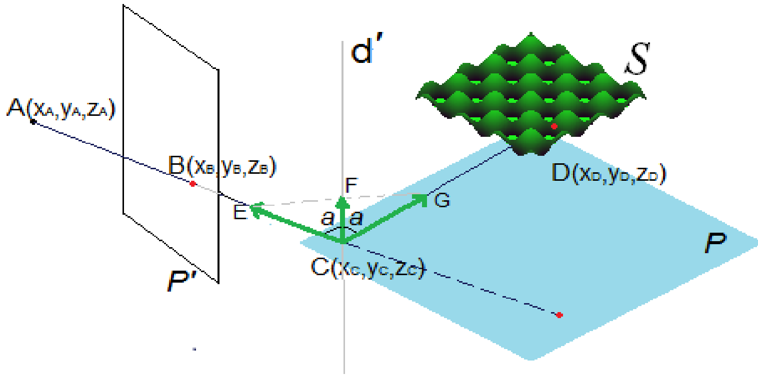
Reflexia luminii in oglinda plana



Ecuatia dreptei AC

$$d_{AC}: \frac{x-x_A}{x_C-x_A} = \frac{y-y_A}{y_C-y_A} = \frac{z-z_A}{z_C-z_A}$$

Vectorul director al dreptei AC

$$\bar{v}_{CA}=(x_A-x_C)\bar{i}+(y_A-y_C)\bar{j}+(z_A-z_C)\bar{k}$$

Norma vectorului $\bar{v}_{CA}$

$$||\bar{v}_{CA}||=\sqrt{(x_A-x_C)^2+(y_A-y_C)^2+(z_A-z_C)^2}$$

Determinarea unui punct E astfel incat $E \in d_{CA}$ si $||v_{CE}||=1$

$$\bar{v}_{CE}=\frac{\bar{v}_{CA}}{||\bar{v}_{CA}||}=\frac{(x_A-x_C)}{||\bar{v}_{CA}||}\bar{i}+\frac{(y_A-y_C)}{||\bar{v}_{CA}||}\bar{j}+\frac{(z_A-z_C)}{||\bar{v}_{CA}||}\bar{k}=(x_E-x_C)\bar{i}+(y_E-y_C)\bar{j}+(z_E-z_C)\bar{k}$$

$$x_E=x_C+\frac{(x_A-x_C)}{||\bar{v}_{CA}||} \qquad y_E=y_C+\frac{(y_A-y_C)}{||\bar{v}_{CA}||} \qquad z_E=z_C+\frac{(z_A-z_C)}{||\bar{v}_{CA}||}\bar{k}$$

Ecuatia planului P

$$P: a_1x+b_1y+c_1z+d_1=0$$

Vectorul normal la planul P

$$\bar{v}_P= a_1\bar{i}+b_1\bar{j}+c_1\bar{k}$$

Ecuatia dreptei care trece prin C si are vectorul director $\bar{V}_P$

$$d' : \frac{x-x_C}{a_1}=\frac{y-y_C}{b_1}=\frac{z-z_C}{c_1}$$

Conditia de apartenenta a punctului F la dreapta d'

$$F(x_F,y_F,z_F)\in d' \Rightarrow \frac{x_F-x_C}{a_1}=\frac{y_F-y_C}{b_1}=\frac{z_F-z_C}{c_1}$$

$$\Rightarrow \begin{cases} x_F=x_C+a_1\dfrac{z_F-z_C}{c_1} \\ y_F=y_C+b_1\dfrac{z_F-z_C}{c_1} \end{cases}$$

Cosinusul unghiului a doi vectori

$$\cos(a)=\frac{\overline{v_{CA}}\cdot\overline{v_P}}{\|\overline{v_{CA}}\|\cdot\|\overline{v_P}\|}$$

Determinarea punctului F astfel incat $F\in d'$ *si* $\triangle CFE$-dr

$$\cos(a)=\frac{\|\overline{v_{CF}}\|}{\|\overline{v_{CE}}\|}=\|\overline{v_{CF}}\|$$

$$\|\overline{v_{CF}}\|=\sqrt{(x_F-x_C)^2+(y_F-y_C)^2+(z_F-z_C)^2}=\cos(a)\quad\Rightarrow\ldots$$

$$\Rightarrow\; x_F=x_C+a_1\frac{\cos(a)}{\|\overline{v_P}\|}\qquad y_F=y_C+b_1\frac{\cos(a)}{\|\overline{v_P}\|}\qquad z_F=z_C+c_1\frac{\cos(a)}{\|\overline{v_P}\|}$$

