МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ

Федеральное государственное бюджетное образовательное учреждение высшего профессионального образования

**«Вятский государственный университет»**

**(ФГБОУ ВО «ВятГУ»)**

Факультет автоматики и вычислительной техники

Кафедра электронных вычислительных машин

Аффинные преобразования в пространстве

Отчет

Лабораторная работа №7 по дисциплине

«Компьютерная графика»

Выполнил студент группы ИВТ-23 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/Кудяшев Я.Ю./

Проверил преподаватель\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/Коржавина А.С./

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**Цель работы**

Цель работы: закрепить лекционный материал по изучению материала одноименной темы, реализовав матрицы переноса, масштабирования, отражения и вращения применительно к координатам описанной в программе объемной фигуры (многогранника) с целью демонстрации движения и преобразования формы этой фигуры в пространстве.

**Листинг программы**

**unit** Unit1;

{$mode objfpc}{$H+}

**interface**

**uses**

Classes, SysUtils, Forms, Controls, Graphics, Dialogs, ExtCtrls, StdCtrls, Types;

**type**

{ TForm1 }

TForm1 = **class**(TForm)

Button1: TButton;

Button10: TButton;

Button11: TButton;

Button12: TButton;

Button13: TButton;

Button14: TButton;

Button15: TButton;

Button16: TButton;

Button17: TButton;

Button2: TButton;

Button3: TButton;

Button4: TButton;

Button5: TButton;

Button6: TButton;

Button7: TButton;

Button8: TButton;

Button9: TButton;

Panel1: TPanel;

**procedure** Button10Click(Sender: TObject);

**procedure** Button11Click(Sender: TObject);

**procedure** Button12Click(Sender: TObject);

**procedure** Button13Click(Sender: TObject);

**procedure** Button14Click(Sender: TObject);

**procedure** Button15Click(Sender: TObject);

**procedure** Button16Click(Sender: TObject);

**procedure** Button17Click(Sender: TObject);

**procedure** Button1Click(Sender: TObject);

**procedure** Button2Click(Sender: TObject);

**procedure** Button3Click(Sender: TObject);

**procedure** Button4Click(Sender: TObject);

**procedure** Button5Click(Sender: TObject);

**procedure** Button6Click(Sender: TObject);

**procedure** Button7Click(Sender: TObject);

**procedure** Button8Click(Sender: TObject);

**procedure** Button9Click(Sender: TObject);

**procedure** FormMouseWheelDown(Sender: TObject; Shift: TShiftState;

MousePos: TPoint; **var** Handled: Boolean);

**procedure** FormMouseWheelUp(Sender: TObject; Shift: TShiftState;

MousePos: TPoint; **var** Handled: Boolean);

**private**

**public**

**end**;

**Type**

TXYZ = **Record**

X, Y, Z: real;

**End**;

**var**

Form1: TForm1;

m:**array** [1..4,1..4] **of** real;

mm:**array** [1..8,1..4] **of** real;

V:**array**[0..7] **of** TXYZ= (

(x:-15;y: 5;z:-35),

(x:-15;y:-25;z:-35),

(x: 15;y:-25;z:-35),

(x: 15;y: 5;z:-35),

(x: 15;y: 5;z: -15),

(x: 15;y:-25;z: -15),

(x:-15;y:-25;z: -15),

(x:-15;y: 5;z: -15));

VVV:**array**[0..7] **of** TXYZ= (

(x:-15;y: 5;z:-35),

(x:-15;y:-25;z:-35),

(x: 15;y:-25;z:-35),

(x: 15;y: 5;z:-35),

(x: 15;y: 5;z: -15),

(x: 15;y:-25;z: -15),

(x:-15;y:-25;z: -15),

(x:-15;y: 5;z: -15));

i,j,k,l,x,y,z:integer;

VV:**array** [1..8,1..4] **of** real =((-15,5,-35,1),(-15,-25,-35,1),(15,-25,-35,1),

(15,5,-35,1),(15,5,-15,1),(15,-25,-15,1),(-15,-25,-15,1),(-15,5,-15,1));

summa:real;

mmm,nnn,lll,xxx,yyy,zzz:real;

kx,ky,kz:real;

