EXPERIMENT 6

AIM: Performing Clipping operation on polygon using Sutherland Hodgeman

CODE:

```
#include<iostream>
#include<GL/glut.h>
using namespace std;
const int MAX_POINTS = 20;
GLint count = 0;
void init(void)
{
glClearColor(1.0,1.0,1.0,0.0);
glMatrixMode(GL_PROJECTION);
gluOrtho2D(-1000,1000,-1000,1000);
}
void plotline(float a,float b,float c,float d)
{
glBegin(GL_LINES);
glVertex2i(a,b);
glVertex2i(c,d);
glEnd();
}
// Returns x-value of point of intersectipn of two lines
int x_intersect(int x1, int y1, int x2, int y2, int x3, int y3, int x4, int y4)
{
int num = (x1*y2 - y1*x2) * (x3-x4) - (x1-x2) * (x3*y4 - y3*x4);
int den = (x1-x2) * (y3-y4) - (y1-y2) * (x3-x4);
return num/den;
}
// Returns y-value of point of intersectipn of two lines
int y_intersect(int x1, int y1, int x2, int y2, int x3, int y3, int x4, int y4)
{
int num = (~x1*y2 - y1*x2) * (y3-y4) - (y1-y2) * (x3*y4 - y3*x4);
```

```
int den = (x1-x2) * (y3-y4) - (y1-y2) * (x3-x4);
return num/den;
}
// This functions clips all the edges w.r.t one clip edge of clipping area

void clip(int poly_points[][2], int &poly_size, int x1, int y1, int x2, int y2)
{
int new_points[MAX_POINTS][2], new_poly_size = 0;
// (ix,iy),(kx,ky) are the co-ordinate values of the points
for (int i = 0; i<poly_size; i++)
{
// i and k form a line in polygon
int k = (i+1) % poly_size;
int ix = poly_points[i][0], iy = poly_points[i][1];
int kx = poly_points[k][0], ky = poly_points[k][1];
// Calculating position of first point
// w.r.t. clipper line
int i_pos = (x2-x1) * (iy-y1) - (y2-y1) * (ix-x1);
// Calculating position of second point
// w.r.t. clipper line
int k_pos = (x2-x1) * (ky-y1) - (y2-y1) * (kx-x1);
// Case 1 : When both points are inside
if (i_pos< 0 &&k_pos< 0)
{
//Only second point is added
new_points[new_poly_size][0] = kx;
new_points[new_poly_size][1] = ky;
new_poly_size++;
}
// Case 2: When only first point is outside
else if (i_pos>= 0 &&k_pos< 0)
{
```

