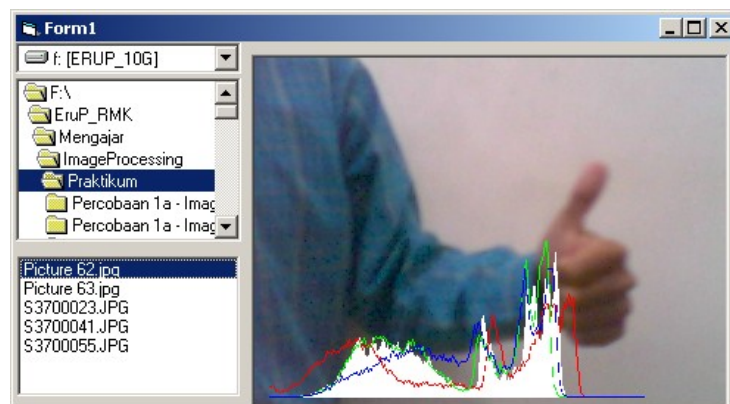|	PRAKTIKUM IV
	Kompensasi Pencahayaan

Tujuan

- Memberikan pengertian perlunya dilakukan pengaturan pencahayaan
- Memberikan contoh macam-macam cara pengaturan pencahayaan

Teori Penunjang

Gambar Percobaan

Prosedur Percobaan

1. Percobaan percobaan berikut tetap menggunakan program (proyek) seperti pada percobaan sebelumnya, sehingga anda dapat menyalin percobaan sebelumnya menjadi percobaan-percobaan ini dan selanjutnya. Simpan setiap jenis percobaan pada direktori terpisah.

2. Percobaan berikut digunakan untuk menghitung nilai histogram dari suatu image. Di sini digunakan perhitungan histogram untuk intensitas I, warna R, G dan B.

3. Masukkan program berikut pada file Module1. Pada percobaan ini digunakan buffer vImage untuk menampung gambar. Tipe dari vImage adalah Integer agar memudahkan dalam pemrosesan image.

```vb
Option Explicit

' Deklarasi Jenis type Data RGB, untuk keperluan Image Processing
Public Type tRGB
    B As Integer
    G As Integer
    R As Integer
End Type

Public Declare Function SetPixel Lib "gdi32" ( _
    ByVal hdc As Long, ByVal x As Long, ByVal y As Long, _
    ByVal crColor As Long) As Long
Public Declare Function GetPixel Lib "gdi32" ( _
    ByVal hdc As Long, ByVal x As Long, ByVal y As Long) As Long

Global vImage() As tRGB
```