**implementation**

{$R \*.lfm}

{ TForm1 }

**Procedure** DrawLine1( a, b: TXYZ);

**Function** cX( X, Z : real ) : real;

**Begin**

cX := (X + ((Form1.Width-50)**Div** 2)) - Z;

**End**;

**Function** cY( Y, Z : real ) : real;

**Begin**

cY := ((Form1.Top+550) **Div** 2) - Y + Z;

**End**;

**begin**

Form1.Canvas.Line(round(cX(a.x, a.Z)), round(cY(a.y, a.Z)), round(cX(b.x, b.Z)), round(cY(b.y, b.Z)));

**end**;

**procedure** osi;

**begin**

Form1.Canvas.Pen.color:=clred;;

Form1.Canvas.Line(500,325,500,0);

Form1.Canvas.Line(500,325,1000,325);

Form1.Canvas.Line(500,325,0,650);

**end**;

**procedure** TForm1.FormMouseWheelUp(Sender: TObject; Shift: TShiftState;

MousePos: TPoint; **var** Handled: Boolean);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

kx:=1.01;

ky:=1.01;

kz:=1.01;

m[1,1]:=kx;

m[2,2]:=ky;

m[3,3]:=kz;

m[4,4]:=1;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button2Click(Sender: TObject);

**begin**

Form1.Close;

**end**;

**procedure** TForm1.Button3Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

lll:=1;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=1;

m[3,3]:=1;

m[4,4]:=1;

m[4,3]:=lll;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button4Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

nnn:=1;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=1;

m[3,3]:=1;

m[4,4]:=1;

m[4,2]:=nnn;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button5Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

nnn:=-1;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=1;

m[3,3]:=1;

m[4,4]:=1;

m[4,2]:=nnn;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button6Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

mmm:=1;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=1;

m[3,3]:=1;

m[4,4]:=1;

m[4,1]:=mmm;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button7Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

mmm:=-1;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=1;

m[3,3]:=1;

m[4,4]:=1;

m[4,1]:=mmm;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button8Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

lll:=-1;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=1;

m[3,3]:=1;

m[4,4]:=1;

m[4,3]:=lll;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button9Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

xxx:=-3.14/10;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=cos(xxx);

m[3,3]:=cos(xxx);

m[4,4]:=1;

m[3,2]:=-sin(xxx);

m[2,3]:=sin(xxx);

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.FormMouseWheelDown(Sender: TObject; Shift: TShiftState;

MousePos: TPoint; **var** Handled: Boolean);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

kx:=0.99;

ky:=0.99;

kz:=0.99;

m[1,1]:=kx;

m[2,2]:=ky;

m[3,3]:=kz;

m[4,4]:=1;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button1Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

// osi;

Form1.Canvas.Pen.Color:=clBlack;

DrawLine1(v[0],v[1]);

DrawLine1(v[1],v[2]);

DrawLine1(v[2],v[3]);

DrawLine1(v[3],v[0]);

DrawLine1(v[0],v[7]);

DrawLine1(v[1],v[6]);

DrawLine1(v[2],v[5]);

DrawLine1(v[3],v[4]);

DrawLine1(v[4],v[5]);

DrawLine1(v[5],v[6]);

DrawLine1(v[6],v[7]);

DrawLine1(v[7],v[4]);

**end**;

**procedure** TForm1.Button15Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

//mmm:=1;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=1;

m[3,3]:=-1;

m[4,4]:=1;

//m[4,1]:=mmm;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button10Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

xxx:=3.14/10;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=cos(xxx);

m[3,3]:=cos(xxx);

m[4,4]:=1;

m[3,2]:=-sin(xxx);

m[2,3]:=sin(xxx);

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button11Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

yyy:=-3.14/10;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=cos(yyy);

m[2,2]:=1;

m[3,3]:=cos(yyy);

m[4,4]:=1;

m[3,1]:=sin(yyy);

m[1,3]:=-sin(yyy);

