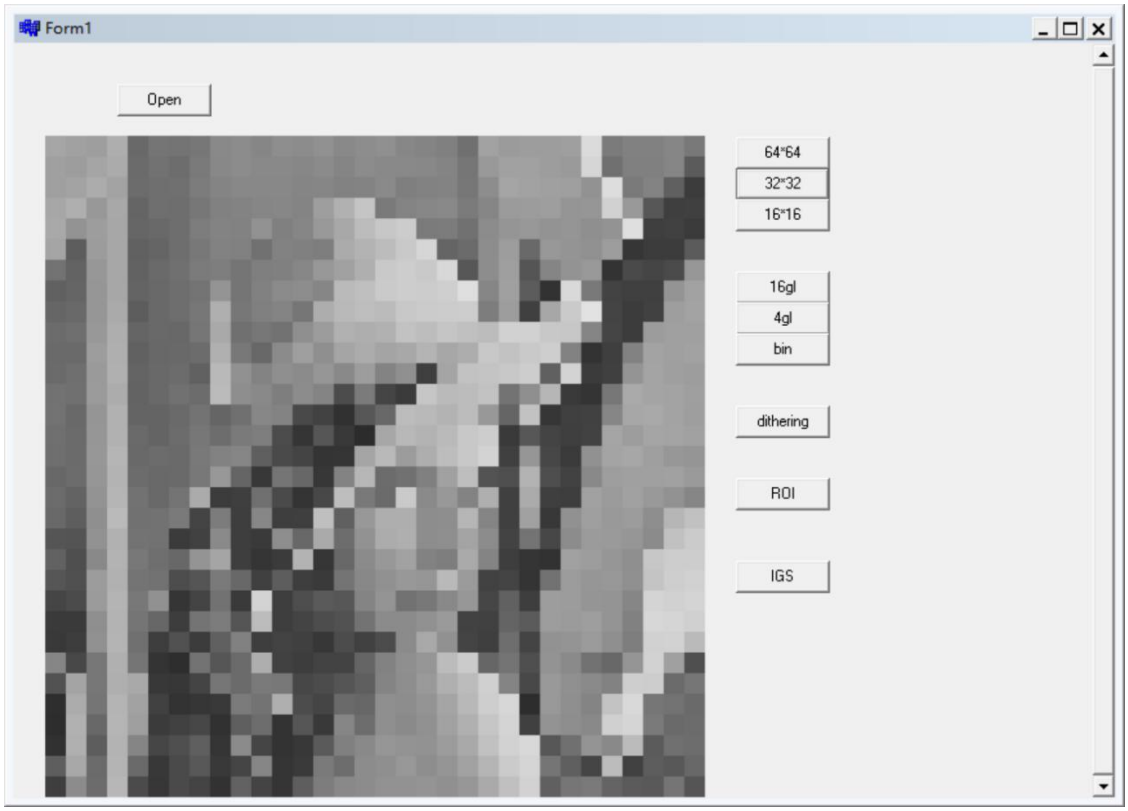
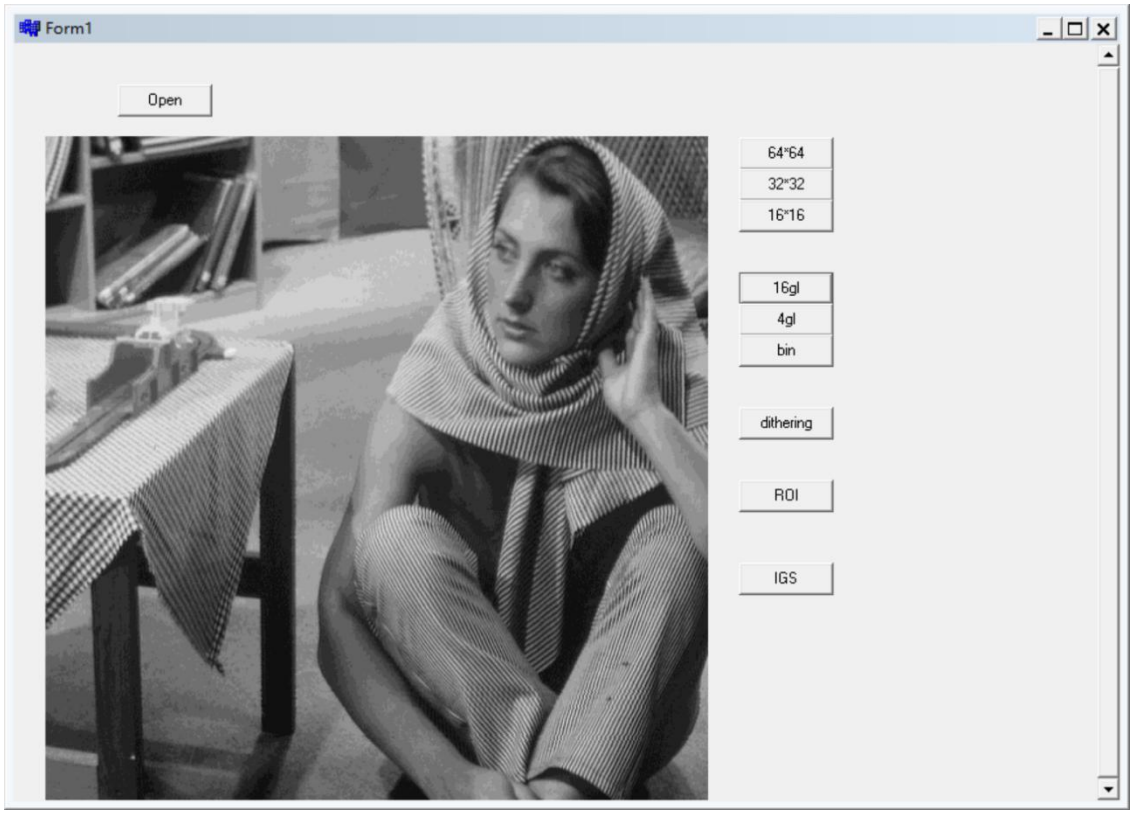
一、執行結果:

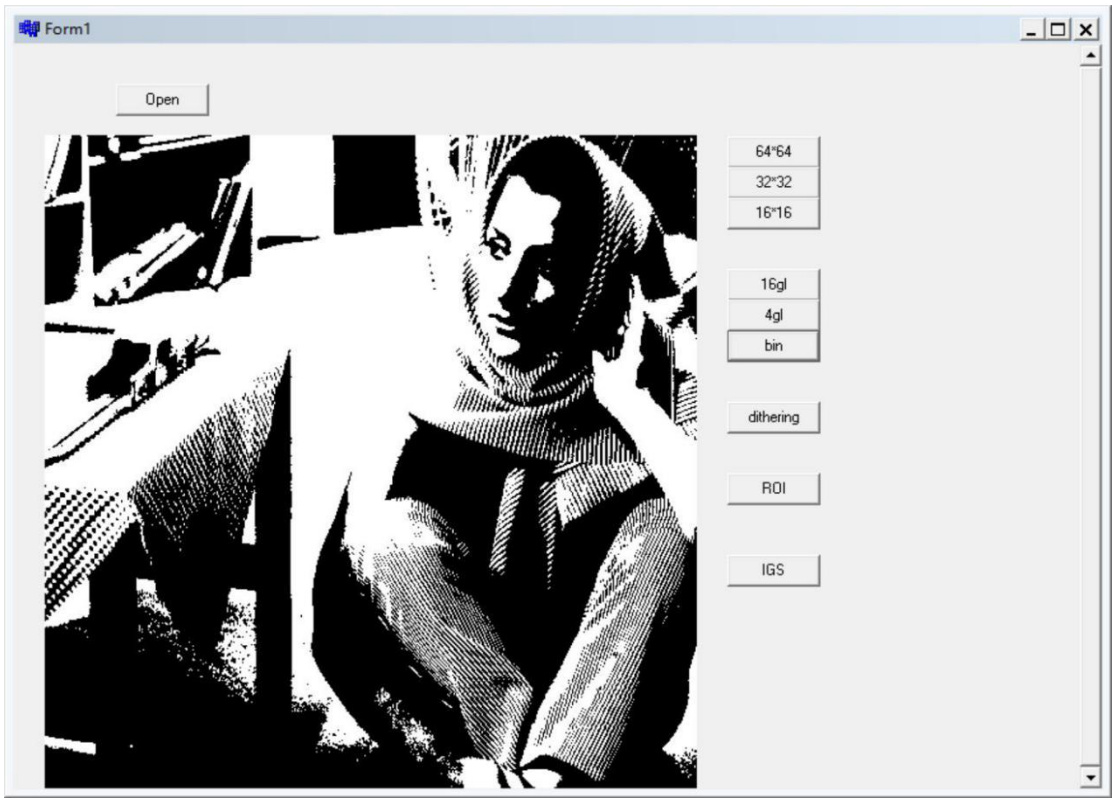
1. Quantization for spatial resolution with 3 levels



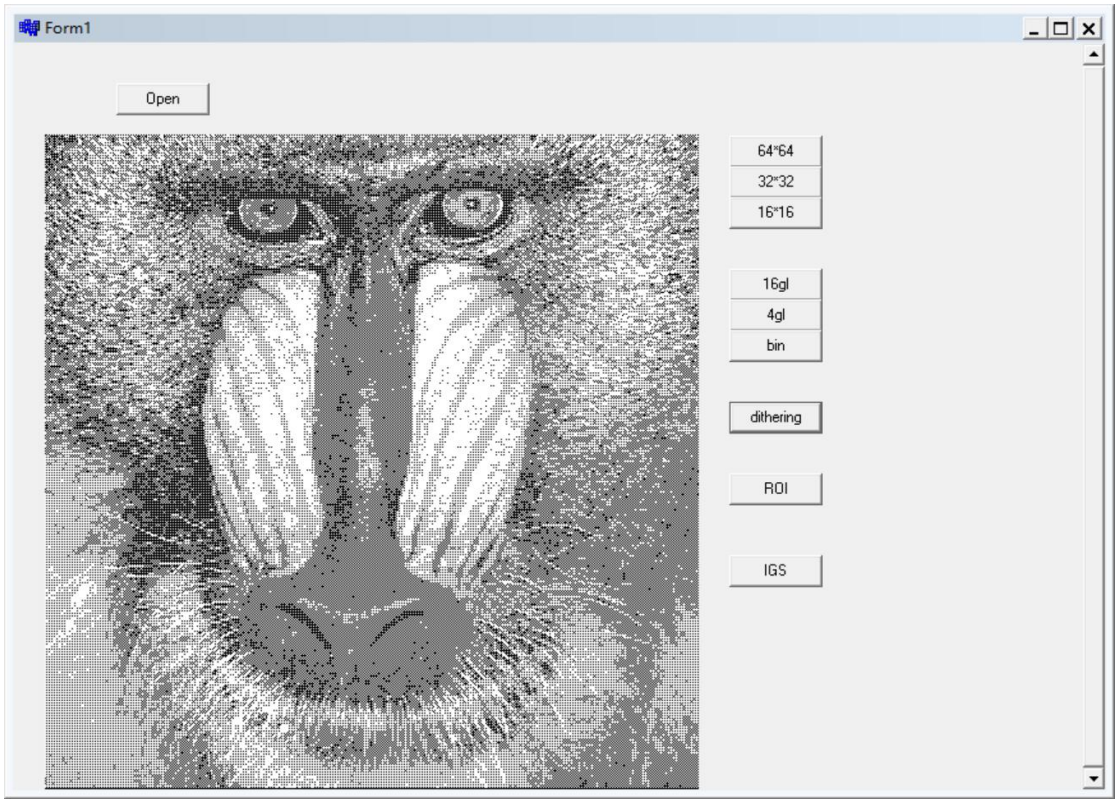
2. Quantization for the gray-level resolution with 3 levels



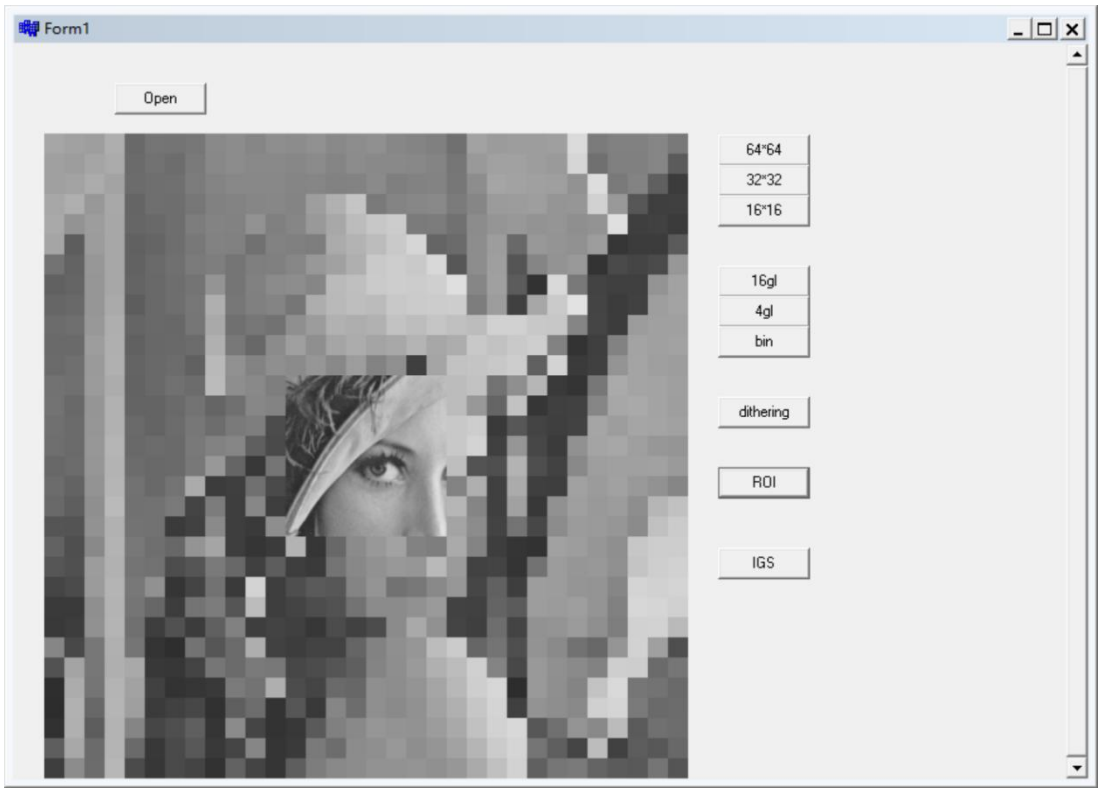

Form1
Open
64*64
32*32
16*16
16gl
4gl
bin
dithering
ROI
IGS


Form1
Open
64*64
32*32
16*16
16gl
4gl
bin
dithering
ROI
IGS

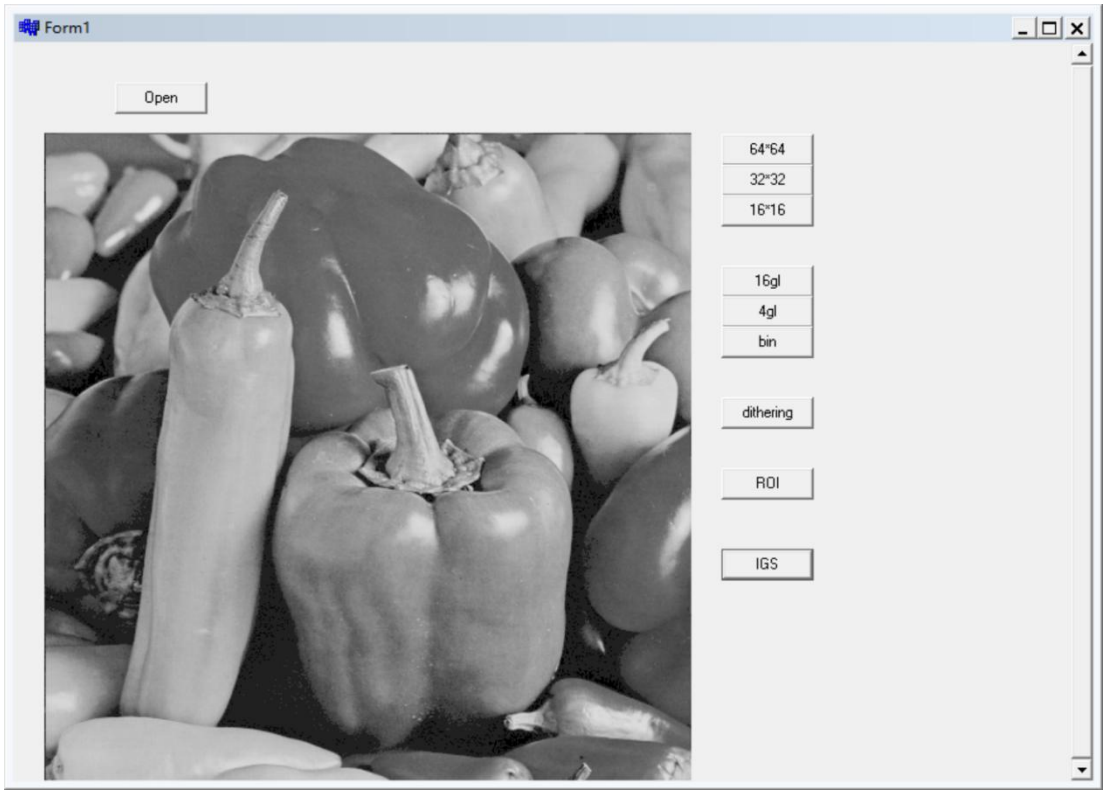
3. Dithering :halftoning



4. ROI (Region-of-Interest) functionality



5. IGS(with quantization)



二、程式碼

```
//---------------------------------------------------------------------
#include <vcl.h>
#include <stdio.h>
#include <math.h>
#pragma hdrstop

#include "Unit1.h"
//---------------------------------------------------------------------
#pragma package(smart_init)
#pragma resource "*.dfm"
TForm1 *Form1;
unsigned char image_array[512][512];

int height;
int width;
int sizeofimage;
```

```
//---------------------------------------------------------------
__fastcall TForm1::TForm1(TComponent* Owner)
        : TForm(Owner)
{
}
//---------------------------------------------------------------

void __fastcall TForm1::Button1Click(TObject *Sender)  //open
{
        height = 512;
        width = 512;
        sizeofimage = height*width;

        FILE *file_open;
        String image_name;
        if(OpenDialog1->Execute())
        {
                image_name = ExtractFilePath(OpenDialog1->FileName);
                image_name          =          image_name          +
ExtractFileName(OpenDialog1->FileName);
                file_open = fopen(image_name.c_str(),"rb");
                fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
                for(int x=0;x<512;x++)
                {
                        for(int y = 0;y < 512;y++)
                        {
                                int pic = image_array[y][x];

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