4. Pada percobaan ini, setiap suatu gambar dibaca, maka data dari gambar tersebut langsung dipindahkan ke buffer vImage agar memudahkan proses pengaturan berikutnya. Masukkan program berikut ini pada Form1.

```vb
Option Explicit

Private Sub Dir1_Change()
    File1.Path = Dir1.Path
End Sub

Private Sub Drive1_Change()
    Dir1.Path = Drive1.Drive
End Sub

Private Sub File1_Click()
    Dim x As Integer, y As Integer
    Dim p As Long
    Picture1.Picture = LoadPicture(File1.Path + "\" + File1.FileName)
    ReDim vImage(0 To Picture1.ScaleWidth - 1, _
                 0 To Picture1.ScaleHeight - 1) As tRGB
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            p = GetPixel(Picture1.hdc, x, y)
            vImage(x, y).R = p And &HFF
            vImage(x, y).G = (p \ &H100) And &HFF
            vImage(x, y).B = (p \ &H10000) And &HFF
        Next
    Next
    Histogram
End Sub

Private Sub Form_Load()
    File1.Pattern = "*.bmp;*.jpg;*.jpeg;*.gif;*.tif"
    Picture1.ScaleMode = 3
    Picture1.AutoSize = True
    Picture1.AutoRedraw = True
End Sub

Private Sub Histogram()
    Dim x As Integer, y As Integer
    Dim R As Integer, G As Integer, B As Integer, I As Integer
    Dim HR(0 To 255) As Long, HG(0 To 255) As Long, HB(0 To 255) As Long
    Dim HI(0 To 255) As Long
```
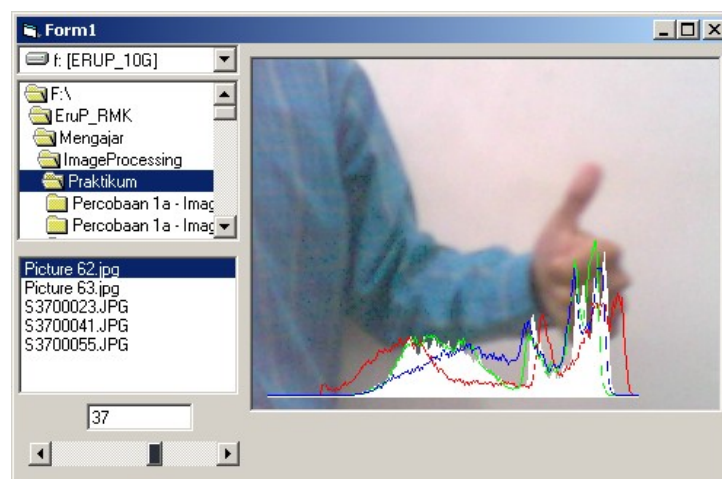
```
    Dim n As Single
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            R = vImage(x, y).R
            G = vImage(x, y).G
            B = vImage(x, y).B
            I = (R + G + B) / 3
            HR(R) = HR(R) + 1
            HG(G) = HG(G) + 1
            HB(B) = HB(B) + 1
            HI(I) = HI(I) + 1
        Next
    Next
    n = 25! * 200 / (Picture1.ScaleWidth * Picture1.ScaleHeight)
    Picture1.Line (10, 231)-(265, 231), vbWhite
    For I = 0 To 255
        Picture1.Line (I + 10, 230)-Step(0, -HI(I) * n), vbWhite
        If I < 255 Then
            Picture1.Line (I + 10, 230 - HR(I) * n)- _
                          (I + 11, 230 - HR(I + 1) * n), vbRed
            Picture1.Line (I + 10, 230 - HG(I) * n)- _
                          (I + 11, 230 - HG(I + 1) * n), vbGreen
            Picture1.Line (I + 10, 230 - HB(I) * n)- _
                          (I + 11, 230 - HB(I + 1) * n), vbBlue
        End If
    Next
End Sub
```

5. Selalu lakukan eksekusi program dari file *.exe-nya agar program dapat berjalan lebih cepat.

6. Percobaan berikut merupakan percobaan sederhana untuk mengubah tingkat Intensitas dari suatu image. Percobaan ini tetap menggunakan hasil dari percobaan sebelumnya (histogram) agar selalu dapat dilihat nilai histogram tiap pemrosesan image. Tambahkan komponen ScrollBar dan TextBox.

