LAMPIRAN

PROGRAM PEMBENTUKAN KURVA DAN PERMUKAAN BEZIER

Program ini terdiri dari :

- Program entry data kurva Bezier yang berguna untuk membuat file data *.bek dan mengisi data titik-titik kontrol untuk kurva Bezier.
- Program entry data Permukaan Bezier yang berguna untuk membuat file data *.bez dan mengisi data titik-titik kontrol untuk permukaan Bezier.
- Program Pembentukan Kurva Bezier berguna untuk membentuk kurva dari data titik-titik kontrol yang disimpan dalam file *.bek dan membuka contoh kurva dari file d.bek.
- Program Pembentukan Permukaan Bezier berguna untuk membentuk Permukaan dari data titik-titik kontrol yang disimpan dalam file *.bez dan membuka contoh permukaan dari file mb1.bez, mb2.bez, ..., mb15.bez yang membentuk permukaan sederhana untuk sebuah mobil.

Listing dari program-program tersebut adalah :

- Program entry data kurva Bezier

```
uses crt;
type data = record
              tkontrol  : integer;
              absis     : array [0..50] of integer;
              ordinat   : array [0..50] of integer;
            end;

var filedata : file of data;
    recdata  : data;
    i,n      : integer;
    namafile : string[8];
```

```
begin
clrscr;
textcolor(white);
gotoxy(10,10);
write('NAMA FILE DATA [8] : ');
readln(namafile);
assign(filedata,namafile+'.bek');
rewrite(filedata);
with recdata do
begin
 clrscr;
 gotoxy(10,6);
 write('BANYAKNYA TITIK CONTROL : ');
 readln(n);
 tkontrol:= n-1;

 for i:=0 to tkontrol do
  begin
    gotoxy(10,7+i);write('ABSIS ( ',i,' ) : ');
    readln(absis[i]);
    gotoxy(50,7+i);write('ORDINAT ( ',i,' ) : ');
    readln(ordinat[i]);
  end;
 write(filedata,recdata);
end;
close(filedata);
end.
```

```
{  Program entry data permukaan Bezier

uses crt;
type data = record
              tkontrol : integer;
              ctitik   : integer;
              absis    : array [0..50,0..50] of integer;
              ordinat: array [0..50,0..50] of integer;
            end;

var filedata : file of data;
    recdata  : data;
    i,j,k,n,m: integer;
    namafile : string[8];

begin
clrscr;
textcolor(white);
```

```
gotoxy(10,10);
write('NAMA FILE DATA [8] : ');
readln(namafile);
assign(filedata,namafile+'.bez');
rewrite(filedata);
with recdata do
begin
 clrscr;
 gotoxy(10,5);
 write('BANYAKNYA TITIK KONTROL ARAH PARAMETER u  : ');
 readln(n);
 gotoxy(10,6);
 write('BANYAKNYA TITIK KONTROL ARAH PARAMETER v : ');
 readln(m);
 tkontrol:=n-1;
 ctitik:=m-1;

 for i:=0 to ctitik do
 begin
  clrscr;
  for j:=0 to tkontrol do
   begin
    gotoxy(10,7+j);
    write('ABSIS ( ',i,',',j,' ) : ');
    readln(absis[i,j]);
    gotoxy(50,7+j);
    write('ORDINAT ( ',i,',',j,' ) : ');
    readln(ordinat[i,j]);
   end;
  end;
 write(filedata,recdata);
end;
close(filedata);
end.
```

