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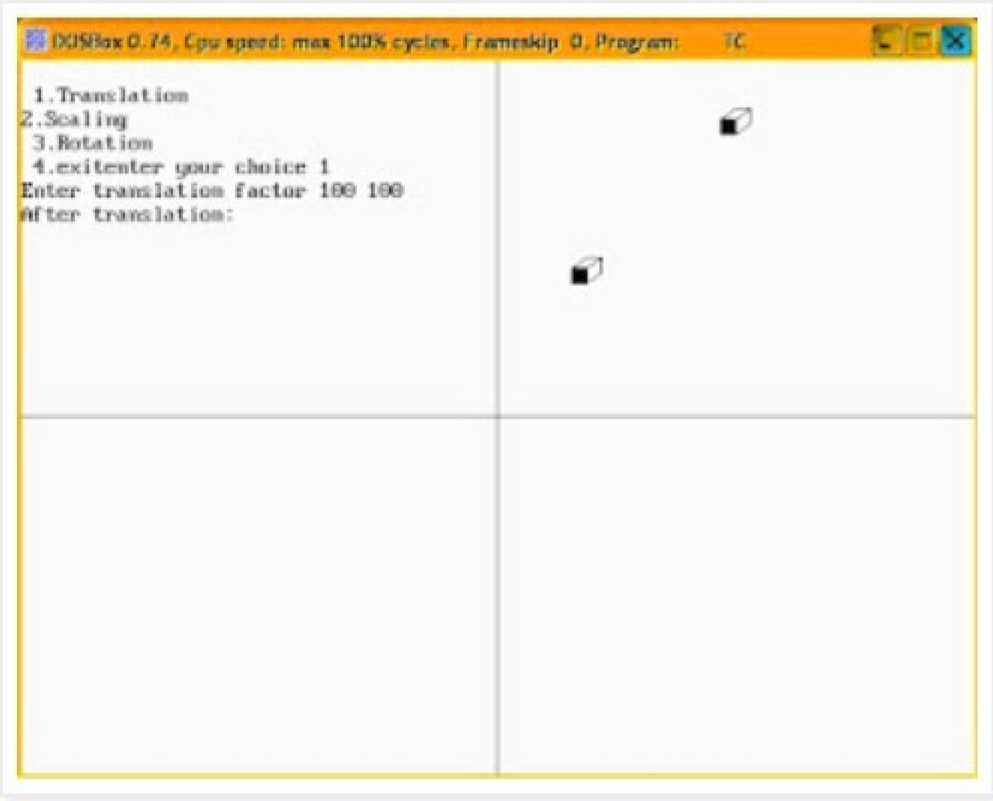
6. 3 D Transformation c Program Code with output.
Code:-

```
#include<stdio.h>
#include<conio.h>
#include<graphics.h>
#include<math.h>
void trans();
void scale();
void rotate();
int maxx,maxy,midx,midy;
void main()
{
 int ch;
 int gd=DETECT,gm;
detectgraph(&gd,&gm);
initgraph(&gd,&gm,"e:\\tc\\bgi");
printf("\n 1.Translation \n2.Scaling\n 3.Rotation \n 4.exit");
printf("enter your choice");
scanf("%d",&ch);
do
{
switch(ch)
{
case 1 : trans();
getch();
break;
case 2 : scale();
getch();
break;
case 3 :  rotate();
getch();
break;
case 4 :break;
}
printf("enter your choice");
scanf("%d",&ch);
} while(ch<4);
}
void trans()
{
int x,y,z,o,x1,x2,y1,y2;
maxx=getmaxx();
maxy=getmaxy();
midx=maxx/2;
midy=maxy/2;
bar3d(midx+50,midy-100,midx+60,midy-90,10,1);
printf("Enter translation factor");
scanf("%d%d",&x,&y);
printf("After translation:");
bar3d(midx+x+50,midy-(y+100),midx+x+60,midy-(y+90),10,1);
}
void scale()
{
int x,y,z,o,x1,x2,y1,y2;
maxx=getmaxx();
maxy=getmaxy();
midx=maxx/2;
midy=maxy/2;
bar3d(midx+50,midy-100,midx+60,midy-90,5,1);
printf("before translation\n");
printf("Enter scaling factors\n");
scanf("%d %d %d", &x,&y,&z);
printf("After scaling\n");
bar3d(midx+(x*50),midy-(y*100),midx+(x*60),midy-(y*90),5*z,1);
}
void rotate()
{
int x,y,z,o,x1,x2,y1,y2;
maxx=getmaxx();
```

```
maxy=getmaxy();
midx=maxx/2;
midy=maxy/2;
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);
printf("After rotation  about x axis");
bar3d(midx+50,midy-x1,midx+60,midy-x2,5,1);
 printf("After rotation about yaxis");
bar3d(midx+x1,midy-100,midx+x2,midy-90,5,1);
}
```

