

COLOR IMAGE FILTERING
PENGOLAHAN CITRA
MK401



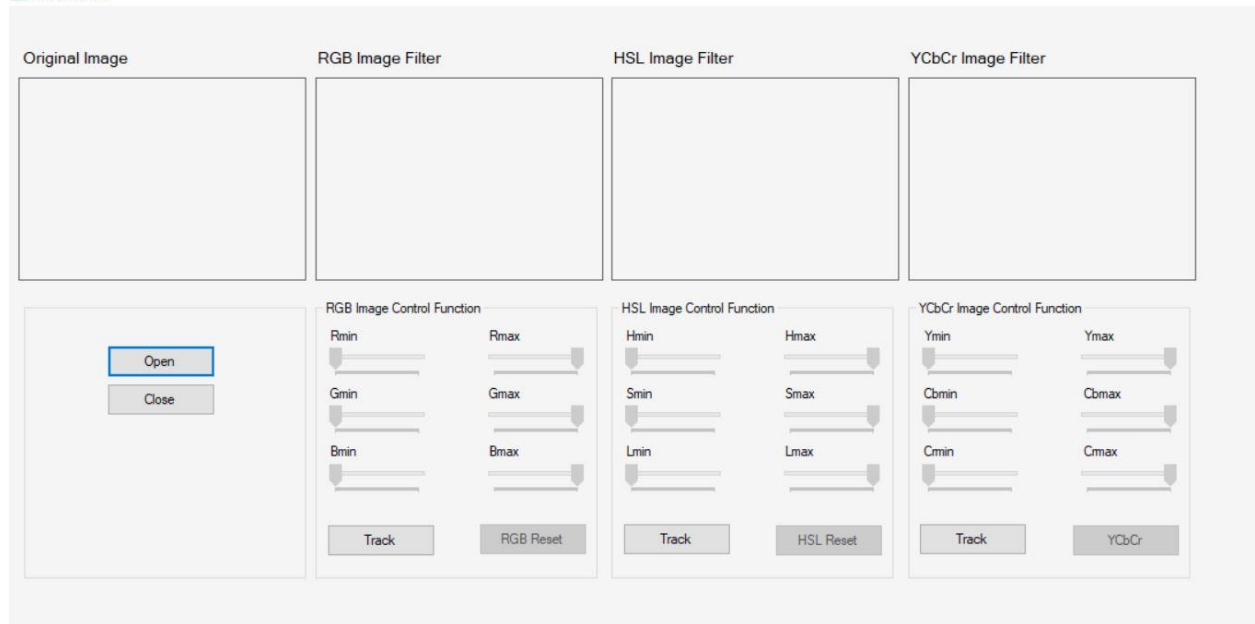
POLITEKNIK NEGERI Batam

Disusun oleh :
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PROGRAM STUDI TEKNIK MEKATRONIKA
JURUSAN TEKNIK ELEKTRO
POLITEKNIK NEGERI BATAM
2020