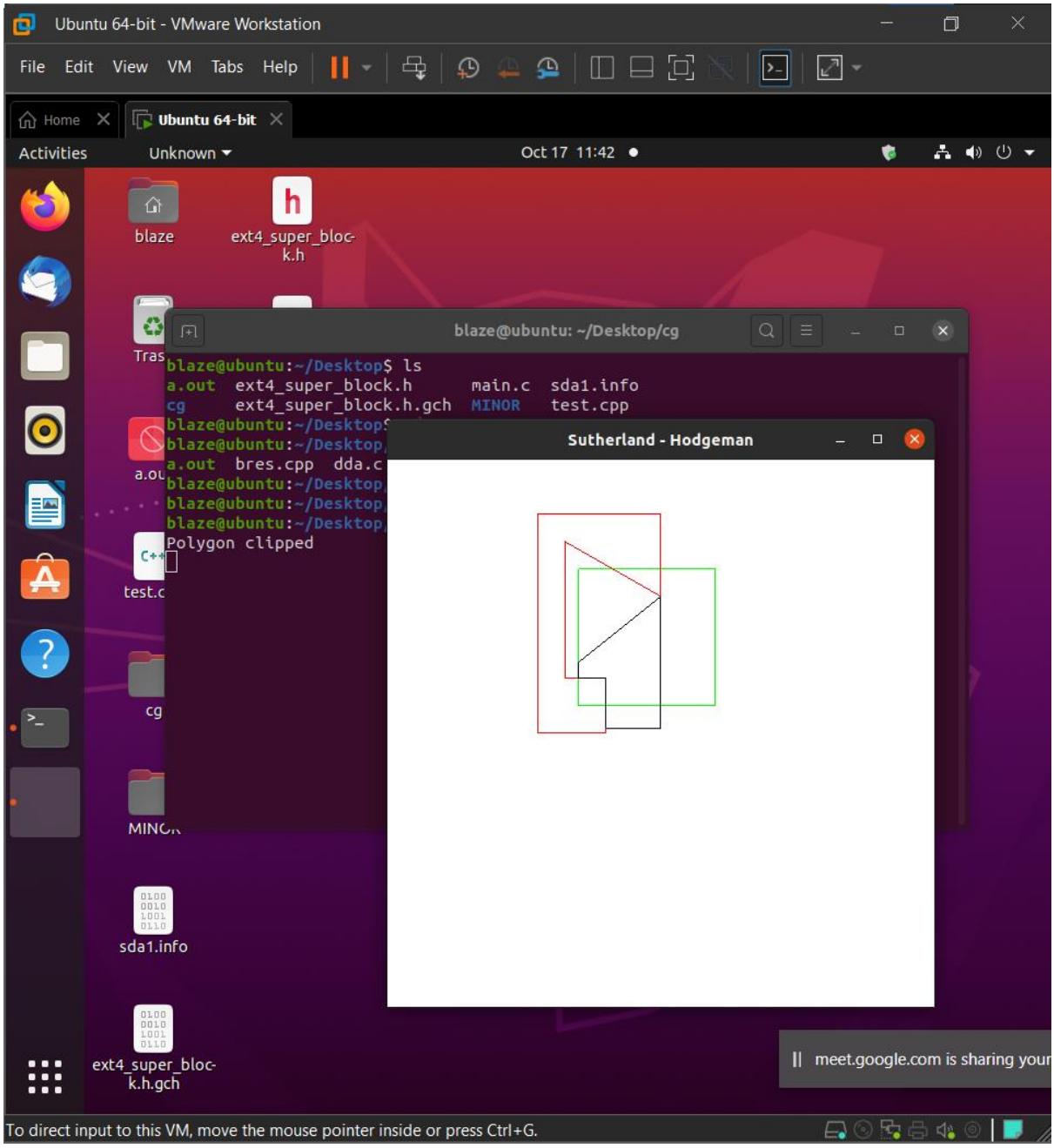
```
// Point of intersection with edge
// and the second point is added
new_points[new_poly_size][0] = x_intersect(x1,y1, x2, y2, ix, iy, kx, ky);
new_points[new_poly_size][1] = y_intersect(x1,y1, x2, y2, ix, iy, kx, ky);
new_poly_size++;
new_points[new_poly_size][0] = kx;
new_points[new_poly_size][1] = ky;
new_poly_size++;
}
// Case 3: When only second point is outside
else if (i_pos< 0 &&k_pos>= 0)
{
//Only point of intersection with edge is added

new_points[new_poly_size][0] = x_intersect(x1, y1, x2, y2, ix, iy, kx, ky);
new_points[new_poly_size][1] = y_intersect(x1, y1, x2, y2, ix, iy, kx, ky);
new_poly_size++;
}
// Case 4: When both points are outside
else
{
//No points are added
}
}
// Copying new points into original array and changing the no. of vertices
poly_size = new_poly_size;
for (int i = 0; i<poly_size; i++)
{
poly_points[i][0] = new_points[i][0];
poly_points[i][1] = new_points[i][1];
}
}
```

