (Framebuffer);  
7     printf ("\nDONE.\n");  
8 }
```