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button12Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

yyy:=3.14/10;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=cos(yyy);

m[2,2]:=1;

m[3,3]:=cos(yyy);

m[4,4]:=1;

m[3,1]:=sin(yyy);

m[1,3]:=-sin(yyy);

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button13Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

zzz:=-3.14/10;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=cos(zzz);

m[2,2]:=cos(zzz);

m[3,3]:=1;

m[4,4]:=1;

m[2,1]:=-sin(zzz);

m[1,2]:=sin(zzz);

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button14Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

zzz:=3.14/10;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=cos(zzz);

m[2,2]:=cos(zzz);

m[3,3]:=1;

m[4,4]:=1;

m[2,1]:=-sin(zzz);

m[1,2]:=sin(zzz);

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button16Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

//mmm:=-1;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=1;

m[2,2]:=-1;

m[3,3]:=1;

m[4,4]:=1;

// m[4,1]:=mmm;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

**end**;

**procedure** TForm1.Button17Click(Sender: TObject);

**begin**

Form1.Canvas.Pen.Color:=clWhite;

**for** i:=0 **to** 750 **do**

Form1.Canvas.Line(0,i,1000,i);

//mmm:=-1;

Form1.Canvas.Pen.Color:=clBlack;

**for** i:=1 **to** 4 **do**

**for** j:=1 **to** 4 **do**

m[i,j]:=0;

m[1,1]:=-1;

m[2,2]:=1;

m[3,3]:=1;

m[4,4]:=1;

// m[4,1]:=mmm;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[1,l]\*m[l,j];

mm[1,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[2,l]\*m[l,j];

mm[2,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[3,l]\*m[l,j];

mm[3,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[4,l]\*m[l,j];

mm[4,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[5,l]\*m[l,j];

mm[5,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[6,l]\*m[l,j];

mm[6,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[7,l]\*m[l,j];

mm[7,j] := Summa;

**end**;

**for** j:=1 **to** 4 **do**

**begin**

Summa:= 0;

**for** l:= 1 **to** 4 **do**

Summa:= Summa + vv[8,l]\*m[l,j];

mm[8,j] := Summa;

**end**;

vvv[0].x:=mm[1,1];

vvv[0].y:=mm[1,2];

vvv[0].z:=mm[1,3];

vvv[1].x:=mm[2,1];

vvv[1].y:=mm[2,2];

vvv[1].z:=mm[2,3];

vvv[2].x:=mm[3,1];

vvv[2].y:=mm[3,2];

vvv[2].z:=mm[3,3];

vvv[3].x:=mm[4,1];

vvv[3].y:=mm[4,2];

vvv[3].z:=mm[4,3];

vvv[4].x:=mm[5,1];

vvv[4].y:=mm[5,2];

vvv[4].z:=mm[5,3];

vvv[5].x:=mm[6,1];

vvv[5].y:=mm[6,2];

vvv[5].z:=mm[6,3];

vvv[6].x:=mm[7,1];

vvv[6].y:=mm[7,2];

vvv[6].z:=mm[7,3];

vvv[7].x:=mm[8,1];

vvv[7].y:=mm[8,2];

vvv[7].z:=mm[8,3];

DrawLine1(vvv[0],vvv[1]);

DrawLine1(vvv[1],vvv[2]);

DrawLine1(vvv[2],vvv[3]);

DrawLine1(vvv[3],vvv[0]);

DrawLine1(vvv[0],vvv[7]);

DrawLine1(vvv[1],vvv[6]);

DrawLine1(vvv[2],vvv[5]);

DrawLine1(vvv[3],vvv[4]);

DrawLine1(vvv[4],vvv[5]);

DrawLine1(vvv[5],vvv[6]);

DrawLine1(vvv[6],vvv[7]);