                        }
                }
                fclose(file_open);
        }
}
//---------------------------------------------------------------

void __fastcall TForm1::Button2Click(TObject *Sender)//Quantization
for spatial resolution with 3 levels 64*64
{
        height = 512;
        width = 512;
        sizeofimage = height*width;
```

```
        FILE *file_open;
        String image_name;
        int pic;
        if(OpenDialog1->Execute())
        {
                image_name = ExtractFilePath(OpenDialog1->FileName);
                image_name          =          image_name          +
ExtractFileName(OpenDialog1->FileName);
                file_open = fopen(image_name.c_str(),"rb");
                fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
               for(int x=0;x<512;x=x+8)
                {
                 for(int y=0;y<512;y=y+8)
                  {
                   pic = image_array[x][y];
                   PaintBox1->Canvas->Pen->Color=RGB(pic,pic,pic);
                   PaintBox1->Canvas->Brush->Color=RGB(pic,pic,pic);
                   PaintBox1->Canvas->Rectangle(y,x,y+8,x+8);
                   }
                }
                fclose(file_open);
        }
}
//---------------------------------------------------------------------

void __fastcall TForm1::Button3Click(TObject *Sender)//Quantization
for spatial resolution with 3 levels 32*32
 {
        height = 512;
        width = 512;
        sizeofimage = height*width;

        FILE *file_open;
        String image_name;
        int pic;
        if(OpenDialog1->Execute())
        {
                image_name = ExtractFilePath(OpenDialog1->FileName);
                image_name          =          image_name          +
ExtractFileName(OpenDialog1->FileName);
                file_open = fopen(image_name.c_str(),"rb");
                fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
```

```
              for(int x=0;x<512;x=x+16)
               {