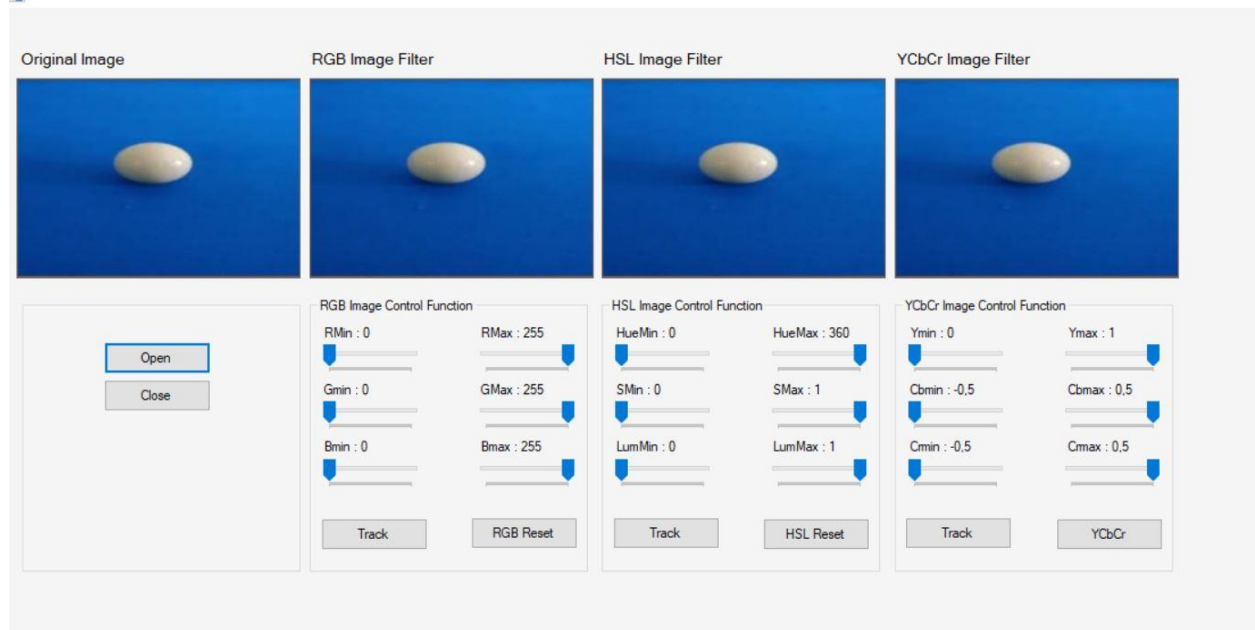
COLOR IMAGE FILTERING

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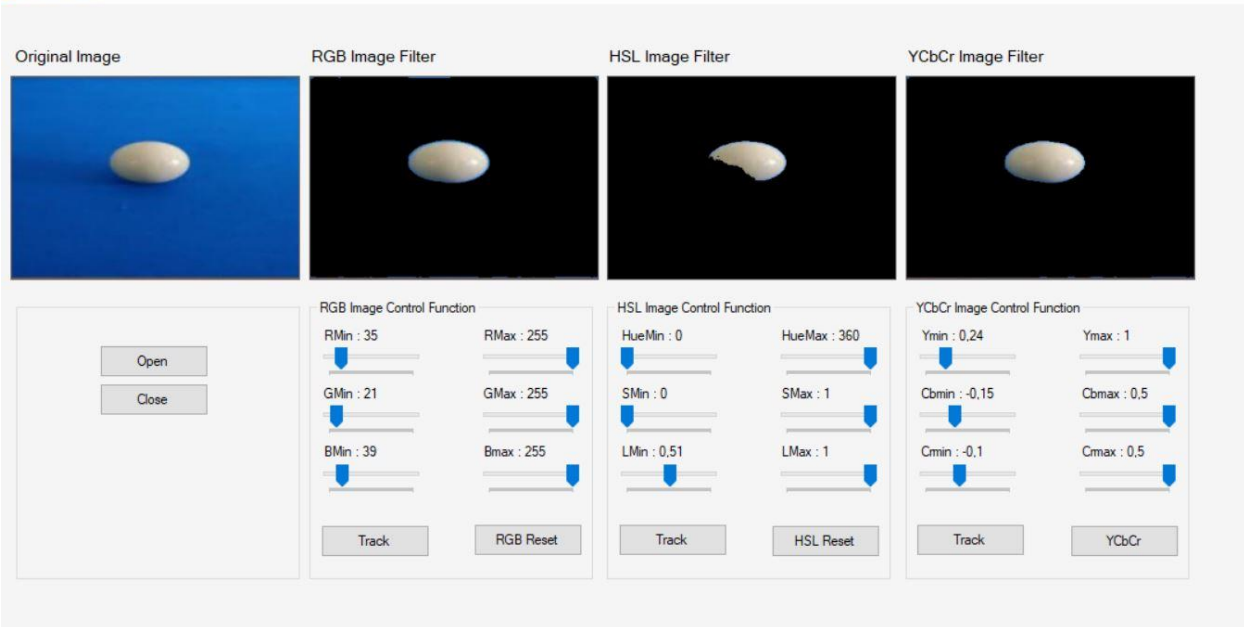


Tampilan awal program

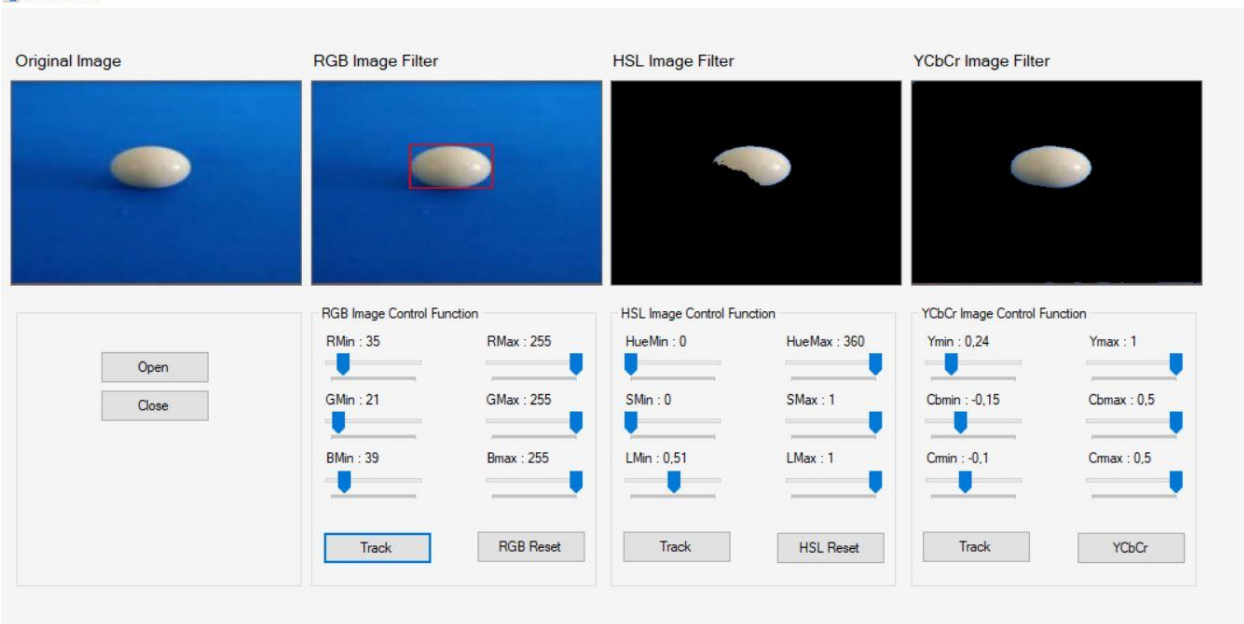
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File gambar di upload