DrawLine1(vvv[7],vvv[4]);

vv[1,1]:=mm[1,1];

vv[1,2]:=mm[1,2];

vv[1,3]:=mm[1,3];

vv[2,1]:=mm[2,1];

vv[2,2]:=mm[2,2];

vv[2,3]:=mm[2,3];

vv[3,1]:=mm[3,1];

vv[3,2]:=mm[3,2];

vv[3,3]:=mm[3,3];

vv[4,1]:=mm[4,1];

vv[4,2]:=mm[4,2];

vv[4,3]:=mm[4,3];

vv[5,1]:=mm[5,1];

vv[5,2]:=mm[5,2];

vv[5,3]:=mm[5,3];

vv[6,1]:=mm[6,1];

vv[6,2]:=mm[6,2];

vv[6,3]:=mm[6,3];

vv[7,1]:=mm[7,1];

vv[7,2]:=mm[7,2];

vv[7,3]:=mm[7,3];

vv[8,1]:=mm[8,1];

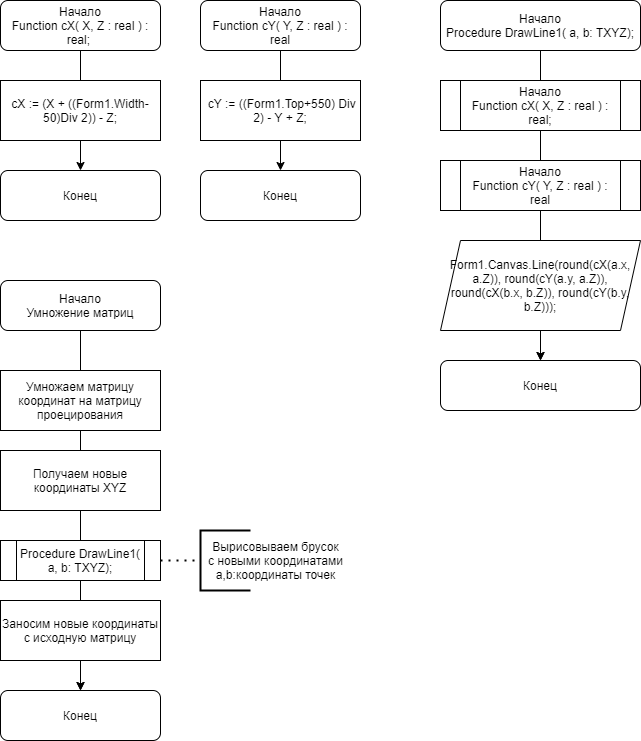
vv[8,2]:=mm[8,2];

vv[8,3]:=mm[8,3];