- Program Pembentukan Kurva Bezier;

```
Program Kurva_Bezier;
Uses crt, dos, graph;

Type A = Array[0..100] of integer;
    data = record
             Tkontrol : integer;
             absis    : array [0..50] of integer;
             ordinat  : array [0..50] of integer;
            end;
```

```
var filedata : file of data;
    recdata  : data;
    nama     : string;
    DriverGrafik, ModeGrafik, i : integer;
    langkahi : integer;
    m,n      :integer;
    v,u      : real;
    pilih    : char;

Procedure GambarPoligon;
var i,j : integer;
begin
WITH RECDATA DO
 begin
  for i := 0 to Tkontrol-1 do
   line(Absis[i],Ordinat[i],Absis[i+1],Ordinat[i+1]);
  if i=Tkontrol-1 then
   line(Absis[i+1],Ordinat[i+1],Absis[0],Ordinat[0]);
 end;
end;

function kombinasi (n,i : integer) : integer;
var A, j : integer;
begin
 A := 1;
 for j := i+1 to n do
   A := A*j;
 for j := 1 to n-i do
   A := A div j;
 kombinasi := A;
end;

function BBlend(i,n : integer; u : real) : real;
var j : integer;
    C : real;
begin
  C := kombinasi(n,i);
  for j := 1 to i do
    C := C * u;
  for j := 1 to n-i do
    C := C * (1-u);
  BBlend :=C;
end;
```

```
procedure Bezier(u: real; n : integer; var x,y : real);
var i : integer;
    B : real;
begin
WITH RECDATA DO
begin
 x := 0; y := 0;
 for i := 0 to n do
     begin
       B := BBlend(i,n,u);
       x := x + Absis[i] * B;
       y := y + Ordinat[i] * B;
     end;
end;
end;

procedure Gambarkurva;
var i : integer;
    x,y : real;
    xl,yl : integer;
begin
WITH RECDATA DO
begin
 for i := 0 to langkahI do
  begin
   Bezier(i/langkahI,Tkontrol,x,y);
   if i = 0 then
        moveTo(round(x),round(y))
   else
        lineto(round(x),round(y))
  end;
end;
end;

begin
  clrscr;
  textcolor(white);
  writeln('BUAT KURVA BARU (1)');
  writeln('BUKA CONTOH KURVA (2)');
  writeln('CANCEL (3)');
  write('PILIH 1, 2 ATAU 3 : ');
  pilih:=readkey;
  if pilih='1' then
   begin
     gotoxy(1,6);
     write('NAMA FILE DATA  : ');readln(nama);
     assign(filedata,nama+'.bek');
```

```
      write('Interval Kenaikan Parameter u = 1/k, k = ');
      readln(langkahi);
      DriverGrafik := detect;
      InitGraph(DriverGrafik,ModeGrafik,'C:\TP\bgi');
      assign(filedata,nama+'.bek');
      reset(filedata);
      reset(filedata);
      for i:=1 to filesize(filedata) do
         read(filedata,recdata);
         gambarpoligon;
         gambarkurva;
         readln;
         close(filedata);
   end
   else
     if pilih='2' then
       begin
         langkahi := 20;
         DriverGrafik := detect;
         InitGraph(DriverGrafik,ModeGrafik,'C:\TP\bgi');
         setbkcolor(white);
         assign(filedata,'d.bek');
         reset(filedata);
         for i:=1 to filesize(filedata) do
             read(filedata,recdata);
             setcolor(8);
             gambarpoligon;
             gambarkurva;
             readln;
             close(filedata);
       end
   else
     if pilih='3' then
     exit;
    closegraph;
end.
```

