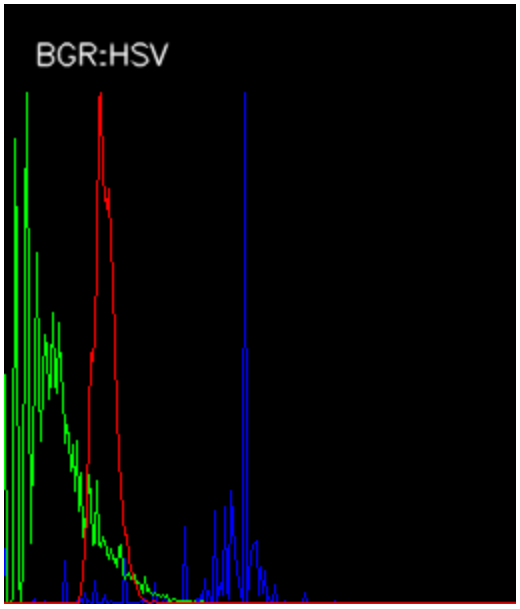
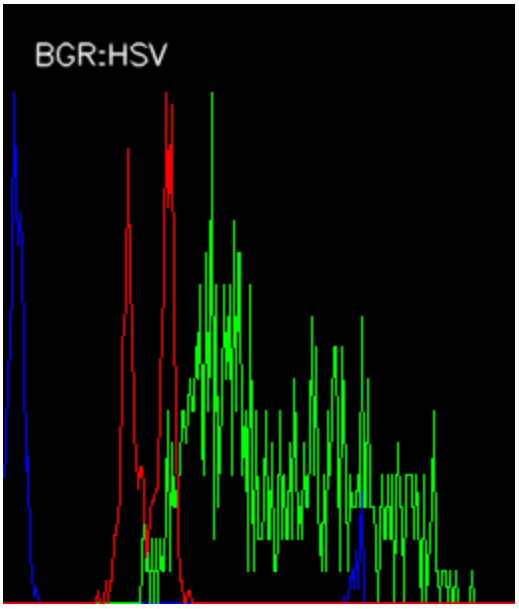
Draft #1

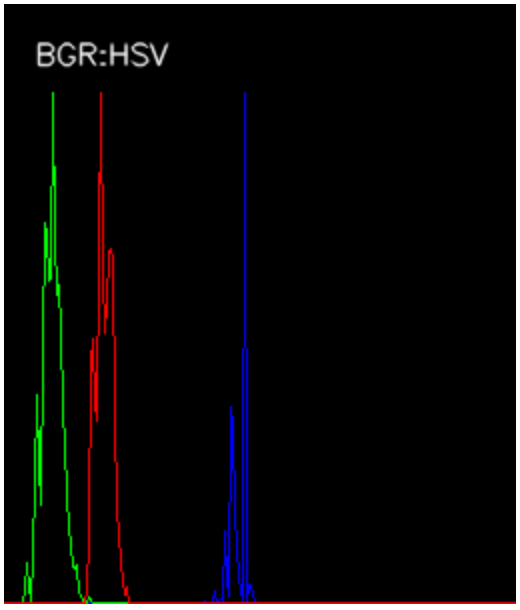
BLACK2 No Blur HSV



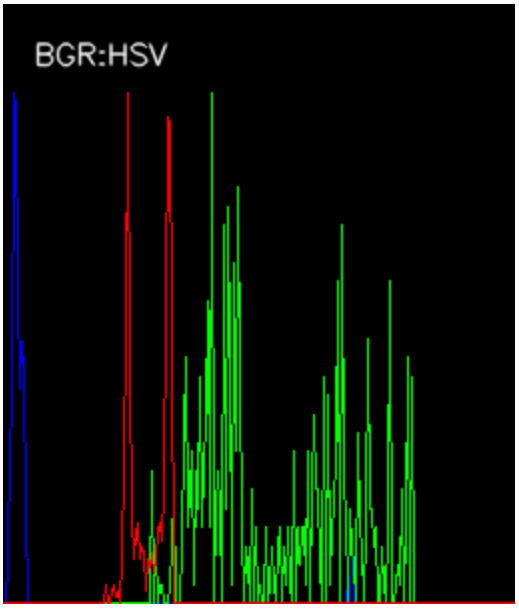
BROWN4 No Blur HSV



BLACK2 Post-Blur HSV



BROWN4 Post-Blur HSV



BLACK2 No Blur HSV Stats

	Min	Max	Avg	Sdv
Ch1:	0	170	106.46307398	29.2809279841
Ch2:	0	99	25.7769132653	16.3881172003
Ch3:	34	181	50.1100765306	5.52947809973