7. Program Module1 dapat menggunakan dari percobaan sebelumnya.

8. Masukkan program berikut pada Form1.

```
Option Explicit

Private Sub Dir1_Change()
    File1.Path = Dir1.Path
End Sub
```

```
Private Sub Drive1_Change()
    Dir1.Path = Drive1.Drive
End Sub

Private Sub File1_Click()
    Dim x As Integer, y As Integer
    Dim p As Long
    Picture1.Picture = LoadPicture(File1.Path + "\" + File1.FileName)
     ReDim vImage(0 To Picture1.ScaleWidth - 1, 0 To Picture1.ScaleHeight - 1)
As tRGB
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            p = GetPixel(Picture1.hdc, x, y)
            vImage(x, y).R = p And &HFF
            vImage(x, y).G = (p \ &H100) And &HFF
            vImage(x, y).B = (p \ &H10000) And &HFF
        Next
    Next
    Histogram
End Sub

Private Sub Form_Load()
    File1.Pattern = "*.bmp;*.jpg;*.jpeg;*.gif;*.tif"
    Picture1.ScaleMode = 3
    Picture1.AutoSize = True
    Picture1.AutoRedraw = True
    ScrollBar1.Min = -128
    ScrollBar1.Max = 128
    Text1 = 0
    ScrollBar1.Value = 0
End Sub

Private Sub Histogram()
    Dim x As Integer, y As Integer
    Dim R As Integer, G As Integer, B As Integer, I As Integer
    Dim HR(0 To 255) As Long, HG(0 To 255) As Long, HB(0 To 255) As Long
    Dim HI(0 To 255) As Long
    Dim n As Single
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            R = vImage(x, y).R
            G = vImage(x, y).G
            B = vImage(x, y).B
            I = (R + G + B) / 3
            HR(R) = HR(R) + 1
            HG(G) = HG(G) + 1
            HB(B) = HB(B) + 1
            HI(I) = HI(I) + 1
        Next
    Next
    n = 25! * 200 / (Picture1.ScaleWidth * Picture1.ScaleHeight)
    Picture1.Line (10, 231)-(265, 231), vbWhite
    For I = 0 To 255
        Picture1.Line (I + 10, 230)-Step(0, -HI(I) * n), vbWhite
        If I < 255 Then
            Picture1.Line (I + 10, 230 - HR(I) * n)- _
                          (I + 11, 230 - HR(I + 1) * n), vbRed
            Picture1.Line (I + 10, 230 - HG(I) * n)- _
                          (I + 11, 230 - HG(I + 1) * n), vbGreen
            Picture1.Line (I + 10, 230 - HB(I) * n)- _
                          (I + 11, 230 - HB(I + 1) * n), vbBlue
        End If
    Next
End Sub

Private Sub Intensity(Alfa As Integer)
    Dim x As Integer, y As Integer
```
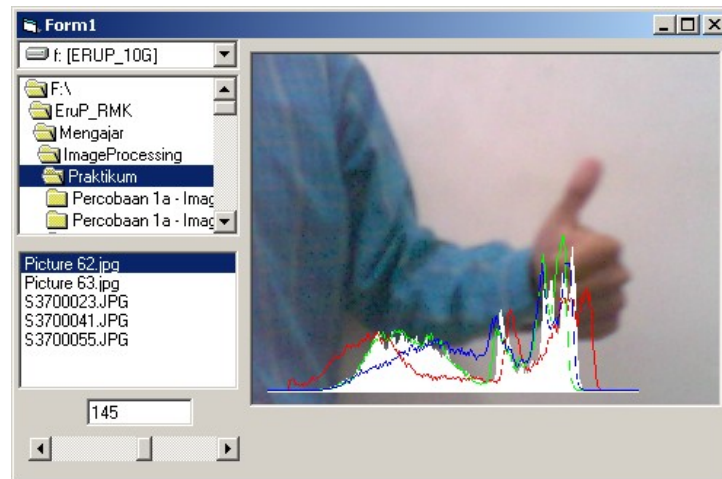
```
    Dim R As Integer, G As Integer, B As Integer, I As Integer
    Dim HR(0 To 255) As Long, HG(0 To 255) As Long, HB(0 To 255) As Long
    Dim HI(0 To 255) As Long
    Dim n As Single
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            R = vImage(x, y).R + Alfa
            G = vImage(x, y).G + Alfa
            B = vImage(x, y).B + Alfa
            If R < 0 Then R = 0
            If R > 255 Then R = 255
            If G < 0 Then G = 0
            If G > 255 Then G = 255
            If B < 0 Then B = 0
            If B > 255 Then B = 255
            I = (R + G + B) / 3
            HR(R) = HR(R) + 1
            HG(G) = HG(G) + 1
            HB(B) = HB(B) + 1
            HI(I) = HI(I) + 1
            SetPixel Picture1.hdc, x, y, RGB(R, G, B)
        Next
    Next
    n = 25! * 200 / (Picture1.ScaleWidth * Picture1.ScaleHeight)
    Picture1.Line (10, 231)-(265, 231), vbWhite
    For I = 0 To 255
        Picture1.Line (I + 10, 230)-Step(0, -HI(I) * n), vbWhite
        If I < 255 Then
            Picture1.Line (I + 10, 230 - HR(I) * n)- _
                          (I + 11, 230 - HR(I + 1) * n), vbRed
            Picture1.Line (I + 10, 230 - HG(I) * n)- _
                          (I + 11, 230 - HG(I + 1) * n), vbGreen
            Picture1.Line (I + 10, 230 - HB(I) * n)- _
                          (I + 11, 230 - HB(I + 1) * n), vbBlue
        End If
    Next
    Picture1.Refresh
End Sub

Private Sub ScrollBar1_Change()
    If ScrollBar1.Value <> Text1 Then
        Intensity ScrollBar1.Value
        Text1 = ScrollBar1.Value
    End If
End Sub
```