- Program Pembentukan Permukaan Bezier

```
Program Permukaan_Bezier;
Uses crt, dos, graph;
Type data = record
             ctitik   : integer;
             tkontrol : integer;
             absis    : array [0..50,0..50] of integer;
             ordinat  : array [0..50,0..50] of integer;
            end;
```

```
var filedata : file of data;
    recdata  : data;
    nama : array[1..100] of string;
    DriverGrafik, ModeGrafik, I : integer;
    jenis : string;
    m,n :integer;
    v,u    : real;
    pilih : char;
    langkahi, langkahj : integer;

Procedure GambarPoligon;
var i,j : integer;
begin
WITH RECDATA DO
begin
 for j := 0 to TKontrol do
   for i := 0 to CTitik-1 do
   line(Absis[j,i],Ordinat[j,i],Absis[j,i+1],Ordinat[j,i+1]);
 for j:=0 to TKontrol-1 do
 for i := 0 to CTitik do
  line(Absis[j,i],Ordinat[j,i],Absis[j+1,i],Ordinat[j+1,i]);
 end;
end;

function kombinasi (n,i : integer) : integer;
var A, j : integer;
begin
 A := 1;
 for j := i+1 to n do
   A := A*j;
 for j := 1 to n-i do
   A := A div j;
 kombinasi := A;
end;

function BBlend(i,n : integer; u : real) : real;
var j : integer;
    v : real;
begin
  v := kombinasi(n,i);
  for j := 1 to i do
    v := v * u;
  for j := 1 to n-i do
    v := v * (1-u);
  BBlend :=v;
end;
```

```
procedure Bezier(u, v : real; n,m : integer; var x,y : real);
var i,j : integer;
    B, Bl : real;
begin
WITH RECDATA DO
begin
 x := 0; y := 0;
 for i := 0 to n do
  begin
   for j := 0 to m do
     begin
       B := BBlend(i,n,u);
       Bl:= BBlend(j,m,v);
       x := x + Absis[j,i] * B * Bl;
       y := y + Ordinat[j,i] * B * Bl;
     end;
  end;
end;
end;

procedure GambarPermukaan;
var i,j : integer;
    x,y : real;
    xl,yl : integer;
begin
WITH RECDATA DO
begin
 for i := 0 to langkahI do
 for j := 0 to langkahj do
  begin
   Bezier(i/langkahI,j/langkahj,CTitik,TKontrol,x,y);
    if (j = 0) then
       moveTo(round(x),round(y))
   else
       lineto(round(x),round(y))
  end;
 for i := 0 to langkahI do
 for j := 0 to langkahj do
  begin
   Bezier(j/langkahj,i/langkahi,CTitik,TKontrol,x,y);
    if (j = 0) then
       moveTo(round(x),round(y))
    else
       lineto(round(x),round(y))
  end;
end;
end;
```

```
begin
  clrscr;
  textcolor(white);
  writeln('BUAT PERMUKAAN (1)');
  writeln('BUKA CONTOH (2)');
  writeln('CANCEL (3)');
  write('PILIH 1, 2 ATAU 3 : ');
  pilih:=readkey;
  if pilih='1' then
   begin
     gotoxy(1,6);
     write('BERAPA FILE DATA YANG DIGUNAKAN ?');readln(n);
     for m:=1 to n do
       begin
         write('NAMA FILE DATA KE- ',m,' : ');
          readln(nama[m]);
         write('Interval Kenaikan Parameter u = 1/k, k = ');
          readln(langkahi);
         write('Interval Kenaikan Parameter v = 1/l, l = ');
          readln(langkahj);
       end;
     DriverGrafik := detect;
     InitGraph(DriverGrafik,ModeGrafik,'C:\TP\bgi');
     for m:=1 to n do
      begin
         assign(filedata,nama[m]+'.bez');
         reset(filedata);
         for i:=1 to filesize(filedata) do
            read(filedata,recdata);
         setcolor(m+1);
         gambarpoligon;
         gambarpermukaan;
         close(filedata);
      end;
   end
  else
    if pilih='2' then
      begin
        langkahi := 20;
        langkahj := 20;
        DriverGrafik := detect;
        InitGraph(DriverGrafik,ModeGrafik,'C:\TP\bgi');
        for m := 1 to 15 do
          begin
            str(m,jenis);
            assign(filedata,'mb'+jenis+'.bez');
            reset(filedata);
```

```
                for i:=1 to filesize(filedata) do
                  read(filedata,recdata);
                setcolor(m+1);
                gambarpermukaan;
                close(filedata);
              end;
        end
    else
      if pilih='3' then
      exit;
     readln;
     closegraph;
end.
```