                for(int y=0;y<512;y=y+16)
                 {
                  pic = image_array[x][y];
                  PaintBox1->Canvas->Pen->Color=RGB(pic,pic,pic);
                  PaintBox1->Canvas->Brush->Color=RGB(pic,pic,pic);
                  PaintBox1->Canvas->Rectangle(y,x,y+16,x+16);
                  }
               }
               fclose(file_open);
       }
}
//---------------------------------------------------------------------

void __fastcall TForm1::Button4Click(TObject *Sender)
//Quantization for spatial resolution with 3 levels 16*16
 {
       height = 512;
       width = 512;
       sizeofimage = height*width;

       FILE *file_open;
       String image_name;
       int pic;
       if(OpenDialog1->Execute())
       {
              image_name = ExtractFilePath(OpenDialog1->FileName);
              image_name          =          image_name          +
ExtractFileName(OpenDialog1->FileName);
              file_open = fopen(image_name.c_str(),"rb");
              fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
             for(int x=0;x<512;x=x+32)
              {
               for(int y=0;y<512;y=y+32)
                {
                 pic = image_array[x][y];
                 PaintBox1->Canvas->Pen->Color=RGB(pic,pic,pic);
                 PaintBox1->Canvas->Brush->Color=RGB(pic,pic,pic);
                 PaintBox1->Canvas->Rectangle(y,x,y+32,x+32);
                 }
              }
              fclose(file_open);
```

```
	}
 }
//---------------------------------------------------------------------

void __fastcall TForm1::Button5Click(TObject *Sender)
//Quantization for the gray-level resolution with 3 levels 16gl
{
	height = 512;
	width = 512;
	sizeofimage = height*width;

	FILE *file_open;
	String image_name;
	int pic;
	if(OpenDialog1->Execute())
	{
		image_name = ExtractFilePath(OpenDialog1->FileName);
		image_name = image_name +
ExtractFileName(OpenDialog1->FileName);
		file_open = fopen(image_name.c_str(),"rb");
		fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
		for(int x=0;x<512;x++)
		{
			for(int y = 0;y < 512;y++)
			{
				int pic = image_array[y][x];
				pic = (pic/16)*16;

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
			}
		}

	}
}
//---------------------------------------------------------------------

void __fastcall TForm1::Button6Click(TObject *Sender)
//Quantization for the gray-level resolution with 3 levels 4gl
{
	height = 512;
	width = 512;
	sizeofimage = height*width;
```

```
	FILE *file_open;
	String image_name;
	int pic;
	if(OpenDialog1->Execute())
	{
		image_name = ExtractFilePath(OpenDialog1->FileName);
		image_name = image_name +
ExtractFileName(OpenDialog1->FileName);
		file_open = fopen(image_name.c_str(),"rb");
		fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
		for(int x=0;x<512;x++)
		{
			for(int y = 0;y < 512;y++)
			{
				int pic = image_array[y][x];
				pic = (pic/64)*64;

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
			}
		}

	}
}
//---------------------------------------------------------------------

void __fastcall TForm1::Button7Click(TObject *Sender)
 //Quantization for the gray-level resolution with 3 levels bin
{
	height = 512;
	width = 512;
	sizeofimage = height*width;

	FILE *file_open;
	String image_name;
	int pic;
	if(OpenDialog1->Execute())
	{
		image_name = ExtractFilePath(OpenDialog1->FileName);
		image_name = image_name +
ExtractFileName(OpenDialog1->FileName);
		file_open = fopen(image_name.c_str(),"rb");
		fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
```

```
              for(int x=0;x<512;x++)
              {
                     for(int y = 0;y < 512;y++)
                     {
                            int pic = image_array[y][x];
                            pic = (pic/128)*255;

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
                     }
              }

       }
}
//---------------------------------------------------------------------

