**Computer Graphic Course – Ray Tracing(Ex2):**

is the position of the camera and P is the lookAt point

Compute camera direction:

Compute New up vector:

Compute right vector as cross of U and N vector:

Find a perpendicular vector with cross product (of two point originate in :

* **cx = aybz − azby**
* **cy = azbx − axbz**
* **cz = axby − aybx**

To calculate coordinate we use:

First calculating M matrix:

Calculating Cx,Cy,Sx,Sy:

While (a,b,c) is on N vector d steps from the camera point:

Then calculating Vx,Vy,Vz:

The coordinate of Will be:

To get the next pixel coordinate on the row of the screen we add Vx and for the column we add Vy

For Each pixel on the grid we use the following ray for intersection:

**Compute intersection between ray and object:**

Spheres:

Intersection of sphere centered at C with radius R,

and ray :

If , no intersection

If , no intersection

The intersection point is , and the normal is .

Plane:

Intersection of plane , and ray :

, (if VN = 0, no intersection)

if VN < 0, normal is N

if VN > 0, normal is -N

Cube:

Intersection of cube centered at C with edge length d,

and ray :

For each ,

calculate .

If ,

Then P is an intersection.

**Compute color on surface:**

Kd – diffuse color

Ks – specular color

I – light intensity (calculated by soft shadows)

N – normal to the surface

L – light direction

n – Phong specularity coefficient

(background color and reflection color are calculated recursively?)