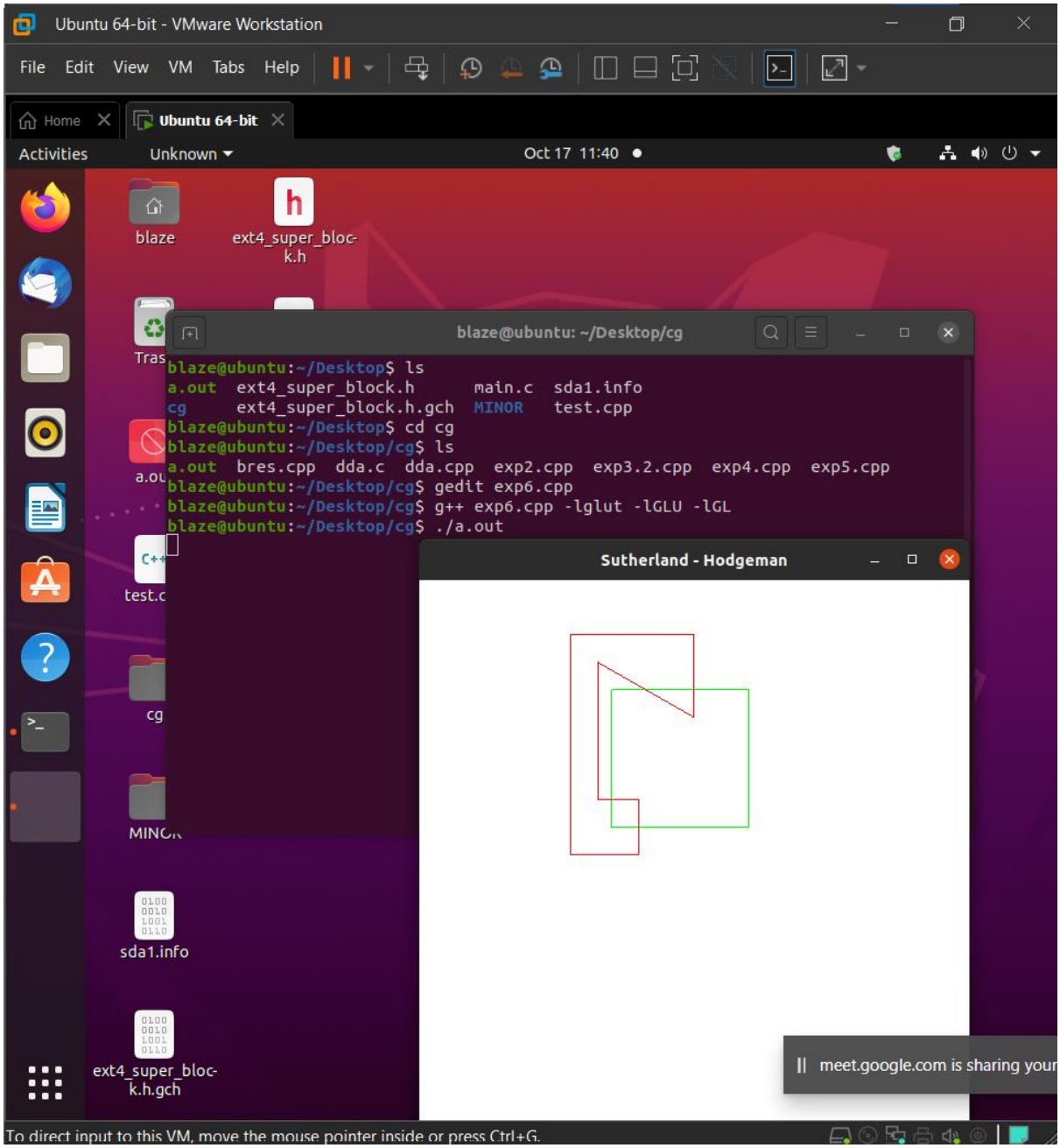
```
// Implements Sutherland–Hodgman algorithm
void suthHodgClip(int poly_points[][2], int poly_size, int clipper_points[][2], int
clipper_size)
{
//i and k are two consecutive indexes
for (int i=0; i<clipper_size; i++)
{
int k = (i+1) % clipper_size;
// We pass the current array of vertices, it's size
// and the end points of the selected clipper line
clip(poly_points, poly_size, clipper_points[i][0],
clipper_points[i][1], clipper_points[k][0],
clipper_points[k][1]);
}
// Printing vertices of clipped polygon
for (int i=0; i<poly_size; i++)
{
glColor3f(0.0,0.0,0.0);
if(i!=(poly_size-1))
{
glBegin(GL_LINES);
glVertex2i(poly_points[i][0],poly_points[i][1]);
glVertex2i(poly_points[i+1][0],poly_points[i+1][1]);

glEnd();
}
else
{
glBegin(GL_LINES);
glVertex2i(poly_points[i][0],poly_points[i][1]);
glVertex2i(poly_points[0][0],poly_points[0][1]);
glEnd();
```

```
}
}
}
void mouse(int button, int action, int x , int y)
{
if(button == GLUT_LEFT_BUTTON && action == GLUT_UP)
{
if(!count)
{
int poly_size = 8;
int poly_points[20][2] = {{-450,0},{-450,800},{0,800},{0,500},{-350,700},{-350,200},{-
200,200},{-200,0}};
// Defining clipper polygon vertices in clockwise order
// 1st Example with square clipper
int clipper_size = 4;
int clipper_points[][2] = {{-300,100},{-300,600},{200,600},{200,100}};
//Calling the clipping function
suthHodgClip(poly_points, poly_size, clipper_points,clipper_size);
count++;
printf("Polygon clipped\n");
glFlush();
}
}
if(button == GLUT_RIGHT_BUTTON && action == GLUT_UP)
{
exit(0);
}
}
void display()
{
glClear(GL_COLOR_BUFFER_BIT);
glColor3f(0.0,1.0,0.0);
```

```
glBegin(GL_LINE_LOOP);
glVertex2i(-300,100);
glVertex2i(200,100);
glVertex2i(200,600);
glVertex2i(-300,600);
glEnd();
glColor3f(1.0,0.0,0.0);
glBegin(GL_LINE_LOOP);
glVertex2i(-450,0);
glVertex2i(-200,0);
glVertex2i(-200,200);
glVertex2i(-350,200);
glVertex2i(-350,700);
glVertex2i(0,500);
glVertex2i(0,800);
glVertex2i(-450,800);
glEnd();
glFlush();
}
int main(int argc,char** argv)
{
glutInit(&argc,argv); glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
glutInitWindowSize(500,500);
glutInitWindowPosition(0,0);
glutCreateWindow("Sutherland - Hodgeman");
glutDisplayFunc(display);
glutMouseFunc(mouse);
init();
glutMainLoop();
return 0;
}
```