void __fastcall TForm1::Button8Click(TObject *Sender)//dithering
{
       height = 512;
       width = 512;
       sizeofimage = height*width;

       FILE *file_open;
       String image_name;
       int pic;
       int q;
       if(OpenDialog1->Execute())
       {
              image_name = ExtractFilePath(OpenDialog1->FileName);
              image_name          =          image_name          +
ExtractFileName(OpenDialog1->FileName);
              file_open = fopen(image_name.c_str(),"rb");
              fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
              for(int x=0;x<512;x=x+2)
              {
                     for(int y = 0;y < 512;y=y+2)
                     {
                            double pic = image_array[y][x];
                            if(pic > 0)
                            {
                              pic = 255;
                            }
                            else
                            {
```

```
                        pic = 0;
                       }

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
                }
             }
              for(int x=1;x<512;x=x+2)
             {
                    for(int y = 0;y < 512;y=y+2)
                    {
                           double pic = image_array[y][x];
                           if(pic > 192)
                           {
                             pic = 255;
                           }
                           else
                           {
                             pic = 0;
                           }

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
                }
             }
              for(int x=0;x<512;x=x+2)
             {
                    for(int y = 1;y < 512;y=y+2)
                    {
                           double pic = image_array[y][x];
                           if(pic > 128)
                           {
                             pic = 255;
                           }
                           else