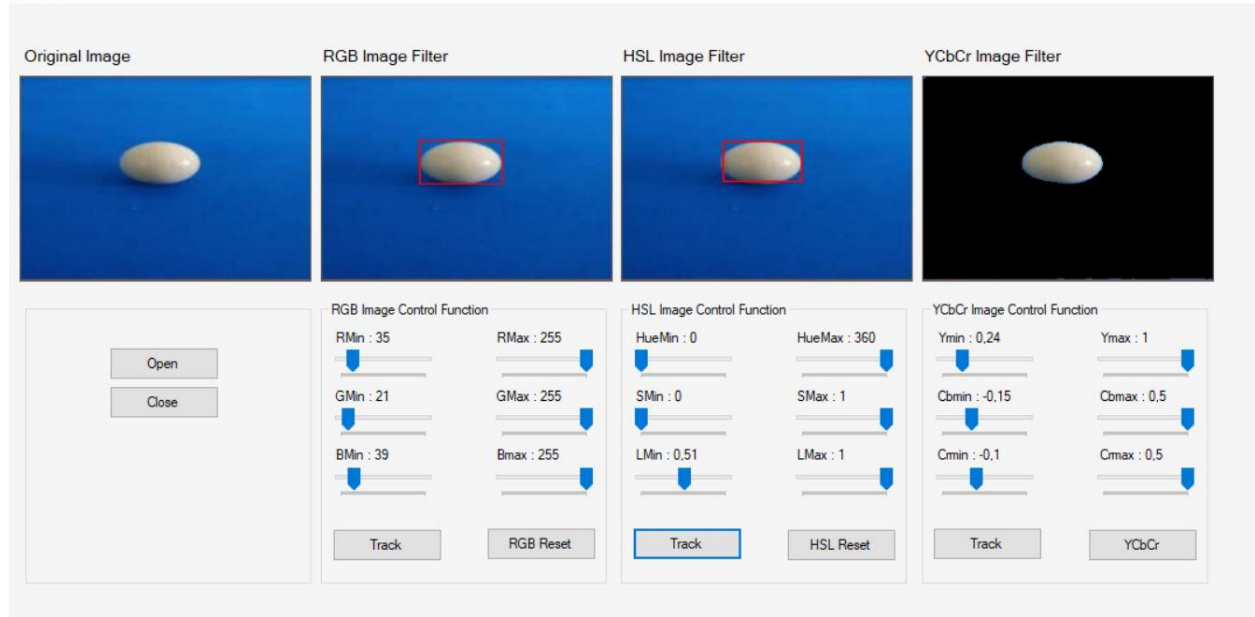


Trackbar RGB, HSL, dan YCbCr



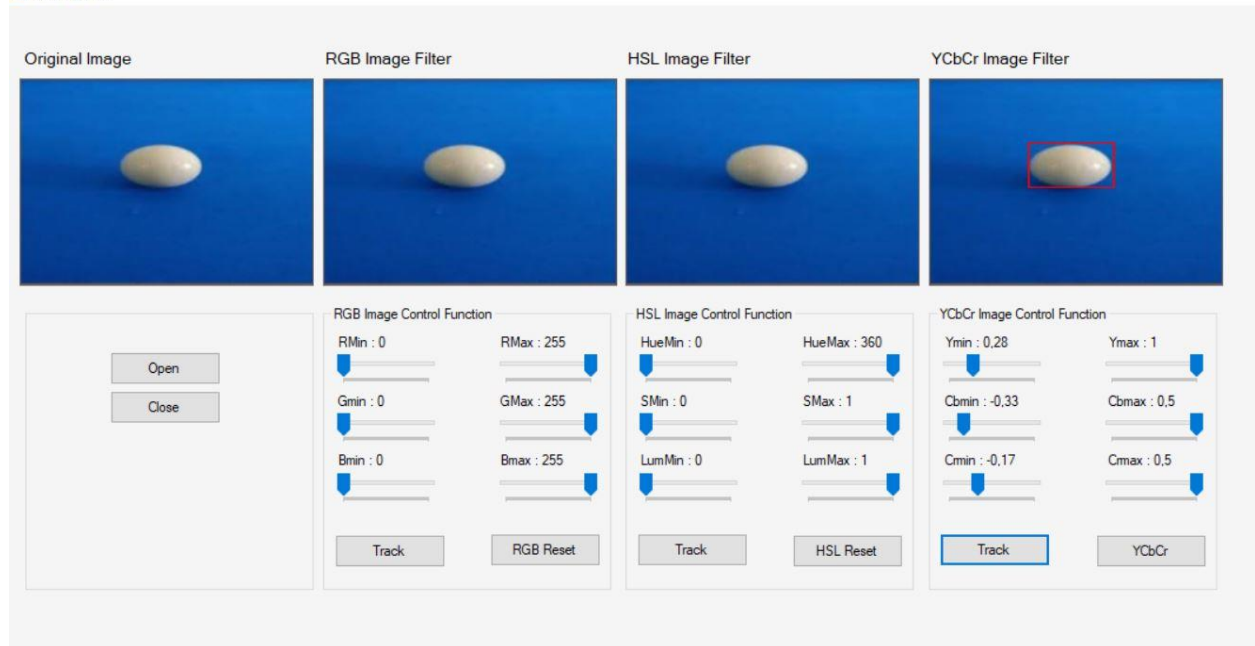
Track RGB Image

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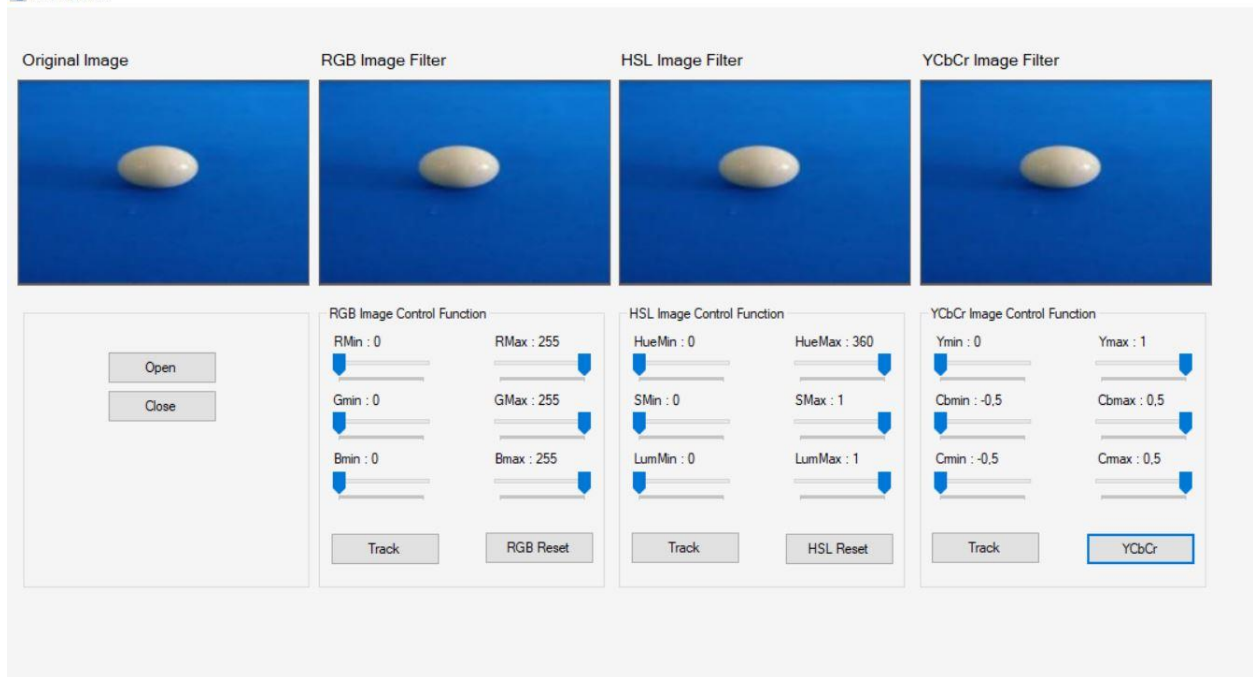