Screen short of output:-

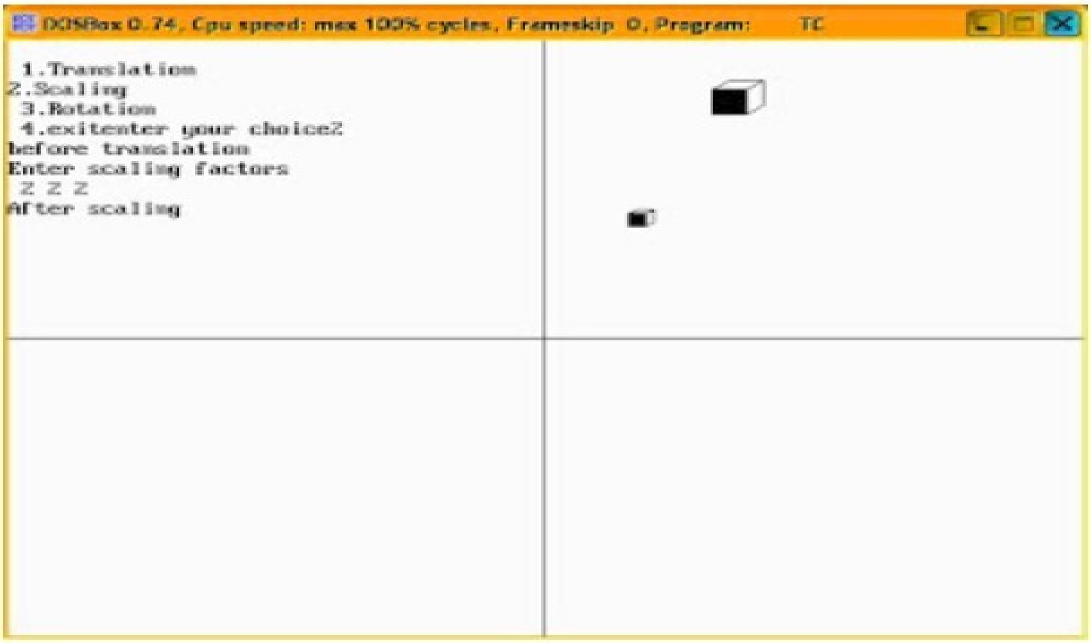
Translation



DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC

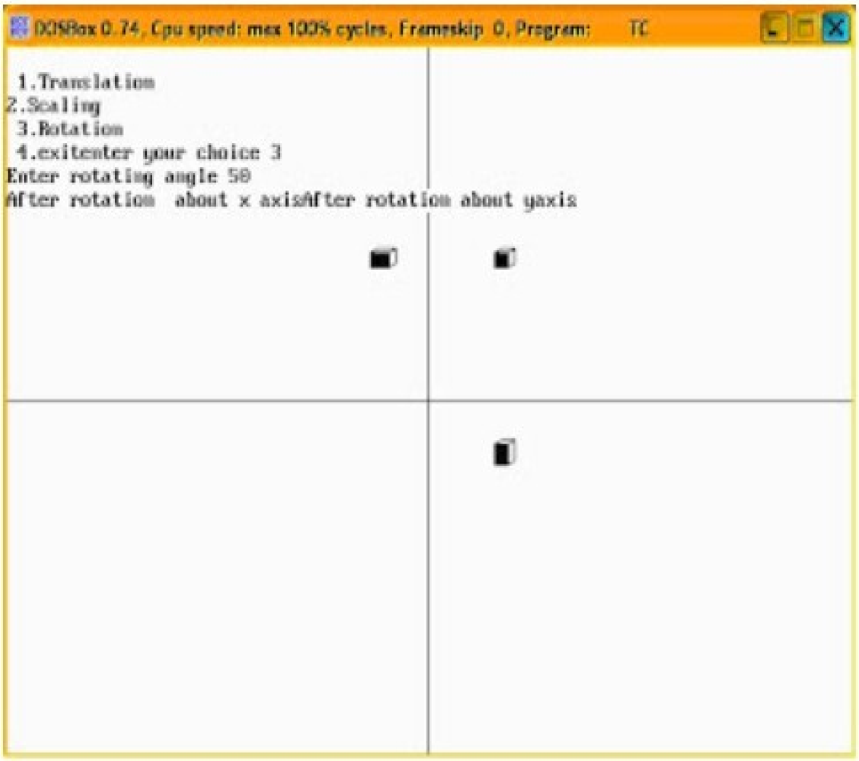
```
 1.Translation
2.Scaling
 3.Rotation
 4.exitenter your choice 1
Enter translation factor 100 100
After translation:
```