                           {
                             pic = 0;
                           }

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
                }
             }
              for(int x=1;x<512;x=x+2)
             {
                    for(int y = 1;y < 512;y=y+2)
                    {
```

```
                              pic = image_array[y][x];
                              if(pic > 64)
                              {
                                pic = 255;
                              }
                              else
                              {
                                pic = 0;
                              }

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
                        }
                }
        }
}
//---------------------------------------------------------------------


void __fastcall TForm1::Button10Click(TObject *Sender)//IGS
{
        height = 512;
        width = 512;
        sizeofimage = height*width;

        FILE *file_open;
        String image_name;
        int pic;
        if(OpenDialog1->Execute())
        {
                image_name = ExtractFilePath(OpenDialog1->FileName);
                image_name          =          image_name          +
ExtractFileName(OpenDialog1->FileName);
                file_open = fopen(image_name.c_str(),"rb");
                fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
               for(int x=0;x<512;x++)
                {
                 for(int y=0;y<512;y++)
                  {
                     int pic1 = image_array[y][x];
                     if (pic1 > 55 )

PaintBox1->Canvas->Pixels[x][y]=RGB(pic1,pic1,pic1);
                     else
```

```
                {
                  int pic2 = image_array[y-1][x];
                  pic = pic1 + pic2 % 16;
                  pic = pic/32*32;

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
                }
              }
             }
             fclose(file_open);
       }