BLACK2 Post-Blur HSV Stats

	Min	Max	Avg	Sdv
Ch1:	90	125	116.464030612	3.88647669504
Ch2:	10	43	23.5691964286	5.00653222455
Ch3:	41	61	49.5772321429	4.02867964548

BROWN4 No Blur HSV Stats

	Min	Max	Avg	Sdv
Ch1:	0	179	19.9073170732	46.2918932142
Ch2:	69	234	137.388617886	39.1011637763
Ch3:	47	93	72.7317073171	10.0790962709

BROWN4 Post-Blur HSV Stats

	Min	Max	Avg	Sdv
Ch1:	2	174	11.7024390244	28.9467845453
Ch2:	74	204	136.830894309	36.3276063139
Ch3:	51	84	72.7691056911	9.63422194749

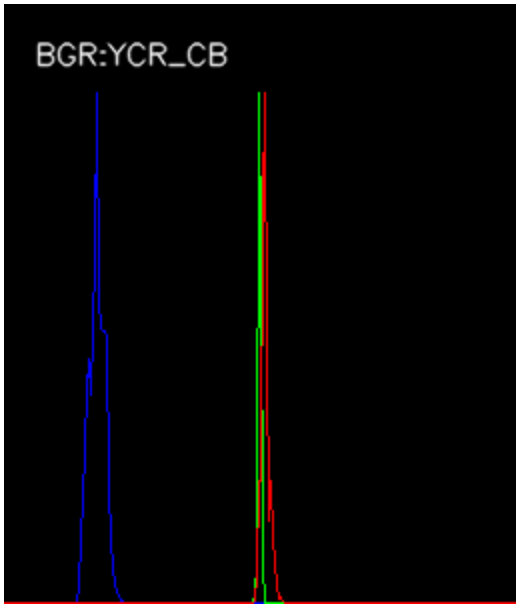
BLACK2 Post-Blur HSV Ranges

Ch1:	90<=116<=125
	104<=116<=128
Ch2:	10<=24<=43
	9<=24<=39
Ch3:	41<=50<=61
	38<=50<=62

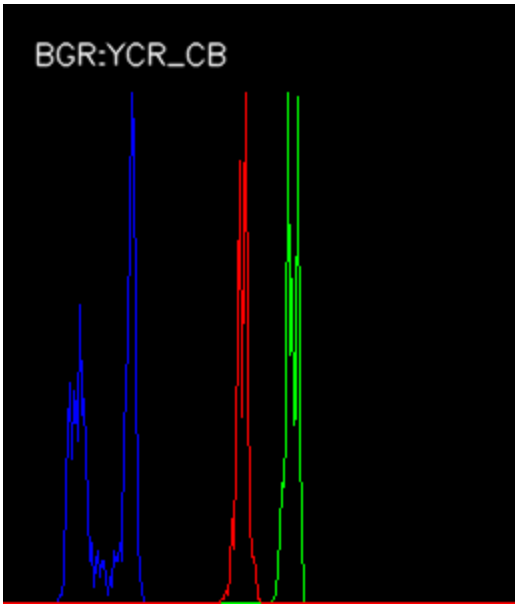
BROWN4 Post-Blur HSV Ranges

Ch1:	2<=12<=174
	0<=12<=40*
Ch2:	74<=137<=204
	28<=137<=246
Ch3:	51<=73<=84
	44<=73<=102