Contoh-contoh yang telah dibentuk oleh program ini menggunakan input data yang disesuaikan dengan resolusi layar monitor yang digunakan yaitu X x Y = 640x480 dengan arah sebagai berikut :

Data titik-titik kontrol dalam file-file data tersebut adalah sebagai berikut :

1. mb1.bez

$P_{0,0}$ = (231, 383)	$P_{1,0}$ = (180, 374)
$P_{0,1}$ = (238, 335)	$P_{1,1}$ = (180, 319)
$P_{0,2}$ = (269, 295)	$P_{1,2}$ = (270, 276)
$P_{0,3}$ = (290, 348)	$P_{1,3}$ = (293, 346)

2. mb2.bez

$P_{0,0}$ = (180, 374)	$P_{1,0}$ = (180, 374)
$P_{0,1}$ = (180, 319)	$P_{1,1}$ = (182, 308)
$P_{0,2}$ = (270, 276)	$P_{1,2}$ = (268, 276)
$P_{0,3}$ = (293, 346)	$P_{1,3}$ = (311, 269)

3. mb3.bez

$P_{0,0}$ = (180, 374)	$P_{1,0}$ = (118, 361)
$P_{0,1}$ = (182, 308)	$P_{1,1}$ = (107, 302)
$P_{0,2}$ = (268, 276)	$P_{1,2}$ = (146, 257)
$P_{0,3}$ = (311, 269)	$P_{1,3}$ = (168, 252)

4. mb4.bez

$P_{0,0}$ = (118, 361)	$P_{1,0}$ = (79, 356)
$P_{0,1}$ = (112, 332)	$P_{1,1}$ = (67, 311)
$P_{0,2}$ = (122, 298)	$P_{1,2}$ = (116, 279)
$P_{0,3}$ = (132, 283)	$P_{1,3}$ = (132, 283)

5. mb5.bez

$P_{0,0}$ = (293, 346)	$P_{1,0}$ = (309, 275)
$P_{0,1}$ = (302, 334)	$P_{1,1}$ = (353, 246)
$P_{0,2}$ = (369, 272)	$P_{1,2}$ = (389, 210)
$P_{0,3}$ = (393, 256)	$P_{1,3}$ = (418, 183)

6. mb6.bez

$P_{0,0}$ = (309, 275)	$P_{1,0}$ = (311, 269)
$P_{0,1}$ = (353, 246)	$P_{1,1}$ = (356, 241)
$P_{0,2}$ = (389, 210)	$P_{1,2}$ = (387, 208)
$P_{0,3}$ = (418, 183)	$P_{1,3}$ = (417, 182)

7. mb7.bez

$P_{0,0}$ = (193, 213)	$P_{1,0}$ = (185, 197)
$P_{0,1}$ = (218, 175)	$P_{1,1}$ = (223, 161)
$P_{0,2}$ = (300, 186)	$P_{1,2}$ = (316, 182)
$P_{0,3}$ = (313, 210)	$P_{1,3}$ = (321, 213)

8. mb8.bez

$P_{0,0}$ = (321, 213)	$P_{1,0}$ = (320, 209)
$P_{0,1}$ = (356, 162)	$P_{1,1}$ = (355, 159)
$P_{0,2}$ = (415, 154)	$P_{1,2}$ = (415, 154)
$P_{0,3}$ = (440, 214)	$P_{1,3}$ = (440, 214)

9. mb9.bez

$P_{0,0}$ = (358, 235)	$P_{1,0}$ = (364, 229)
$P_{0,1}$ = (361, 208)	$P_{1,1}$ = (368, 203)
$P_{0,2}$ = (362, 197)	$P_{1,2}$ = (368, 198)
$P_{0,3}$ = (360, 178)	$P_{1,3}$ = (366, 176)

10. mb10.bez

$P_{0,0}$ = (312, 269)	$P_{1,0}$ = (306, 266)
$P_{0,1}$ = (309, 242)	$P_{1,1}$ = (304, 238)
$P_{0,2}$ = (307, 233)	$P_{1,2}$ = (299, 230)
$P_{0,3}$ = (321, 212)	$P_{1,3}$ = (313, 209)