9. Jangan lupa untuk menjalankan program dari file *.exe agar program dapat berjalan lebih cepat.

10. Coba ubah-ubah nilai intensitasnya dengan menggeser scrollbar, positif untuk meningkatkan intensitas dan negatif untuk menurunkan intensitas.

11. Percobaan berikut ini digunakan untuk melakukan pengaturan Intensitas Otomatis, dengan diberikan nilai referensi tertentu sebagai intensitas rata-rata. Ubah-ubah nilainya untuk mendapatkan nilai intensitas yang sesuai dengan nilai 0 sampai 255.

12. Program pada file Module1 tetap sama dengan percobaan sebelumnya. Sesuaikan program pada file Form1 dengan program berikut.

```
Option Explicit

Dim IntensitasRata2 As Integer

Private Sub Dir1_Change()
    File1.Path = Dir1.Path
End Sub

Private Sub Drive1_Change()
    Dir1.Path = Drive1.Drive
End Sub

Private Sub File1_Click()
    Dim x As Integer, y As Integer
    Dim p As Long
    Dim I As Long
    Dim R As Integer, G As Integer, B As Integer
    Picture1.Picture = LoadPicture(File1.Path + "\" + File1.FileName)
     ReDim vImage(0 To Picture1.ScaleWidth - 1, 0 To Picture1.ScaleHeight - 1)
As tRGB
    I = 0
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            p = GetPixel(Picture1.hdc, x, y)
            R = p And &HFF
            G = (p \ &H100) And &HFF
            B = (p \ &H10000) And &HFF
            vImage(x, y).R = R
            vImage(x, y).G = G
            vImage(x, y).B = B
            I = I + R + G + B
        Next
    Next
    IntensitasRata2 = I / (Picture1.ScaleWidth * Picture1.ScaleHeight * 3)
    Intensity ScrollBar1.Value - IntensitasRata2
End Sub

Private Sub Form_Load()
    File1.Pattern = "*.bmp;*.jpg;*.jpeg;*.gif;*.tif"
    Picture1.ScaleMode = 3
    Picture1.AutoSize = True
    Picture1.AutoRedraw = True
    ScrollBar1.Min = 0
    ScrollBar1.Max = 255
    Text1 = 128
    ScrollBar1.Value = 128
```

```
End Sub

Private Sub Histogram()
    Dim x As Integer, y As Integer
    Dim R As Integer, G As Integer, B As Integer, I As Integer
    Dim HR(0 To 255) As Long, HG(0 To 255) As Long, HB(0 To 255) As Long
    Dim HI(0 To 255) As Long
    Dim n As Single
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            R = vImage(x, y).R
            G = vImage(x, y).G
            B = vImage(x, y).B
            I = (R + G + B) / 3
            HR(R) = HR(R) + 1
            HG(G) = HG(G) + 1
            HB(B) = HB(B) + 1
            HI(I) = HI(I) + 1
        Next
    Next
    n = 25! * 200 / (Picture1.ScaleWidth * Picture1.ScaleHeight)