BLACK2 No Blur YCR_CB

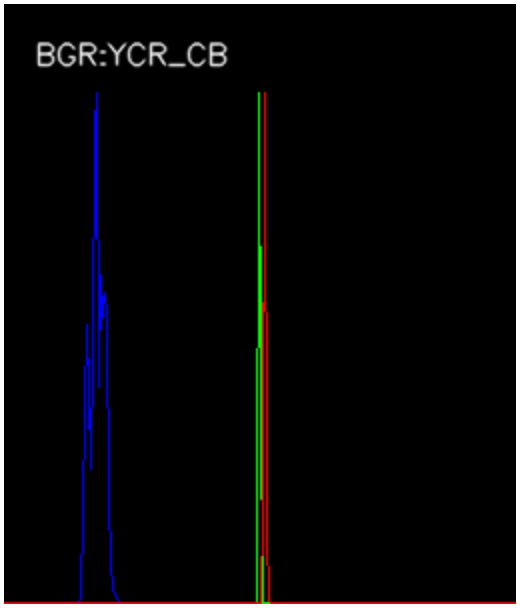


BROWN4 No Blur YCR_CB

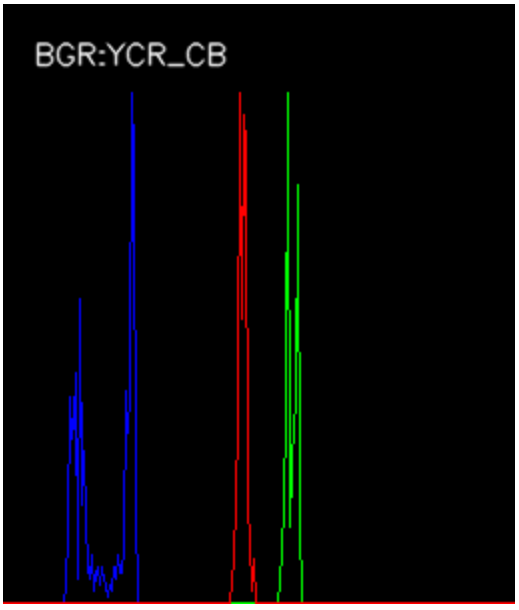


*all blur histograms are identical

BLACK2 Post-Blur YCR_CB



BROWN4 Post-Blur YCR_CB



BLACK2 No Blur YCR_CB Stats

	Min	Max	Avg	Sdv
Ch1:	32	176	46.0411352041	4.19741225396
Ch2:	123	132	127.388839286	0.692168604628
Ch3:	123	141	130.189540816	2.08093086347

BLACK2 Post-Blur YCR_CB Stats

	Min	Max	Avg	Sdv
Ch1:	38	57	46.0363520408	3.62491448999
Ch2:	127	128	127.288137755	0.452895561015
Ch3:	128	133	129.986033163	0.519390664303

BROWN4 No Blur YCR_CB Stats

	Min	Max	Avg	Sdv
Ch1:	28	69	50.6113821138	13.1544990804
Ch2:	135	150	143.821138211	2.96821240536
Ch3:	109	128	119.27804878	2.75723841414

BROWN4 Post-Blur YCR_CB Stats

	Min	Max	Avg	Sdv
Ch1:	31	66	50.6048780488	13.0020001817
Ch2:	138	148	143.861788618	2.6174064096
Ch3:	114	125	119.343089431	2.0026844302

Min<=Avg<=Max
Avg-3*Sdv<=Avg<=Avg+3*Sdv

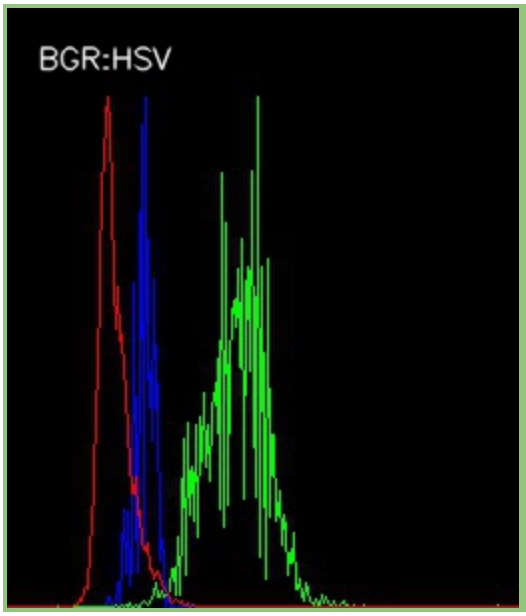
BLACK2 Post-Blur YCR_CB Ranges

Ch1:	38<=46<=57
	35<=46<=57
Ch2:	127<=127<=128
	126<=127<=129
Ch3:	128<=130<=133
	128<=130<=132