OUTPUT:


Ubuntu 64-bit - VMware Workstation
File Edit View VM Tabs Help
Home
Ubuntu 64-bit
Activities
Unknown
Oct 17 11:42
blaze
ext4_super_block.h
blaze@ubuntu: ~/Desktop/cg
blaze@ubuntu:~/Desktop$ ls
a.out ext4_super_block.h main.c sda1.info
cg ext4_super_block.h.gch MINOR test.cpp
blaze@ubuntu:~/Desktop
blaze@ubuntu:~/Desktop
a.out bres.cpp dda.c
blaze@ubuntu:~/Desktop
blaze@ubuntu:~/Desktop
blaze@ubuntu:~/Desktop
Polygon clipped
Sutherland - Hodgeman
cg
sda1.info
ext4_super_block.h.gch
meet.google.com is sharing your
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.


Ubuntu 64-bit - VMware Workstation
File Edit View VM Tabs Help
Home
Ubuntu 64-bit
Activities
Unknown
Oct 17 11:40
blaze
ext4_super_block.h
blaze@ubuntu: ~/Desktop/cg
blaze@ubuntu:~/Desktop$ ls
a.out ext4_super_block.h main.c sda1.info
cg ext4_super_block.h.gch MINOR test.cpp
blaze@ubuntu:~/Desktop$ cd cg
blaze@ubuntu:~/Desktop/cg$ ls
a.out bres.cpp dda.c dda.cpp exp2.cpp exp3.2.cpp exp4.cpp exp5.cpp
blaze@ubuntu:~/Desktop/cg$ gedit exp6.cpp
blaze@ubuntu:~/Desktop/cg$ g++ exp6.cpp -lglut -lGLU -lGL
blaze@ubuntu:~/Desktop/cg$ ./a.out
Sutherland - Hodgeman
sda1.info
ext4_super_block.h.gch
meet.google.com is sharing your
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.