    Picture1.Line (10, 231)-(265, 231), vbWhite
    For I = 0 To 255
        Picture1.Line (I + 10, 230)-Step(0, -HI(I) * n), vbWhite
        If I < 255 Then
            Picture1.Line (I + 10, 230 - HR(I) * n)- _
                          (I + 11, 230 - HR(I + 1) * n), vbRed
            Picture1.Line (I + 10, 230 - HG(I) * n)- _
                          (I + 11, 230 - HG(I + 1) * n), vbGreen
            Picture1.Line (I + 10, 230 - HB(I) * n)- _
                          (I + 11, 230 - HB(I + 1) * n), vbBlue
        End If
    Next
End Sub

Private Sub Intensity(Alfa As Integer)
    Dim x As Integer, y As Integer
    Dim R As Integer, G As Integer, B As Integer, I As Integer
    Dim HR(0 To 255) As Long, HG(0 To 255) As Long, HB(0 To 255) As Long
    Dim HI(0 To 255) As Long
    Dim n As Single
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            R = vImage(x, y).R + Alfa
            G = vImage(x, y).G + Alfa
            B = vImage(x, y).B + Alfa
            If R < 0 Then R = 0
            If R > 255 Then R = 255
            If G < 0 Then G = 0
            If G > 255 Then G = 255
            If B < 0 Then B = 0
            If B > 255 Then B = 255
            I = (R + G + B) / 3
            HR(R) = HR(R) + 1
            HG(G) = HG(G) + 1
            HB(B) = HB(B) + 1
            HI(I) = HI(I) + 1
            SetPixel Picture1.hdc, x, y, RGB(R, G, B)
        Next
    Next
    n = 25! * 200 / (Picture1.ScaleWidth * Picture1.ScaleHeight)
    Picture1.Line (10, 231)-(265, 231), vbWhite
    For I = 0 To 255
        Picture1.Line (I + 10, 230)-Step(0, -HI(I) * n), vbWhite
        If I < 255 Then
            Picture1.Line (I + 10, 230 - HR(I) * n)- _
                          (I + 11, 230 - HR(I + 1) * n), vbRed
            Picture1.Line (I + 10, 230 - HG(I) * n)- _
```

```
                                (I + 11, 230 - HG(I + 1) * n), vbGreen
                    Picture1.Line (I + 10, 230 - HB(I) * n)- _
                                (I + 11, 230 - HB(I + 1) * n), vbBlue
            End If
        Next
        Picture1.Refresh
End Sub


Private Sub ScrollBar1_Change()
    If ScrollBar1.Value <> Text1 Then
        Intensity ScrollBar1.Value - IntensitasRata2
        Text1 = ScrollBar1.Value
    End If
End Sub
```
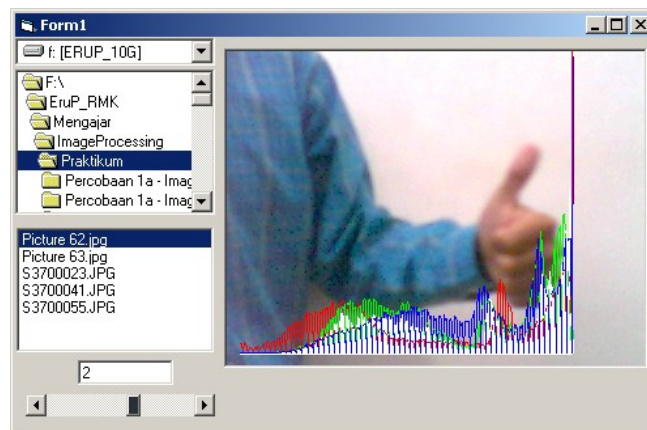
13. Coba buka berbagai gambar dan perhatikan, apakah tingkat pencahayaannya selalu sama ?

14. Berikut ini adalah program untuk pengaturan Kontras dengan nilai tertentu. Cobah ubah-ubah nilainya untuk mendapatkan nilai kontras yang lebih baik.