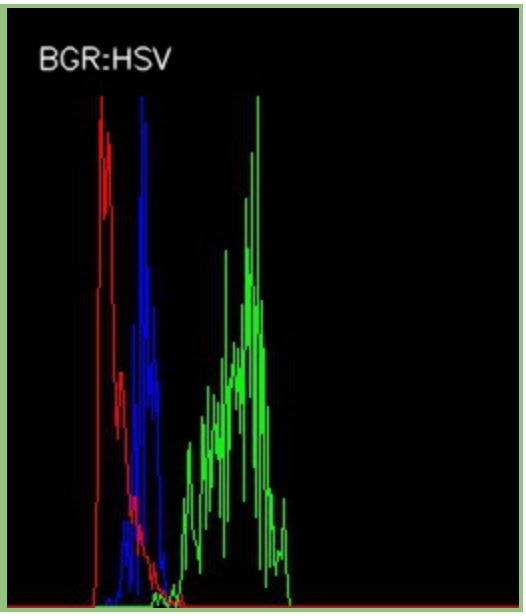
BROWN4 Post-Blur YCR_CB Ranges

Ch1:	31<=51<=66
	12<=51<=90
Ch2:	138<=144<=148
	136<=144<=152
Ch3:	114<=119<=125
	113<=119<=125

GREEN1 No Blur HSV



GREEN1 Post-Blur HSV



GREEN1 No Blur HSV Stats

	Min	Max	Avg	Sdv
Ch1:	50	80	68.3671636086	5.06939003721
Ch2:	54	245	113.801796636	15.4970492845
Ch3:	25	93	53.7652905199	8.1734093828

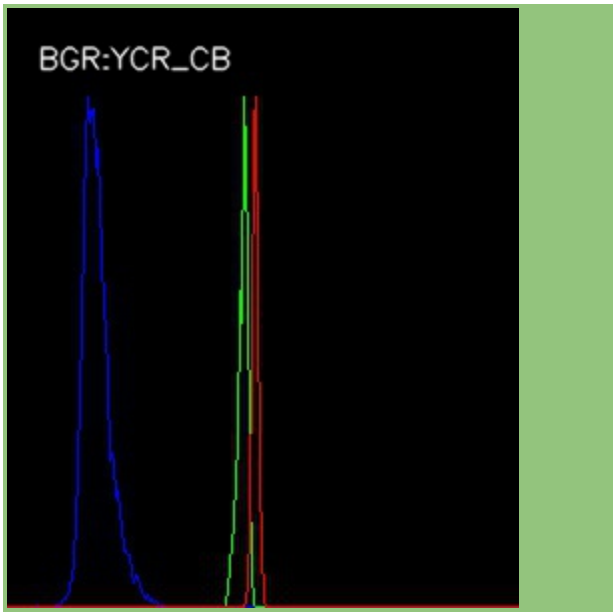
GREEN1 Post-Blur HSV Stats

	Min	Max	Avg	Sdv
Ch1:	50	78	68.3981269113	4.9279150403
Ch2:	73	140	113.309250765	12.9588388615
Ch3:	44	87	53.8541666667	7.54866638138

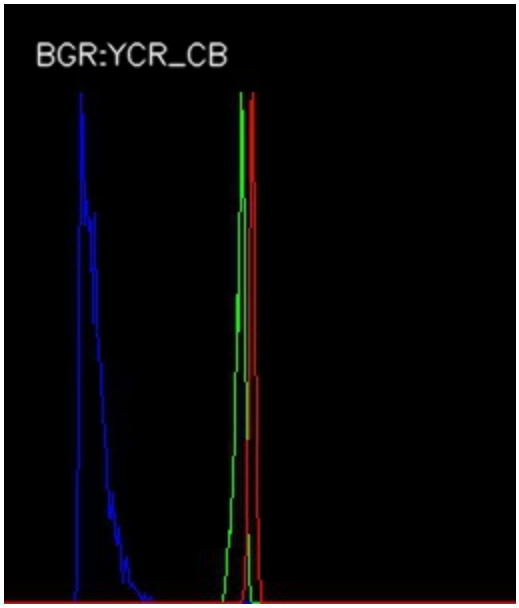
GREEN1 Post-Blur HSV Ranges

Ch1:	50<=68<=78
	54<=68<=83
Ch2:	73<=113<=140
	74<=113<=152
Ch3:	44<=54<=87
	31<=54<=77

GREEN1 No Blur YCR_CB



GREEN1 Post-Blur YCR_CB



GREEN1 No Blur YCR_CB Stats

	Min	Max	Avg	Sdv
Ch1:	15	78	44.7368119266	7.10542861691
Ch2:	109	123	117.430045872	2.46281197239
Ch3:	119	128	123.685015291	1.4694197558