Track HSL Image

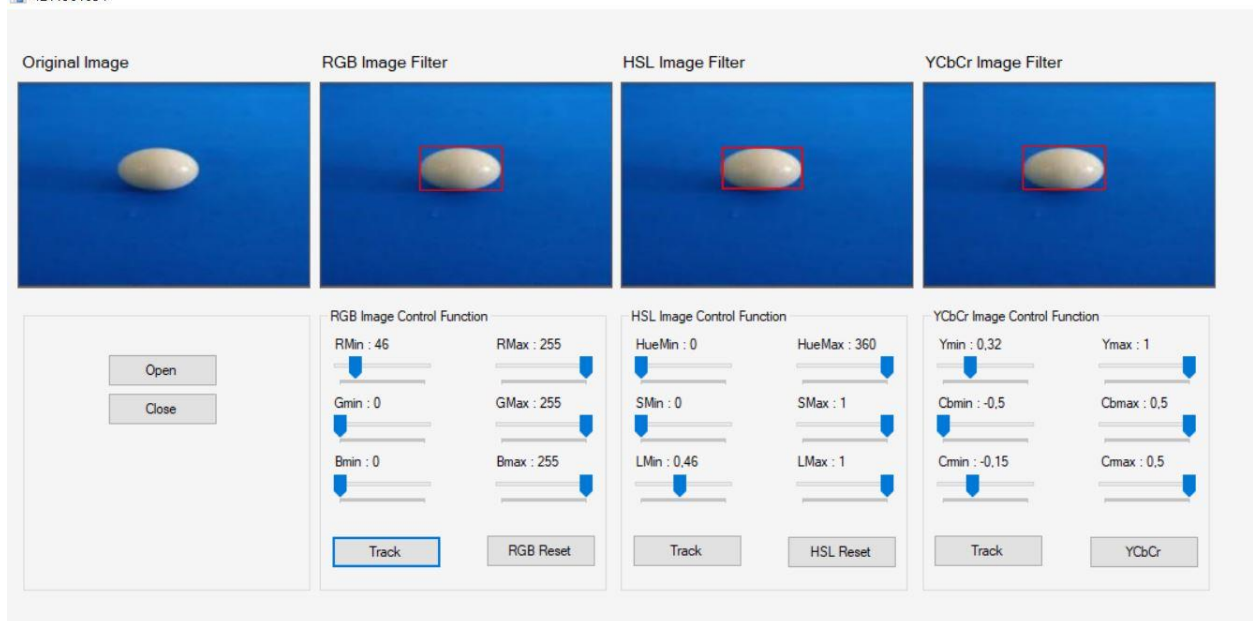
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Track YCbCr Image



Button RGB Reset, HSL Reset, dan YCbCr diklik



Track RGB Image, HSL Image, dan YCbCr Image

Menurut anda, filter manakah yang paling baik hasilnya diantara HSL filter, RGB filter dan YCbCr filter.

Jawab: Dari percobaan yang dilakukan, dapat disimpulkan bahwa RGB filter lebih baik daripada HSL filter dan YCbCr filter.