Scaling


DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC

```
 1.Translation
2.Scaling
 3.Rotation
 4.exitenter your choice2
before translation
Enter scaling factors
 2 2 2
After scaling
```

Rotation


DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC

```
 1.Translation
2.Scaling
 3.Rotation
 4.exitenter your choice 3
Enter rotating angle 50
After rotation  about x axisAfter rotation about yaxis
```

7. Creating animations using Transformations in c-language

```
#include <stdio.h>
#include <GL/glut.h>
#include <math.h>

// these are the parameters
#define maxHt 800
#define maxWd 600
#define maxLns 10000
#define transSpeed 1
#define rotSpeed 0.02
#define rotateLimit 0.2
#define boundLimitL -200
#define boundLimitR 500
#define grasslandy 230

// Structure for storing lines
typedef struct lines {
        int x1, x2, y1, y2;
} LINE;

// Object type structure for storing each body part
typedef struct objects {
        LINE edge[maxLns];
        int translation, cx, cy, xoffset, yoffset;
        float theta;
        int rotationState;
        int EdgeCount;
} Object;
```

```
// the different objects
Object Head, upBody, Tail, downBody, FlegF, FlegB, BlegF, BlegB;
// global
int dinoTranslate = 0;

// basic init function for OPENGL
void myInit(void)
{
	glClearColor(1.0, 1.0, 1.0, 0.0);
	glMatrixMode(GL_PROJECTION);
	glLoadIdentity();
	gluOrtho2D(0, maxHt, 0, maxWd);
	glClear(GL_COLOR_BUFFER_BIT);
}

// this function tranlates, and rotates a point according to an object and draws it
void rotateandshiftPt(int px, int py, Object obbj)
{
	int xf, yf;

	xf = obbj.cx + (int)((float)(px - obbj.cx) * cos(obbj.theta)) - ((float)(py - obbj.cy) * sin(obbj.theta));
	yf = obbj.cy + (int)((float)(px - obbj.cx) * sin(obbj.theta)) + ((float)(py - obbj.cy) * cos(obbj.theta));
	glBegin(GL_POINTS);
	glVertex2i(obbj.translation + xf + obbj.xoffset, yf + obbj.yoffset);
	glEnd();
}

// this function draws a line using Bresenhams
void drawLineBresenham(int x1, int y1, int x2, int y2, Object obbj)
```

```
{
    int Dx, Dy, Dxmul2, Dymul2, Pk, xtempi, ytempi;
    float lineSlope, xtemp, ytemp;
    Dx = abs(x2 - x1);
    Dy = abs(y2 - y1);
    Dxmul2 = 2 * Dx;
    Dymul2 = 2 * Dy;
    ytemp = (float)(y2 - y1);
    xtemp = (float)(x2 - x1);
    lineSlope = (ytemp / xtemp);

    if (lineSlope >= -1.0 && lineSlope <= 1.0) {
        Pk = Dymul2 - Dx;
        if (x1 > x2) {
            xtempi = x2;
            x2 = x1;
            x1 = xtempi;
            ytempi = y2;
            y2 = y1;
            y1 = ytempi;
        }
        for (xtempi = x1, ytempi = y1; xtempi <= x2; xtempi++) {
            rotateandshiftPt(xtempi, ytempi, obbj);
            if (Pk < 0) {
                Pk = Pk + Dymul2;
            } else {
                Pk = Pk + Dymul2 - Dxmul2;
                if (lineSlope >= 0.0 && lineSlope <= 1.0)
                    ytempi = ytempi + 1;
                else if (lineSlope < 0.0 && lineSlope >= -1.0)
                    ytempi = ytempi - 1;
            }
        }
    } else {
        Pk = Dxmul2 - Dy;
        if (y1 > y2) {
            xtempi = x2;
            x2 = x1;
            x1 = xtempi;
            ytempi = y2;
            y2 = y1;
            y1 = ytempi;
        }
        for (xtempi = x1, ytempi = y1; ytempi <= y2; ytempi++) {