GREEN1 Post-Blur YCR_CB Stats

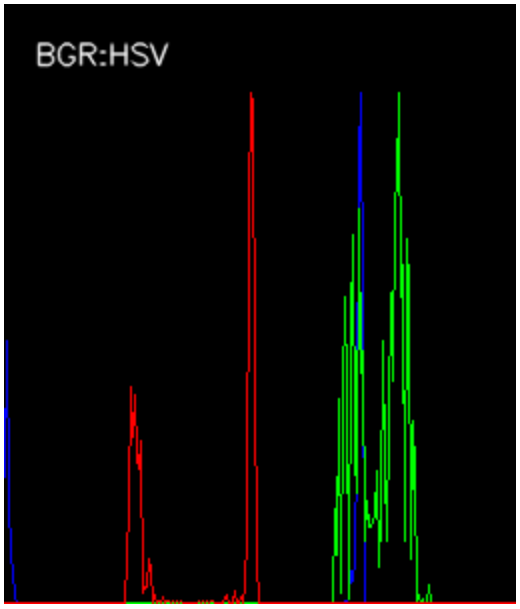
	Min	Max	Avg	Sdv
Ch1:	36	73	44.8199541284	6.40596525307
Ch2:	110	123	117.417240061	2.42305775757
Ch3:	119	127	123.677752294	1.40340689435

GREEN1 Post-Blur YCR_CB Ranges

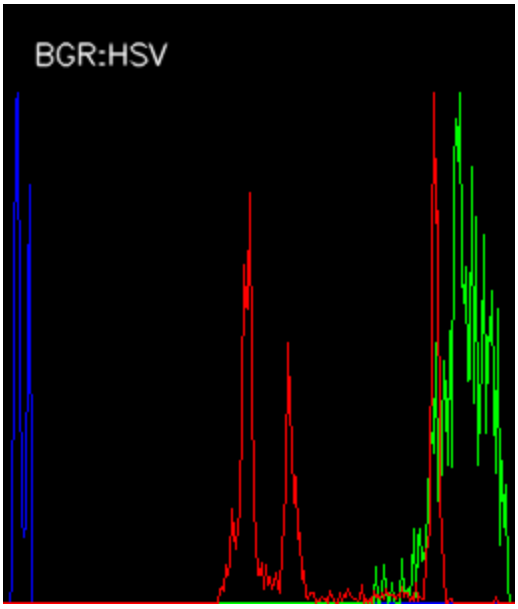
Ch1:	36<=45<=73
	26<=45<=64
Ch2:	110<=117<=123
	110<=117<=125
Ch3:	119<=123<=127
	119<=123<=128

From this point on Only the Post-Blur Histogram will be shown. It is evident that the Median filter removes outliers and still keeps the average and deviation the same.

RED5 Post-Blur HSV



ORANGE5 Post-Blur HSV



RED5 Post-Blur HSV Stats

	Min	Max	Avg	Sdv
Ch1:	0	179	128.57050393	78.8406282277
Ch2:	165	212	187.125751271	11.8217966264
Ch3:	61	126	98.8062875636	28.4177755127

ORANGE5 Post-Blur HSV

	Min	Max	Avg	Sdv
Ch1:	4	13	8.49415204678	2.89397857633
Ch2:	186	252	229.776900585	11.8379503613
Ch3:	108	246	158.894152047	41.4731142497

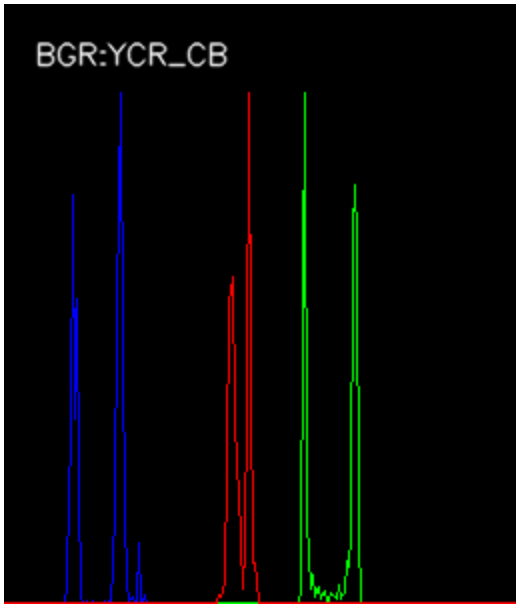
RED5 Post-Blur HSV Ranges

Ch1: 0<=129<=179***
Ch2: 165<=187<=212
152<=187<=222
Ch3: 61<=99<=126
14<=99<=184**