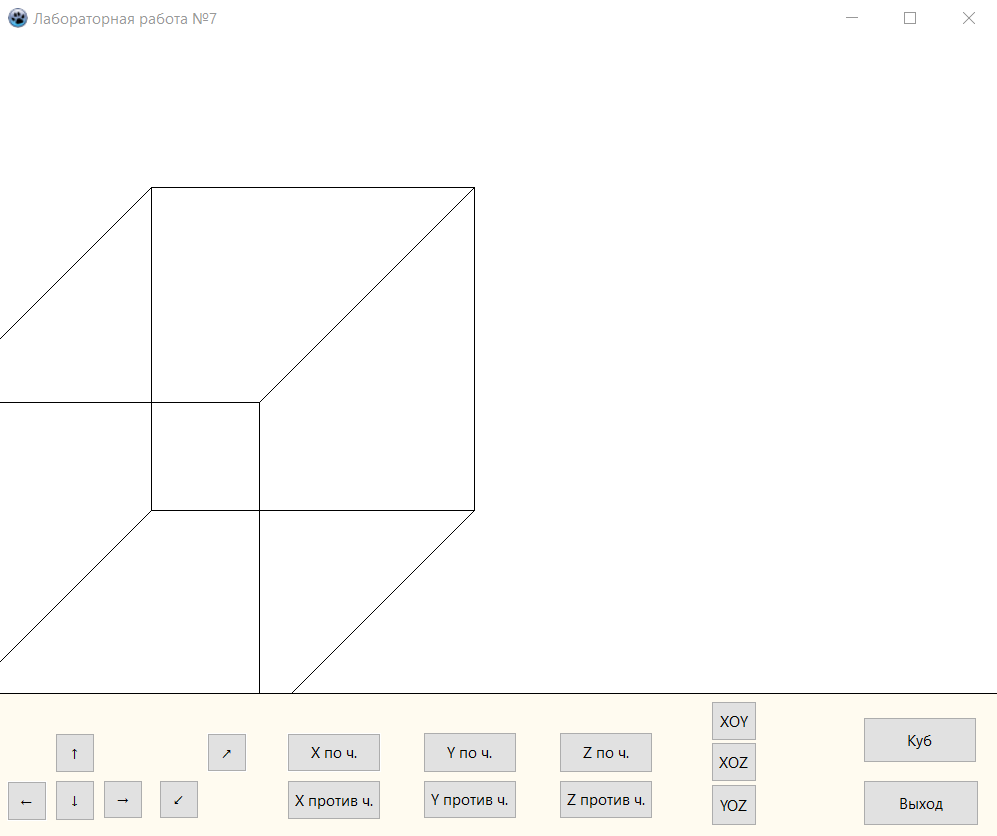
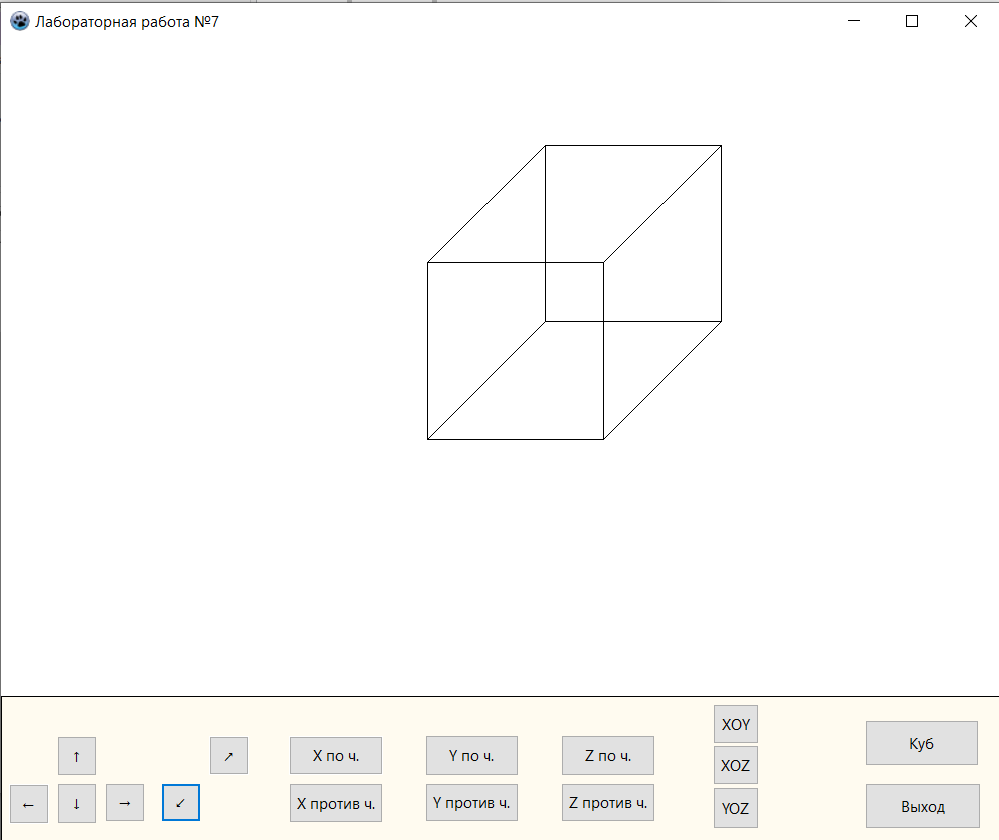
**end**;

**end**.

**Схемы алгоритмов**



**Экранные формы**



**Вывод**

В ходе выполнения данной лабораторной работы были реализованы матрицы переноса, масштабирования, отражения и вращения применительно к координатам куба, указанного в программе. При помощи среды программирования Lazarus была создана программа, демонстрирующая движение и преобразования формы заданного координатами куба в пространстве.