15. Program pada file Module1 tetap sama dengan percobaan sebelumnya. Sesuaikan program pada file Form1 dengan program berikut.

```
Option Explicit

Private Sub Dir1_Change()
    File1.Path = Dir1.Path
End Sub

Private Sub Drive1_Change()
    Dir1.Path = Drive1.Drive
End Sub

Private Sub File1_Click()
    Dim x As Integer, y As Integer
    Dim p As Long
    Picture1.Picture = LoadPicture(File1.Path + "\" + File1.FileName)
    ReDim vImage(0 To Picture1.ScaleWidth - 1, 0 To Picture1.ScaleHeight - 1)
As tRGB
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            p = GetPixel(Picture1.hdc, x, y)
            vImage(x, y).R = p And &HFF
            vImage(x, y).G = (p \ &H100) And &HFF
            vImage(x, y).B = (p \ &H10000) And &HFF
        Next
    Next
    Histogram
```

```
End Sub

Private Sub Form_Load()
    File1.Pattern = "*.bmp;*.jpg;*.jpeg;*.gif;*.tif"
    Picture1.ScaleMode = 3
    Picture1.AutoSize = True
    Picture1.AutoRedraw = True
    ScrollBar1.Min = -10
    ScrollBar1.Max = 10
    Text1 = 0
    ScrollBar1.Value = 0
End Sub

Private Sub Histogram()
    Dim x As Integer, y As Integer
    Dim R As Integer, G As Integer, B As Integer, I As Integer
    Dim HR(0 To 255) As Long, HG(0 To 255) As Long, HB(0 To 255) As Long
    Dim HI(0 To 255) As Long
    Dim n As Single
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            R = vImage(x, y).R
            G = vImage(x, y).G
            B = vImage(x, y).B
            I = (R + G + B) / 3
            HR(R) = HR(R) + 1
            HG(G) = HG(G) + 1
            HB(B) = HB(B) + 1
            HI(I) = HI(I) + 1
        Next
    Next
    n = 25! * 200 / (Picture1.ScaleWidth * Picture1.ScaleHeight)
    Picture1.Line (10, 231)-(265, 231), vbWhite
    For I = 0 To 255
        Picture1.Line (I + 10, 230)-Step(0, -HI(I) * n), vbWhite
        If I < 255 Then
            Picture1.Line (I + 10, 230 - HR(I) * n)- _
                          (I + 11, 230 - HR(I + 1) * n), vbRed
            Picture1.Line (I + 10, 230 - HG(I) * n)- _
                          (I + 11, 230 - HG(I + 1) * n), vbGreen
            Picture1.Line (I + 10, 230 - HB(I) * n)- _
                          (I + 11, 230 - HB(I + 1) * n), vbBlue
        End If
    Next
End Sub

Private Sub Contrast(c As Single)
    Dim x As Integer, y As Integer
    Dim R As Integer, G As Integer, B As Integer, I As Integer
    Dim HR(0 To 255) As Long, HG(0 To 255) As Long, HB(0 To 255) As Long
    Dim HI(0 To 255) As Long
    Dim n As Single
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            R = vImage(x, y).R * c
            G = vImage(x, y).G * c
            B = vImage(x, y).B * c
            If R < 0 Then R = 0
            If R > 255 Then R = 255
            If G < 0 Then G = 0
            If G > 255 Then G = 255
            If B < 0 Then B = 0
            If B > 255 Then B = 255
            I = (R + G + B) / 3
            HR(R) = HR(R) + 1
            HG(G) = HG(G) + 1
            HB(B) = HB(B) + 1
            HI(I) = HI(I) + 1
```
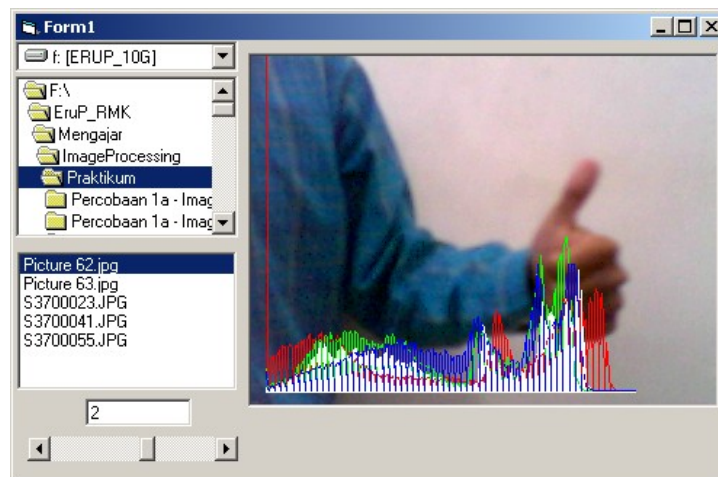
```
            SetPixel Picture1.hdc, x, y, RGB(R, G, B)
        Next
    Next
    n = 25! * 200 / (Picture1.ScaleWidth * Picture1.ScaleHeight)
    Picture1.Line (10, 231)-(265, 231), vbWhite
    For I = 0 To 255
        Picture1.Line (I + 10, 230)-Step(0, -HI(I) * n), vbWhite
        If I < 255 Then
            Picture1.Line (I + 10, 230 - HR(I) * n)- _
                          (I + 11, 230 - HR(I + 1) * n), vbRed
            Picture1.Line (I + 10, 230 - HG(I) * n)- _
                          (I + 11, 230 - HG(I + 1) * n), vbGreen
            Picture1.Line (I + 10, 230 - HB(I) * n)- _
                          (I + 11, 230 - HB(I + 1) * n), vbBlue
        End If
    Next
    Picture1.Refresh
End Sub

Private Sub ScrollBar1_Change()
    If ScrollBar1.Value <> Text1 Then
        Contrast 2 ^ (ScrollBar1.Value / 5)
        Text1 = ScrollBar1.Value
    End If
End Sub
```