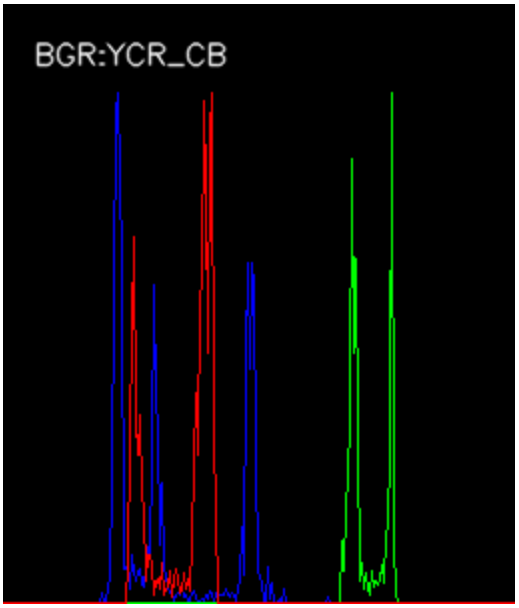
ORANGE5 Post-Blur Ranges

Ch1: 4<=8<=13
0<=8<=17
Ch2: 186<=230<=252
194<=230<=265
Ch3: 108<=159<=246
34<=159<=283

RED5 Post-Blur YCR_CB



ORANGE5 Post-Blur YCR_CB



RED5 Post-Blur YCR_CB Stats

	Min	Max	Avg	Sdv
Ch1:	31	70	48.0268146093	11.7077299554
Ch2:	148	177	164.197411003	12.0424335566
Ch3:	107	126	117.126675913	4.50577739778

ORANGE5 Post-Blur YCR_CB Stats

	Min	Max	Avg	Sdv
Ch1:	49	162	84.4739766082	29.0655675589
Ch2:	169	196	181.078070175	8.98159513931
Ch3:	62	106	89.2198830409	15.8852854782

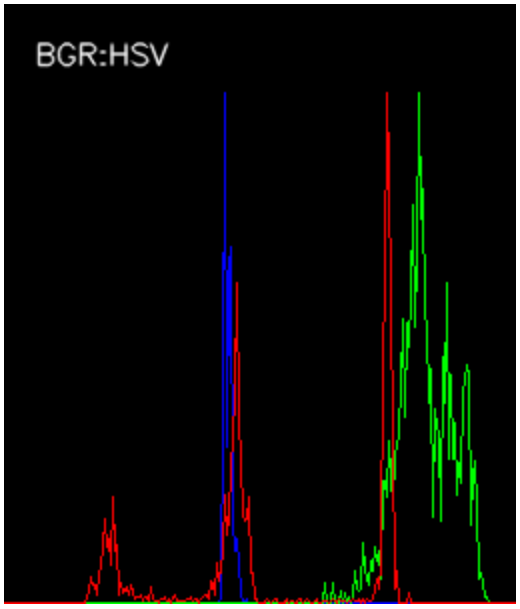
RED5 Post-Blur YCR_CB Ranges

Ch1: 31<=48<=70
13<=48<=83
Ch2: 148<=164<=177
128<=164<=200
Ch3: 107<=117<=126
103<=117<=131

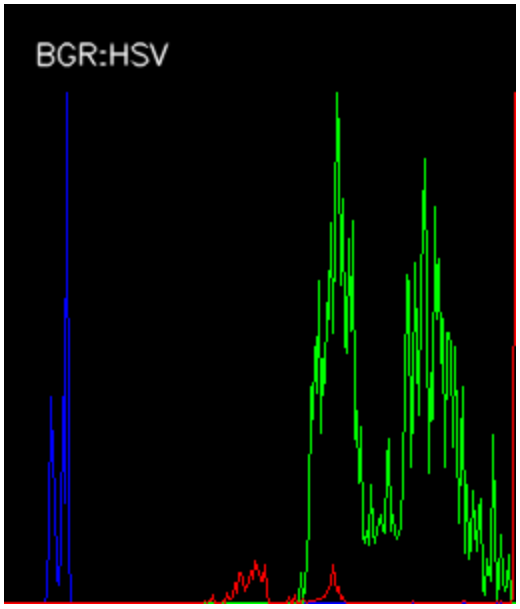
ORANGE5 Post-Blur YCR_CB Ranges

Ch1: 49<=84<=162
-3<=84<=171
Ch2: 169<=181<=196
154<=181<=207
Ch3: 62<=89<=106
41<=89<=137