11. mb11.bez

$P_{0,0}$ = (174, 251)	$P_{1,0}$ = (168, 251)
$P_{0,1}$ = (173, 224)	$P_{1,1}$ = (166, 224)
$P_{0,2}$ = (177, 216)	$P_{1,2}$ = (170, 217)
$P_{0,3}$ = (193, 198)	$P_{1,3}$ = (184, 198)

12. mb12.bez

$P_{0,0}$ = (211, 372)
$P_{0,1}$ = (255, 342)
$P_{0,2}$ = (173, 335)
$P_{0,3}$ = (211, 358)

$P_{1,0}$ = (212, 358)
$P_{1,1}$ = (212, 358)
$P_{1,2}$ = (212, 358)
$P_{1,3}$ = (212, 358)

13. mb13.bez

$P_{0,0}$ = (393, 257)
$P_{0,1}$ = (408, 206)
$P_{0,2}$ = (421, 180)
$P_{0,3}$ = (440, 215)

$P_{1,0}$ = (393, 257)
$P_{1,1}$ = (393, 189)
$P_{1,2}$ = (418, 171)
$P_{1,3}$ = (440, 215)

14. mb14.bez

$P_{0,0}$ = (320, 210)
$P_{0,1}$ = (355, 158)
$P_{0,2}$ = (400, 160)
$P_{0,3}$ = (418, 182)
$P_{2,0}$ = (222, 162)
$P_{2,1}$ = (282, 148)
$P_{2,2}$ = (345, 142)
$P_{2,3}$ = (364, 150)

$P_{1,0}$ = (312, 181)
$P_{1,1}$ = (329, 155)
$P_{1,2}$ = (375, 148)
$P_{1,3}$ = (415, 180)
$P_{3,0}$ = (184, 197)
$P_{3,1}$ = (257, 148)
$P_{3,2}$ = (320, 145)
$P_{3,3}$ = (331, 158)

15. mb15.bez

$P_{0,0}$ = (96, 346)
$P_{0,1}$ = (134, 321)
$P_{0,2}$ = (64, 315)
$P_{0,3}$ = (96, 346)

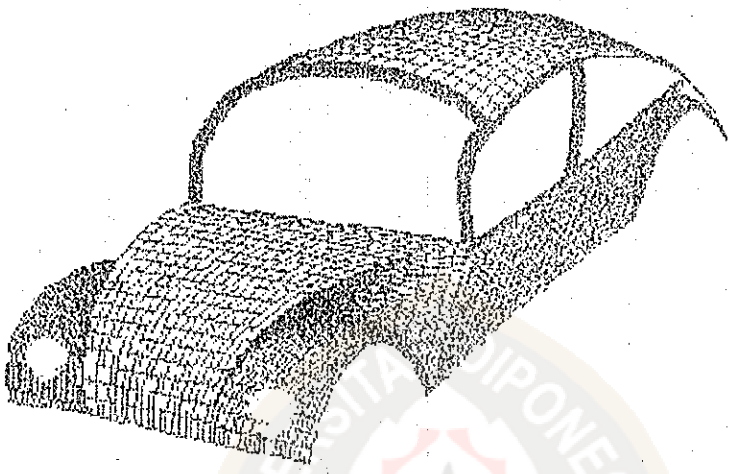
$P_{1,0}$ = (97, 334)
$P_{1,1}$ = (97, 334)
$P_{1,2}$ = (97, 334)
$P_{1,3}$ = (97, 334)

Contoh kurva Bezier yang digunakan disimpan dalam file data d.bek yang berisi lima titik kontrol sebagai berikut :

file d.bek

P_0 = (100, 300)
P_1 = (150, 200)
P_2 = (300, 250)
P_3 = (350, 300)
P_4 = (355, 325)

Hasil contoh permukaan :



Hasil contoh kurva :