Determinarea punctului G, simetricul punctului E fata de F

$$x_G=2x_F-x_E\qquad y_G=2y_F-y_E\qquad z_G=2z_F-z_E$$

Vectorul care trece prin punctele C si G si e cu varful in G

$$\overline{v_{CG}}=(x_G-x_C)\overline{i}+(y_G-y_C)\overline{j}+(z_G-z_C)\overline{k}$$

Ecuatia dreptei CG

$$d_{GC}:\ \frac{x-x_G}{x_C-x_G}=\frac{y-y_G}{y_C-y_G}=\frac{z-z_G}{z_C-z_G}$$

Punctul de intersectie dintre dreapta d_{GC} *si suprafata* $\mathcal{S}$

$$D(x_D,y_D,z_D)=d_{GC}\cap\mathcal{S}(x,y,z)\;\Rightarrow\;\begin{cases}d_{GC}:\ \dfrac{x_D-x_G}{x_C-x_G}=\dfrac{y_D-y_G}{y_C-y_G}=\dfrac{z_D-z_G}{z_C-z_G}\\ \mathcal{S}(x_D,y_D,z_D)=0\end{cases}\;\Rightarrow D$$

Punctul de intersectie dintre dreapta d_{AC} *si planul P'*

$$B(x_B,y_B,z_B)\in d_{AC}\cap P'(x_P,y_P,z_P)\;\Rightarrow\;\begin{cases}\dfrac{x_B-x_A}{x_C-x_A}=\dfrac{y_B-y_A}{y_C-y_A}=\dfrac{z_B-z_A}{z_C-z_A}\\ P'(x_P,y_P,z_P)=0\end{cases}\;\Rightarrow B$$

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float x,y,z,a,b,c,x0,y0,z0,k,xc=1,yc=1,zc=1,A,B,C,D,E,F,cos1,dx,dy,dz,xp,yp,
sem,cy=250;
for(x=-0.1;x<=0.3;x+=0.0003)
     for(y=-0.1;y<=0.3;y+=0.0003)
    {
           z=0;
           a=0.86*x-0.86*y;b=z-0.5*x-0.5*y;
           pDC->SetPixel(a*1000+300,-b*1000+cy,RGB(0,(z+0.01)*2000,0));
     }
for(x=-0.1;x<=0.1;x+=0.0003)
      for(y=-0.1;y<=0.1;y+=0.0003)
     {
           z=sin(x*100)*sin(y*100)/50+0.15;
           a=0.86*x-0.86*y;b=z-0.5*x-0.5*y;
           pDC->SetPixel(a*1000+300,-b*1000+cy,
                   RGB(30,(z-0.2+0.02)*6000,30));
     }
for(x0=-0.1;x0<=0.3;x0+=0.0003)
   for(y0=-0.1;y0<=0.3;y0+=0.0003)
     {
      z0=0 ;
      dx=0;dy=0;dz=1;
      k=(dx*dx+dy*dy+dz*dz)/(dx*(xc-x0)+dy*(yc-y0)+dz*(zc-z0));
      a=2*dx-k*(xc-x0);
      b=2*dy-k*(yc-y0);
      c=2*dz-k*(zc-z0);
      z=z0;
      sem=0;
      while(z<=z0+0.4&&sem==0)
       {
         x=a/c*(z-z0)+x0;
        y=b/c*(z-z0)+y0;
         if(x>=-0.1&&x<=0.1&&y>=-0.1&&y<=0.1&&fabs(z-
(sin(x*100)*sin(y*100)/50+0.15))<0.001)
           sem=1;
         z+=0.001;
        }
        if(sem==1)
        {
           xp=0.86*x0-0.86*y0;yp=z0-0.5*x0-0.5*y0;
           pDC->SetPixel(xp*1000+300,-yp*1000+cy,
                    RGB(0,(z-0.2+0.02)*6000,0));
         }
  }
```