Screen Shoot Sourcecode

```
1  using System;
2  using System.Collections.Generic;
3  using System.ComponentModel;
4  using System.Data;
5  using System.Drawing;
6  using System.Linq;
7  using System.Text;
8  using System.Threading.Tasks;
9  using System.Windows.Forms;
10 using AForge;
11 using AForge.Imaging;
12 using AForge.Imaging.Filters;
13
14 namespace Pertemuan8_4211901034
15 {
16     3 references
17     public partial class Form1 : Form
18     {
19         // global variable
20         Bitmap sourceImage;
21         Bitmap HSLImage, RGBImage, YCbCrImage;
22
23         //Space antara min Trackbar dan max Trackbar
24         int TRACK_SPACE = 2;
25
26         //HSL trackbar variable
27         int Hmin, Hmax;
28         float Smin, Smax, Lmin, Lmax;
29
30         //RGB trackbar variable
31         int Rmin, Rmax, Gmin, Gmax, Bmin, Bmax;
32
33         //YCbCr trackbar variable
34         float Ymin, Ymax, Cbmin, Cbmax, Crmin, Crmax;
35
36         1 reference
37         private void trackBarHmin_Scroll(object sender, EventArgs e)
38         {
39             if (trackBarHmax.Value - trackBarHmin.Value <= TRACK_SPACE)
40             {
41                 trackBarHmin.Value = trackBarHmax.Value - TRACK_SPACE;
42                 Hmin = trackBarHmin.Value;
43                 labelHmin.Text = string.Format("HueMin : {0}", Hmin);
44                 HSLFiltering(sourceImage);
45             }
46
47             1 reference
48             private void trackBarHmax_Scroll(object sender, EventArgs e)
49             {
50                 if (trackBarHmax.Value - trackBarHmin.Value <= TRACK_SPACE)
51                 {
52                     trackBarHmax.Value = trackBarHmin.Value + TRACK_SPACE;
53                     Hmax = (int)trackBarHmax.Value / 100;
54                     labelHmax.Text = string.Format("HueMax : {0}", Hmax);
55                     HSLFiltering(sourceImage);
56                 }
57             }
58         }
59     }
60 }
```

```
Pertemuan8_4211901034
Pertemuan8_4211901034.Form1

51 } # private void trackBarHmax_Scroll(object sender, EventArgs e)
52
53 1 reference
54 private void trackBarYmin_Scroll(object sender, EventArgs e)
55 {
56     if (trackBarYmax.Value - trackBarYmin.Value <= TRACK_SPACE)
57         trackBarYmin.Value = trackBarYmax.Value - TRACK_SPACE;
58     Ymin = (float)trackBarYmin.Value / 100;
59     labelYmin.Text = string.Format("Ymin : {0}", Ymin);
60     YCbCrFiltering(sourceImage);
61 }
62
63 1 reference
64 private void trackBarYmax_Scroll(object sender, EventArgs e)
65 {
66     if (trackBarYmax.Value - trackBarYmin.Value <= TRACK_SPACE)
67         trackBarYmax.Value = trackBarYmin.Value + TRACK_SPACE;
68     Ymax = (float)trackBarYmax.Value / 100;
69     labelYmax.Text = string.Format("Ymax : {0}", Ymax);
70     YCbCrFiltering(sourceImage);
71 }
72
73 1 reference
74 private void trackBarCbmin_Scroll(object sender, EventArgs e)
75 {
76     if (trackBarCbmax.Value - trackBarCbmin.Value <= TRACK_SPACE)
77         trackBarCbmin.Value = trackBarCbmax.Value - TRACK_SPACE;
78     Cbmin = (float)trackBarCbmin.Value / 100;
79     labelCbmin.Text = string.Format("Cbmin : {0}", Cbmin);
80     YCbCrFiltering(sourceImage);
81 }
82
83 1 reference
84 private void trackBarCbmax_Scroll(object sender, EventArgs e)
85 {
86     if (trackBarCbmax.Value - trackBarCbmin.Value <= TRACK_SPACE)
87         trackBarCbmax.Value = trackBarCbmin.Value + TRACK_SPACE;
88     Cbmax = (float)trackBarCbmax.Value / 100;
89     labelCbmax.Text = string.Format("Cbmax : {0}", Cbmax);
90     YCbCrFiltering(sourceImage);
91 }
92
93 1 reference
94 private void trackBarCrmin_Scroll(object sender, EventArgs e)
95 {
96     if (trackBarCrmax.Value - trackBarCrmin.Value <= TRACK_SPACE)
97         trackBarCrmin.Value = trackBarCrmax.Value - TRACK_SPACE;
98     Crmin = (float)trackBarCrmin.Value / 100;
99     labelCrmin.Text = string.Format("Crmin : {0}", Crmin);
100     YCbCrFiltering(sourceImage);
101 }
102
103 1 reference
104 private void trackBarCrmax_Scroll(object sender, EventArgs e)
105 {
106     if (trackBarCrmax.Value - trackBarCrmin.Value <= TRACK_SPACE)
107         trackBarCrmax.Value = trackBarCrmin.Value + TRACK_SPACE;
108     Crmax = (float)trackBarCrmax.Value / 100;
109     labelCrmax.Text = string.Format("Crmax : {0}", Crmax);
110     YCbCrFiltering(sourceImage);
111 }
112 }
```



```
Form1.cs* - Form1.cs [Design]*
Pertemuan8_4211901034 Pertemuan8_4211901034.Form1

1 reference
98 private void trackBarCrmax_Scroll(object sender, EventArgs e)
99 {
100     if (trackBarCrmax.Value - trackBarCrmin.Value <= TRACK_SPACE)
101         trackBarCrmax.Value = trackBarCrmin.Value + TRACK_SPACE;
102     Crmax = (float)trackBarCrmax.Value / 100;
103     labelCrmax.Text = string.Format("Crmax : {0}", Crmax);
104     YCbCrFiltering(sourceImage);
105 }
106
1 reference
107 private void trackBarSmin_Scroll(object sender, EventArgs e)
108 {
109     if (trackBarSmax.Value - trackBarSmin.Value <= TRACK_SPACE)
110         trackBarSmin.Value = trackBarSmax.Value - TRACK_SPACE;
111     Smin = trackBarSmin.Value;
112     labelSmin.Text = string.Format("Smin : {0}", Smin);
113     HSLFiltering(sourceImage);
114 }
115
1 reference
116 private void buttonRGBTrack_Click(object sender, EventArgs e)
117 {
118     if (RGBImage == null) return;
119     Bitmap tempImage = new Bitmap(sourceImage);
120     pictureBoxRGB.Image = tempImage;
121     BlobCounter bc = new BlobCounter();
122     bc.MinHeight = 5;
123     bc.MinWidth = 5;
124     bc.FilterBlobs = true;
125     bc.ObjectsOrder = ObjectsOrder.Area;
126     bc.ProcessImage(RGBImage);
127     Rectangle[] rects = bc.GetObjectsRectangles();
128     foreach (Rectangle recs in rects)
129     {
130         if (rects.Length > 0)
131         {
132             Rectangle objectRect = rects[0]; //!= recs;
133             Graphics graph = Graphics.FromImage(tempImage);
134             using (Pen pen = new Pen(Color.FromArgb(255, 0, 0), 2))
135             {
136                 graph.DrawRectangle(pen, objectRect);
137             }
138             graph.Dispose();
139         }
140     }
141
1 reference
142 private void buttonHSLTrack_Click(object sender, EventArgs e)
143 {
144     if (HSLImage == null) return;
145     Bitmap tempImage = new Bitmap(sourceImage);
146     pictureBoxHSL.Image = tempImage;
147     BlobCounter bc = new BlobCounter();
```