}
//---------------------------------------------------------------------

void __fastcall TForm1::Button9Click(TObject *Sender)//ROI
{
 height = 512;
       width = 512;
       sizeofimage = height*width;
       int pic;
       FILE *file_open;
       String image_name;
       if(OpenDialog1->Execute())
       {
             image_name = ExtractFilePath(OpenDialog1->FileName);
             image_name          =          image_name          +
ExtractFileName(OpenDialog1->FileName);
             file_open = fopen(image_name.c_str(),"rb");
             fread(image_array,sizeof(unsigned
char)*512*512,1,file_open);
          for(int y = 0;y <192;y++)
          {
              for(int x=0;x<512;x++)
             {
                 pic = image_array[y/16*16][x/16*16];

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
             }
          }
          for(int y = 320;y <512;y++)
          {
              for(int x=0;x<512;x++)
             {
                 pic = image_array[y/16*16][x/16*16];
```

```
PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
              }
           }

           for(int y = 192;y <320;y++)
           {
               for(int x=0;x<192;x++)
              {
                  pic = image_array[y/16*16][x/16*16];

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
              }
           }
           for(int y = 192;y<320;y++)
           {
               for(int x=320;x<512;x++)
              {
                  pic = image_array[y/16*16][x/16*16];

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
              }
           }


              for(int x=192;x<320;x++)
              {
                     for(int y = 192;y <320;y++)
                     {
                            int pic = image_array[y][x];

PaintBox1->Canvas->Pixels[x][y]=RGB(pic,pic,pic);
                     }
              }
         fclose(file_open);
        }
}
//---------------------------------------------------------------------------
```