            rotateandshiftPt(xtempi, ytempi, obbj);
            if (Pk < 0) {
                Pk = Pk + Dxmul2;
            } else {
                Pk = Pk + Dxmul2 - Dymul2;
                if (lineSlope > 1.0)
                    xtempi = xtempi + 1;
                else if (lineSlope < -1.0)
                    xtempi = xtempi - 1;
            }
        }
    }
}
// here all the edges are iterated and drawn
void drawObj(Object obbj)
{
    int i;
    for (i = 0; i < obbj.EdgeCount; i++) {
        drawLineBresenham(obbj.edge[i].x1, obbj.edge[i].y1, obbj.edge[i].x2,
obbj.edge[i].y2, obbj);
```

```
        }
}

// in this function, an object is updated
void updateObj(Object* obbj)
{
        obbj->translation = dinoTranslate;

        if (obbj->rotationState == 1) {
                obbj->theta = obbj->theta + rotSpeed;
                if (obbj->theta >= (3.14159))
                        obbj->theta = obbj->theta - (2.0 * 3.14159);
                if (obbj->theta > rotateLimit)
                        obbj->rotationState = -1;

        } else if (obbj->rotationState == -1) {
                obbj->theta = obbj->theta - rotSpeed;

                if (obbj->theta <= (-3.14159))
                        obbj->theta = (2.0 * 3.14159) + obbj->theta;

                if (obbj->theta < -rotateLimit)
                        obbj->rotationState = 1;
        }
}

// The actual function where the Dinosaur is drawn
void drawDino(void)
{
        // an infinite while loop for moving the dinosaur
        while (1) {
                glClear(GL_COLOR_BUFFER_BIT);
```

```
// draw grassland
glLineWidth(5.0);
glColor3f(0.0f, 1.0f, 0.3f);
glBegin(GL_LINES);
glVertex2i(0, grasslandy);
glVertex2i(maxHt, grasslandy);
glEnd();
glPointSize(3.0);
glColor3f(0.9f, 0.5f, 0.6f);
// update all parts

updateObj(&Head);
updateObj(&upBody);
updateObj(&Tail);
updateObj(&downBody);
updateObj(&FlegF);
updateObj(&FlegB);
updateObj(&BlegF);
updateObj(&BlegB);

// draw all parts, also draw joining parts
drawObj(Head);
drawObj(upBody);
drawObj(Tail);
drawObj(downBody);
drawObj(FlegF);
drawObj(FlegB);
drawObj(BlegF);
drawObj(BlegB);

dinoTranslate--; // decreased because moving forward
if (dinoTranslate <= boundLimitL) {
```

```
            dinoTranslate = boundLimitR;
            printf("\ntranslate %d", dinoTranslate);
        }
        printf("\ntranslate %d", dinoTranslate);
        glFlush();
    }
}

// TAn object is stored using this function
void storeObj(char* str, Object* obbj)
{
    obbj->theta = 0.0;

    FILE* fp;
    fp = fopen(str, "r");
    if (fp == NULL) {
        printf("Could not open file");
        return;
    }
    obbj->EdgeCount = 0;
    int count = 0, x1, y1, x2, y2;
    while (!feof(fp)) {
        count++;
        if (count > 2) {
            x1 = x2;
            y1 = y2;
            count = 2;
        }
        if (count == 1) {
            fscanf(fp, "%d, %d", &x1, &y1);
        } else {
            fscanf(fp, "%d, %d", &x2, &y2);
            printf("\n%d, %d", x2, y2);
            obbj->edge[obbj->EdgeCount].x1 = x1;
            obbj->edge[obbj->EdgeCount].y1 = y1;
            obbj->edge[obbj->EdgeCount].x2 = x2;
            obbj->edge[obbj->EdgeCount].y2 = y2;
            obbj->EdgeCount++;