Form1.cs* - X Form1.cs [Design]*

Pertemuan8_4211901034 - Pertemuan8_4211901034.Form1

```

146 BlobCounter bc = new BlobCounter();
147 bc.MinHeight = 5;
148 bc.MinWidth = 5;
149 bc.FilterBlobs = true;
150 bc.ObjectsOrder = ObjectsOrder.Area;
151 bc.ProcessImage(HSLImage);
152 Rectangle[] rects = bc.GetObjectsRectangles();
153 foreach (Rectangle recs in rects)
154     if (rects.Length > 0)
155     {
156         Rectangle objectRect = rects[0]; // = recs;
157         Graphics graph = Graphics.FromImage(tempImage);
158         using (Pen pen = new Pen(Color.FromArgb(255, 0, 0), 2))
159         {
160             graph.DrawRectangle(pen, objectRect);
161         }
162         graph.Dispose();
163     }
164 } private void buttonHSLTrack_Click(object sender, EventArgs e)
165
166 1 reference
167 private void buttonYCbCrTrack_Click(object sender, EventArgs e)
168 {
169     if (YCbCrImage == null) return;
170     Bitmap tempImage = new Bitmap(sourceImage);
171     pictureBoxYCbCr.Image = tempImage;
172     BlobCounter bc = new BlobCounter();
173     bc.MinHeight = 5;
174     bc.MinWidth = 5;
175     bc.FilterBlobs = true;
176     bc.ObjectsOrder = ObjectsOrder.Area;
177     bc.ProcessImage(YCbCrImage);
178     Rectangle[] rects = bc.GetObjectsRectangles();
179     foreach (Rectangle recs in rects)
180         if (rects.Length > 0)
181         {
182             Rectangle objectRect = rects[0]; // = recs;
183             Graphics graph = Graphics.FromImage(tempImage);
184             using (Pen pen = new Pen(Color.FromArgb(255, 0, 0), 2))
185             {
186                 graph.DrawRectangle(pen, objectRect);
187             }
188             graph.Dispose();
189         }
190
191 1 reference
192 private void buttonRGBreset_Click(object sender, EventArgs e)
193 {
194     pictureBoxRGB.Image = sourceImage;
195     trackBarReset(true, false, false);
196     labelReset(true, false, false);
197 }

```

96 % 0 2

```
Form1.cs* -> X Form1.cs [Design]*
Pertemuan8_4211901034 Pertemuan8_4211901034.Form1

195     labelReset(true, false, false);
196 } # private void buttonRGBreset_Click(object sender, EventArgs e)
197
198 1 reference
199 private void buttonHSLreset_Click(object sender, EventArgs e)
200 {
201     pictureBoxHSL.Image = sourceImage;
202     trackBarReset(false, true, false);
203     labelReset(false, true, false);
204 }
205
206 1 reference
207 private void buttonYCbCrReset_Click(object sender, EventArgs e)
208 {
209     pictureBoxYCbCr.Image = sourceImage;
210     trackBarReset(false, false, true);
211     labelReset(false, false, true);
212 }
213
214 1 reference
215 private void button2_Click(object sender, EventArgs e)
216 {
217     Close();
218 }
219
220 1 reference
221 private void trackBarGmin_Scroll(object sender, EventArgs e)
222 {
223     if (trackBarGmax.Value - trackBarGmin.Value <= TRACK_SPACE)
224     {
225         trackBarGmin.Value = trackBarGmax.Value - TRACK_SPACE;
226         Gmin = trackBarGmin.Value;
227         labelGmin.Text = string.Format("GMin : {0}", Gmin);
228         RGBFiltering(sourceImage);
229     }
230 }
231
232 1 reference
233 private void trackBarGmax_Scroll(object sender, EventArgs e)
234 {
235     if (trackBarGmax.Value - trackBarGmin.Value <= TRACK_SPACE)
236     {
237         trackBarGmax.Value = trackBarGmin.Value + TRACK_SPACE;
238         Gmax = trackBarGmax.Value;
239         labelGmax.Text = string.Format("GMax : {0}", Gmax);
240         RGBFiltering(sourceImage);
241     }
242 }
243
244 1 reference
245 private void trackBarBmax_Scroll(object sender, EventArgs e)
246 {
247     if (trackBarBmax.Value - trackBarBmin.Value <= TRACK_SPACE)
248     {
249         trackBarBmax.Value = trackBarBmin.Value + TRACK_SPACE;
250         Bmax = trackBarBmax.Value;
251         labelBmax.Text = string.Format("BMax : {0}", Bmax);
252         RGBFiltering(sourceImage);
253     }
254 }
255
256 96 % 0 2
ErrorList Locals Watch1
```

```
Form1.cs*  Form1.cs [Design]*
Pertemuan8_4211901034  Pertemuan8_4211901034.Form1

241     RGBFiltering(sourceImage);
242 } private void trackBarBmax_Scroll(object sender, EventArgs e)
243
244     1 reference
245     private void trackBarBmin_Scroll(object sender, EventArgs e)
246     {
247         if (trackBarBmax.Value - trackBarBmin.Value <= TRACK_SPACE)
248             trackBarBmin.Value = trackBarBmax.Value - TRACK_SPACE;
249         Bmin = trackBarBmin.Value;
250         labelBmin.Text = string.Format("BMin : {0}", Bmin);
251         RGBFiltering(sourceImage);
252     }
253
254     1 reference
255     private void trackBarSmax_Scroll(object sender, EventArgs e)
256     {
257         if (trackBarSmax.Value - trackBarSmin.Value <= TRACK_SPACE)
258             trackBarSmax.Value = trackBarSmin.Value + TRACK_SPACE;
259         Smax = (float)trackBarSmax.Value / 100;
260         labelSmax.Text = string.Format("SMax : {0}", Smax);
261         HSLFiltering(sourceImage);
262     }
263
264     1 reference
265     private void trackBarLmin_Scroll(object sender, EventArgs e)
266     {
267         if (trackBarLmax.Value - trackBarLmin.Value <= TRACK_SPACE)
268             trackBarLmin.Value = trackBarLmax.Value - TRACK_SPACE;
269         Lmin = (float)trackBarLmin.Value / 100;
270         labelLmin.Text = string.Format("LMin : {0}", Lmin);
271         HSLFiltering(sourceImage);
272     }
273
274     1 reference
275     private void trackBarLmax_Scroll(object sender, EventArgs e)
276     {
277         if (trackBarLmax.Value - trackBarLmin.Value <= TRACK_SPACE)
278             trackBarLmax.Value = trackBarLmin.Value + TRACK_SPACE;
279         Lmax = (float)trackBarLmax.Value / 100;
280         labelLmax.Text = string.Format("LMax : {0}", Lmax);
281         HSLFiltering(sourceImage);
282     }
283
284     1 reference
285     private void groupBox3_Enter(object sender, EventArgs e)
286     {
287     }
288
289     1 reference
290     public Form1()
291     {
292         InitializeComponent();
293     }
294 }
```

```
Form1.cs* x Form1.cs [Design]*
Pertemuan8_4211901034 - Pertemuan8_4211901034.Form1

287 InitializeComponent();
288 //trackbar init
289 trackBarInit();
290 trackBarReset(true, true, true);
291 trackBarEnable(false);
292 //fullscreen display
293 WindowState = FormWindowState.Maximized;
294 } public Form1()
295
296 1 reference
297 private void trackBarInit()
298 {
299     trackBarYmax.Maximum = 100;
300     trackBarYmin.Maximum = 100;
301     trackBarCbmax.Maximum = 50;
302     trackBarCbmin.Minimum = -50;
303     trackBarCbmin.Maximum = 50;
304     trackBarCbmin.Minimum = -50;
305     trackBarCrmax.Maximum = 50;
306     trackBarCrmin.Minimum = -50;
307     trackBarCrmin.Maximum = 50;
308     trackBarHmin.Maximum = 360;
309     trackBarHmax.Maximum = 360;
310     trackBarSmax.Maximum = 100;
311     trackBarSmin.Maximum = 100;
312     trackBarLmax.Maximum = 100;
313     trackBarLmin.Maximum = 100;
314     trackBarRmax.Maximum = 255;
315     trackBarRmin.Maximum = 255;
316     trackBarGmax.Maximum = 255;
317     trackBarGmin.Maximum = 255;
318     trackBarBmax.Maximum = 255;
319     trackBarBmin.Maximum = 255;
320 }
321
322 5 references
323 private void trackBarReset(bool RGB, Boolean HSL, bool YCbCr)
324 {
325     // RGB trackbar reset
326     if (RGB)
327     {
328         trackBarRmax.Value = 255;
329         trackBarRmin.Value = 0;
330         trackBarGmax.Value = 255;
331         trackBarGmin.Value = 0;
332         trackBarBmax.Value = 255;
333         trackBarBmin.Value = 0;
334         Rmin = 0; Rmax = 255;
335         Gmin = 0; Gmax = 255;
336         Bmin = 0; Bmax = 255;
337     }
338 }
```