16. Coba perhatika hasil percobaan tersebut. Jika nilai kontras ditingkatkan, maka nilai histogramnya menjadi aneh. Coba jelaskan apa yang terjadi.

17. Berikut ini adalah contoh pengaturan kontras yang lain, dimana pengaturan berdasarkan penentuan titik tengah gray level, yaitu 128. Coba bandingkan hasilnya dengan pengaturan kontras sebelumnya.

18. Program pada file Module1 tetap sama dengan percobaan sebelumnya. Ubah/sesuaikan program pada file Form1 dengan hanya mengbah bagian sub Contrast sebagai berikut.

```
    Dim x As Integer, y As Integer
    Dim R As Integer, G As Integer, B As Integer, I As Integer
    Dim HR(0 To 255) As Long, HG(0 To 255) As Long, HB(0 To 255) As Long
    Dim HI(0 To 255) As Long
    Dim n As Single
    For y = 0 To Picture1.ScaleHeight - 1
        For x = 0 To Picture1.ScaleWidth - 1
            R = (vImage(x, y).R - 128) * c + 128
```

```
            G = (vImage(x, y).G - 128) * c + 128
            B = (vImage(x, y).B - 128) * c + 128
            If R < 0 Then R = 0
            If R > 255 Then R = 255
            If G < 0 Then G = 0
            If G > 255 Then G = 255
            If B < 0 Then B = 0
            If B > 255 Then B = 255
            I = (R + G + B) / 3
            HR(R) = HR(R) + 1
            HG(G) = HG(G) + 1
            HB(B) = HB(B) + 1
            HI(I) = HI(I) + 1
            SetPixel Picture1.hdc, x, y, RGB(R, G, B)
        Next
    Next
    n = 25! * 200 / (Picture1.ScaleWidth * Picture1.ScaleHeight)
    Picture1.Line (10, 231)-(265, 231), vbWhite
    For I = 0 To 255
        Picture1.Line (I + 10, 230)-Step(0, -HI(I) * n), vbWhite
        If I < 255 Then
            Picture1.Line (I + 10, 230 - HR(I) * n)- _
                          (I + 11, 230 - HR(I + 1) * n), vbRed
            Picture1.Line (I + 10, 230 - HG(I) * n)- _
                          (I + 11, 230 - HG(I + 1) * n), vbGreen
            Picture1.Line (I + 10, 230 - HB(I) * n)- _
                          (I + 11, 230 - HB(I + 1) * n), vbBlue
        End If
    Next
    Picture1.Refresh
End Sub
```

19. Cobalah membuat program pengaturan kontras secara otomatis. Pengaturan dapat didasarkan nilai intensitas minimal dan maksimal. Anda dapat melihat teori image processing tentang mengaturan kontras otomatis atau dapat mencontoh program percobaan dari praktikum Robot Vision III.

Tugas

1. Apa perbedaan penggunaan antara pengaturan intensitas dan pengaturan kontras ?

2. Apa perbedaan hasil (mana yang terbaik) antara pengatura kontras berbasis nilai 0 dengan pengaturan kontras berbasis nilai 128 ?