        }
    }

    // printf("\nPolygon stored!");
    fclose(fp);
}

// All parts are stored.
void storeAllParts()
{
    FILE* fp, *fp2;
    int cx, cy;
    fp = fopen("centrePts.txt", "r");
    fp2 = fopen("offsetDino.txt", "r");
    if (fp == NULL || fp2 == NULL) {
        printf("Could not open file");
        return;
    }
    // parts
    //----------------
    // head+neck
    storeObj("headDino.txt", &Head);
    fscanf(fp, "%d, %d", &cx, &cy);
    Head.cx = cx;
    Head.cy = cy;
    fscanf(fp2, "%d, %d", &cx, &cy);
```

```
Head.xoffset = cx;
Head.yoffset = cy;
Head.rotationState = 1;

// upper body boundary(only translation)
storeObj("bodyupDino.txt", &upBody);
upBody.cx = 0;
upBody.cy = 0;
fscanf(fp2, "%d, %d", &cx, &cy);
upBody.xoffset = cx;
upBody.yoffset = cy;
upBody.rotationState = 0;

// tail
storeObj("tailDino.txt", &Tail);
fscanf(fp, "%d, %d", &cx, &cy);
Tail.cx = cx;
Tail.cy = cy;
fscanf(fp2, "%d, %d", &cx, &cy);
Tail.xoffset = cx;
Tail.yoffset = cy;
Tail.rotationState = -1;

// back leg front
storeObj("backlegFDino.txt", &BlegF);
fscanf(fp, "%d, %d", &cx, &cy);
BlegF.cx = cx;
BlegF.cy = cy;
fscanf(fp2, "%d, %d", &cx, &cy);
BlegF.xoffset = cx;
BlegF.yoffset = cy;
BlegF.rotationState = -1;
```

```
// back leg rear
storeObj("backlegRDino.txt", &BlegB);
fscanf(fp, "%d, %d", &cx, &cy);
BlegB.cx = cx;
BlegB.cy = cy;
fscanf(fp2, "%d, %d", &cx, &cy);
BlegB.xoffset = cx;
BlegB.yoffset = cy;
BlegB.rotationState = 1;

// lower body boundary(only translation)
storeObj("bodydownDino.txt", &downBody);
downBody.cx = 0;
downBody.cy = 0;
fscanf(fp2, "%d, %d", &cx, &cy);
downBody.xoffset = cx;
downBody.yoffset = cy;
downBody.rotationState = 0;

// front leg rear
storeObj("frontlegRDino.txt", &FlegB);
fscanf(fp, "%d, %d", &cx, &cy);
FlegB.cx = cx;
FlegB.cy = cy;
fscanf(fp2, "%d, %d", &cx, &cy);
FlegB.xoffset = cx;
FlegB.yoffset = cy;
FlegB.rotationState = -1;

// front leg front
storeObj("frontlegFDino.txt", &FlegF);
```

```
    fscanf(fp, "%d, %d", &cx, &cy);
    FlegF.cx = cx;
    FlegF.cy = cy;
    fscanf(fp2, "%d, %d", &cx, &cy);
    FlegF.xoffset = cx;
    FlegF.yoffset = cy;
    FlegF.rotationState = 1;

    //------------------------
    fclose(fp);
}

void main(int argc, char** argv)
{

    storeAllParts();
    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
    glutInitWindowSize(maxHt, maxWd);
    glutInitWindowPosition(0, 0);
    glutCreateWindow("Walking dinosaur");
    myInit();
    glutDisplayFunc(drawDino); // actual loop call
    glutMainLoop();
}
```

8. KeyFraming graphics animation(C program for bouncing ball):-

SourceCode-

```
#include <stdio.h>
#include <conio.h>
#include <graphics.h>
#include <dos.h>

int main() {
 int gd = DETECT, gm;
 int i, x, y, flag=0;
 initgraph(&gd, &gm, "C:\\TC\\BGI");

 /* get mid positions in x and y-axis */
 x = getmaxx()/2;
 y = 30;


 while (!kbhit()) {
  if(y >= getmaxy()-30 || y <= 30)
     flag = !flag;
     /* draws the gray board */
     setcolor(RED);
     setfillstyle(SOLID_FILL, RED);
     circle(x, y, 30);
     floodfill(x, y, RED);

 /* delay for 50 milli seconds */
 delay(50);

 /* clears screen */
 cleardevice();
 if(flag){
     y = y + 5;
 } else {
     y = y - 5;
 }
    }

    getch();
    closegraph();
    return 0;
}
```

ScreenShort:-