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Error List Locals Watch 1


```
Form1.cs*  Form1.cs [Design]*
Pertemuan8_4211901034  Pertemuan8_4211901034.Form1

336  // YCbCr trackbar reset
337
338  // YCbCr trackbar reset
339  if (YCbCr)
340  {
341      trackBarYmax.Value = 100;
342      trackBarYmin.Value = 0;
343      trackBarCbmax.Value = 50;
344      trackBarCbmin.Value = -50;
345      trackBarCrmax.Value = 50;
346      trackBarCrmin.Value = -50;
347      Ymin = (float)trackBarYmin.Value / 100;
348      Ymax = (float)trackBarYmax.Value / 100;
349      Crmin = (float)trackBarCrmin.Value / 100;
350      Crmax = (float)trackBarCrmax.Value / 100;
351      Cbmin = (float)trackBarCbmin.Value / 100;
352      Cbmax = (float)trackBarCbmax.Value / 100;
353  }
354
355  // HSL trackbar
356  if (HSL)
357  {
358      trackBarHmax.Value = 360;
359      trackBarHmin.Value = 0;
360      trackBarSmax.Value = 100;
361      trackBarSmin.Value = 0;
362      trackBarLmax.Value = 100;
363      trackBarLmin.Value = 0;
364      Hmin = trackBarHmin.Value;
365      Hmax = trackBarHmax.Value;
366      Smin = (float)trackBarSmin.Value / 100;
367      Smax = (float)trackBarSmax.Value / 100;
368      Lmin = (float)trackBarLmin.Value / 100;
369      Lmax = (float)trackBarLmax.Value / 100;
370  }
371  } private void trackBarReset(bool RGB, Boolean HSL, bool YCbCr)
372
373  // trackbar enable
374  2 references
375  private void trackBarEnable(bool enable = true)
376  {
377      //HSL trackbar Enable
378      trackBarHmax.Enabled = enable;
379      trackBarHmin.Enabled = enable;
380      trackBarSmax.Enabled = enable;
381      trackBarSmin.Enabled = enable;
382      trackBarLmax.Enabled = enable;
383      trackBarLmin.Enabled = enable;
384      //RGB trackbar Enable
385      trackBarRmax.Enabled = enable;
386      trackBarRmin.Enabled = enable;
387      trackBarGmax.Enabled = enable;
388      trackBarGmin.Enabled = enable;
389  }
```

```
Form1.cs* - X Form1.cs [Design]*
Pertemuan8_4211901034 - Pertemuan8_4211901034.Form1

387 trackBarHmax.Enabled = enable;
388 trackBarGmin.Enabled = enable;
389 trackBarBmin.Enabled = enable;
390 //YCbCr trackbar disable
391 trackBarYmax.Enabled = enable;
392 trackBarYmin.Enabled = enable;
393 trackBarCbmax.Enabled = enable;
394 trackBarCbmin.Enabled = enable;
395 trackBarCrmax.Enabled = enable;
396 trackBarCrmin.Enabled = enable;
397 buttonHSLreset.Enabled = enable;
398 buttonRGBreset.Enabled = enable;
399 buttonYCbCrReset.Enabled = enable;
400 } private void trackBarEnable(bool enable = true)
401
402 //Reseting Label
403 4 references
404 private void labelReset(bool RGB, bool HSL, bool YCbCr)
405 {
406 //HSL label reset
407 if (HSL)
408 {
409     labelHmax.Text = string.Format("HueMax : {0}", trackBarHmax.Value);
410     labelHmin.Text = string.Format("HueMin : {0}", trackBarHmin.Value);
411     labelSmin.Text = string.Format("SMin : {0}", (float)trackBarSmin.Value / 100);
412     labelSmax.Text = string.Format("SMax : {0}", (float)trackBarSmax.Value / 100);
413     labelLmax.Text = string.Format("LumMax : {0}", (float)trackBarLmax.Value / 100);
414     labelLmin.Text = string.Format("LumMin : {0}", (float)trackBarLmin.Value / 100);
415 }
416 //RGB label reset
417 if (RGB)
418 {
419     labelRmax.Text = string.Format("RMax : {0}", trackBarRmax.Value);
420     labelRmin.Text = string.Format("RMin : {0}", trackBarRmin.Value);
421     labelGmax.Text = string.Format("GMax : {0}", trackBarGmax.Value);
422     labelGmin.Text = string.Format("Gmin : {0}", trackBarGmin.Value);
423     labelBmax.Text = string.Format("Bmax : {0}", trackBarBmax.Value);
424     labelBmin.Text = string.Format("Bmin : {0}", trackBarBmin.Value);
425 }
426 //YCbCr label reset
427 if (YCbCr)
428 {
429     labelYmax.Text = string.Format("Ymax : {0}", (float)trackBarYmax.Value / 100);
430     labelYmin.Text = string.Format("Ymin : {0}", (float)trackBarYmin.Value / 100);
431     labelCbmax.Text = string.Format("Cbmax : {0}", (float)trackBarCbmax.Value / 100);
432     labelCbmin.Text = string.Format("Cbmin : {0}", (float)trackBarCbmin.Value / 100);
433     labelCrmax.Text = string.Format("Crmax : {0}", (float)trackBarCrmax.Value / 100);
434     labelCrmin.Text = string.Format("Crmin : {0}", (float)trackBarCrmin.Value / 100);
435 }
436 }
437
438 1 reference
439
96 % 0 2
Error List Locals Watch 1
```

```

Form1.cs [Design]*
Pertemuan8_4211901034
Pertemuan8_4211901034.Form1

434 } if (YCbCr)
435 } private void labelReset(bool RGB, bool HSL, bool YCbCr)
436
1 reference
437 private void button1_Click(object sender, EventArgs e)
438 {
439     if (openFileDialog1.ShowDialog() == DialogResult.OK)
440     {
441         sourceImage = (Bitmap)Bitmap.FromFile(openFileDialog1.FileName);
442         pictureBoxOri.Image = sourceImage;
443         pictureBoxHSL.Image = sourceImage;
444         pictureBoxRGB.Image = sourceImage;
445         pictureBoxYCbCr.Image = sourceImage;
446         trackBarReset(true, true, true);
447         labelReset(true, true, true);
448         trackBarEnable();
449     }
450 }
451
452
6 references
453 private void RGBFiltering(Bitmap srcImage)
454 {
455     // create filter
456     ColorFiltering filter = new ColorFiltering();
457     // set color ranges to keep
458     filter.Red = new IntRange(Rmin, Rmax);
459     filter.Green = new IntRange(Gmin, Gmax);
460     filter.Blue = new IntRange(Bmin, Bmax);
461     // apply the filter
462     RGBImage = filter.Apply(sourceImage);
463     pictureBoxRGB.Image = RGBImage;
464 }
465
466
6 references
467 private void YCbCrFiltering(Bitmap srcImage)
468 {
469     // create filter
470     YCbCrFiltering filter = new YCbCrFiltering();
471     // set color ranges to keep
472     filter.Y = new Range(Ymin, Ymax);
473     filter.Cb = new Range(Cbmin, Cbmax);
474     filter.Cr = new Range(Crmin, Crmax);
475     YCbCrImage = filter.Apply(sourceImage);
476     //draw the picture
477     pictureBoxYCbCr.Image = YCbCrImage;
478 }
479
480
6 references
481 private void HSLFiltering(Bitmap sourceImage)
482 {

