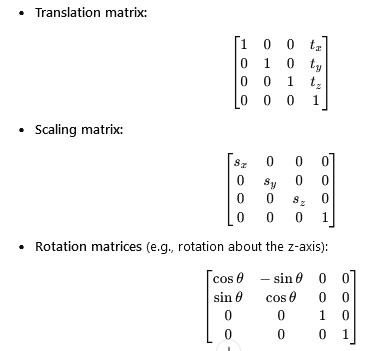
**EXERCISE - 4**

**AIM :** To implement 3D transformation operations (translation, scaling, and rotation) on an object and display the transformed object using graphical techniques.

**PROCEDURE:**

1. **Input:**
   * The 3D coordinates of the object.
   * Transformation parameters (e.g., translation distances, scaling factors, or rotation angles).
2. **Apply Transformation Matrix:**
   * For each transformation, multiply the object's 3D coordinates with the appropriate transformation matrix:
   * 

3 **Transform the Object:**

* Multiply the transformation matrix with each point of the object to compute the transformed coordinates.

4 **Output:**

* Display the original and transformed object using a graphical interface.

**SAMPLE CODE:**

**3D Translation**:

#include<stdio.h>

#include<conio.h>

#include<graphics.h>

#include<math.h>

int maxx,maxy,midx,midy;

void axis()

{

getch();

cleardevice();

line(midx,0,midx,maxy);

line(0,midy,maxx,midy);

}

void main()

{

int x,y,z,o,x1,x2,y1,y2;

int gd=DETECT,gm;

detectgraph(&gd,&gm);

initgraph(&gd,&gm,"c:\\tc\\bgi");

*//setfillstyle(0,getmaxcolor());*

maxx=getmaxx();

maxy=getmaxy();

midx=maxx/2;

midy=maxy/2;

axis();

bar3d(midx+50,midy-100,midx+60,midy-90,10,1);

printf("Enter translation factor");

scanf("%d%d",&x,&y);

*//axis();*

printf("After translation:");

bar3d(midx+x+50,midy-(y+100),midx+x+60,midy-(y+90),10,1);

getch();

closegraph();

}

**3D Scaling:**

#include<stdio.h>

#include<conio.h>

#include<graphics.h>

#include<math.h>

int maxx,maxy,midx,midy;

void axis()

{

getch();

cleardevice();

line(midx,0,midx,maxy);

line(0,midy,maxx,midy);

}

void main()

{

int x,y,z,o,x1,x2,y1,y2;

int gd=DETECT,gm;

detectgraph(&gd,&gm);

initgraph(&gd,&gm,"c:\\tc\\bgi");

*//setfillstyle(0,getmaxcolor());*

maxx=getmaxx();

maxy=getmaxy();

midx=maxx/2;

midy=maxy/2;

axis();

bar3d(midx+50,midy-100,midx+60,midy-90,5,1);

printf("Enter scaling factors");

scanf("%d%d%d", &x,&y,&z);

*//axis();*

printf("After scaling");

bar3d(midx+(x\*50),midy-(y\*100),midx+(x\*60),midy-(y\*90),5\*z,1);

*//axis();*

getch();

closegraph();

}

**3D Rotation:**

#include<stdio.h>

#include<conio.h>

#include<graphics.h>

#include<math.h>

int maxx,maxy,midx,midy;

void axis()

{

getch();

cleardevice();

line(midx,0,midx,maxy);

line(0,midy,maxx,midy);

}

void main()

{

int x,y,z,o,x1,x2,y1,y2;

int gd=DETECT,gm;

detectgraph(&gd,&gm);

initgraph(&gd,&gm,"c:\\tc\\bgi");

*//setfillstyle(0,getmaxcolor());*

maxx=getmaxx();

maxy=getmaxy();

midx=maxx/2;

midy=maxy/2;

axis();

bar3d(midx+50,midy-100,midx+60,midy-90,5,1);

printf("Enter rotating angle");

scanf("%d",&o);

 x1=50\*cos(o\*3.14/180)-100\*sin(o\*3.14/180);

 y1=50\*sin(o\*3.14/180)+100\*cos(o\*3.14/180);

 x2=60\*cos(o\*3.14/180)-90\*sin(o\*3.14/180);

 y2=60\*sin(o\*3.14/180)+90\*cos(o\*3.14/180);

 axis();

printf("After rotation about z axis");

bar3d(midx+x1,midy-y1,midx+x2,midy-y2,5,1);

axis();

printf("After rotation  about x axis");

bar3d(midx+50,midy-x1,midx+60,midy-x2,5,1);

axis();

printf("After rotation about yaxis");

bar3d(midx+x1,midy-100,midx+x2,midy-90,5,1);

getch();

closegraph();

}