```



```

Form1.cs*  Form1.cs [Design]*
Pertemuan8_4211901034  Pertemuan8_4211901034.Form1

470         YCbCrFiltering filter = new YCbCrFiltering();
471         // set color ranges to keep
472         filter.Y = new Range(Ymin, Ymax);
473         filter.Cb = new Range(Cbmin, Cbmax);
474         filter.Cr = new Range(Crmin, Crmax);
475         YCbCrImage = filter.Apply(sourceImage);
476         //draw the picture
477         pictureBoxYCbCr.Image = YCbCrImage;
478     } private void YCbCrFiltering(Bitmap srcImage)
479
480
481     6 references
482     private void HSLFiltering(Bitmap sourceImage)
483     {
484         // create filter
485         HSLFiltering filter = new HSLFiltering();
486         filter.Hue = new IntRange(Hmin, Hmax);
487         filter.Saturation = new Range(Smin, Smax);
488         filter.Luminance = new Range(Lmin, Lmax);
489         // apply the filter
490         HSLImage = filter.Apply(sourceImage);
491         pictureBoxHSL.Image = HSLImage;
492
493     1 reference
494     private void trackBar1_Scroll(object sender, EventArgs e)
495     {
496         if (trackBarRmax.Value - trackBarRmin.Value <= TRACK_SPACE)
497             trackBarRmin.Value = trackBarRmax.Value - TRACK_SPACE;
498         Rmin = trackBarRmin.Value;
499         labelRmin.Text = string.Format("RMin : {0}", Rmin);
500         RGBFiltering(sourceImage);
501     }
502
503     1 reference
504     private void trackBar2_Scroll(object sender, EventArgs e)
505     {
506         if (trackBarRmax.Value - trackBarRmin.Value <= TRACK_SPACE)
507             trackBarRmax.Value = trackBarRmin.Value + TRACK_SPACE;
508         Rmax = trackBarRmax.Value;
509         labelRmax.Text = string.Format("RMax : {0}", Rmax);
510         RGBFiltering(sourceImage);
511     }
512
513     1 reference
514     private void label7_Click(object sender, EventArgs e)
515     {
516     }
517
518     } public partial class Form1 : Form
519     { namespace Pertemuan8_4211901034

```