BLUE4 Post-Blur HSV



YELLOW4 Post-Blur HSV



BLUE4 Post-Blur HSV Stats

	Min	Max	Avg	Sdv
Ch1:	108	121	111.707970112	2.06683742119
Ch2:	160	241	210.237391034	14.0429035865
Ch3:	41	202	136.790473225	50.7495344974

YELLOW4 Post-Blur HSV Stats

	Min	Max	Avg	Sdv
Ch1:	21	32	27.7952460384	3.42161515865
Ch2:	148	252	192.901028635	26.4909370007
Ch3:	97	255	187.274673339	61.2006540063

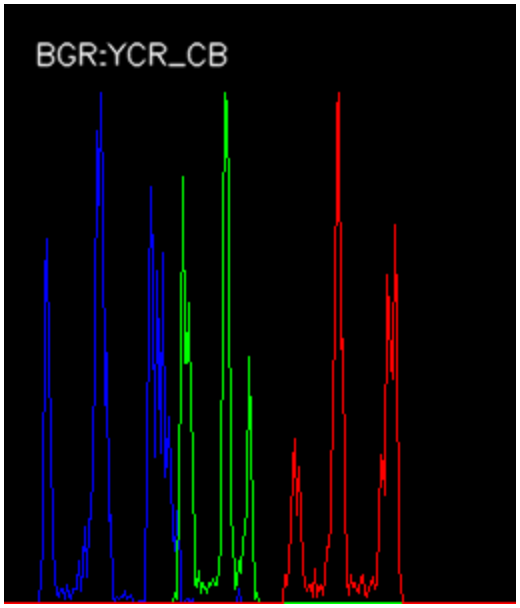
BLUE4 Post-Blur HSV Ranges

Ch1: 108<=112<=121
106<=112<=118
Ch2: 160<=210<=241
168<=210<=252
Ch3: 41<=137<=202
-15<=137<=289

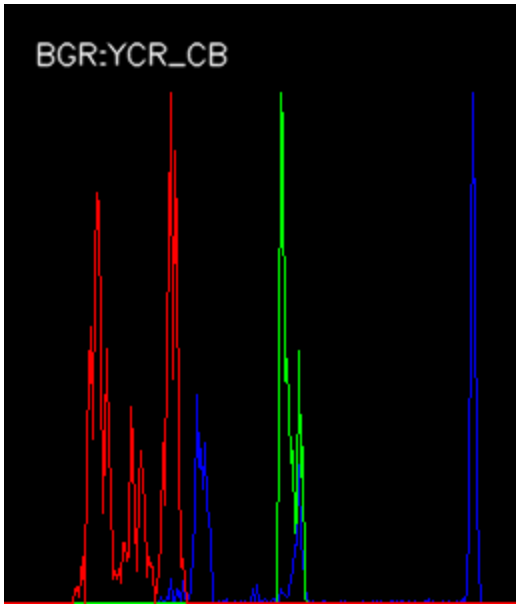
YELLOW4 Post-Blur HSV Ranges

Ch1: 21<=28<=32
18<=28<=38
Ch2: 14 8<=193<=252
113.4<=193<=272
Ch3: 97<=187<=255
3<=187<=371

BLUE4 Post-Blur YCR_CB



YELLOW4 Post-Blur YCR_CB



BLUE4 Post-Blur YCR_CB Stats

	Min	Max	Avg	Sdv
Ch1:	18	117	55.5157222914	21.0253079876
Ch2:	85	126	104.183841843	12.008570795
Ch3:	140	198	173.8251868	17.0324331885

YELLOW4 Post-Blur YCR_CB Stats

	Min	Max	Avg	Sdv
Ch1:	78	237	165.446205171	62.5704692317
Ch2:	137	150	141.650681123	3.75199255121
Ch3:	35	90	64.0222407562	16.9845243526

BLUE4 Post-Blur YCR_CB Ranges

Ch1: 18<=56<=117
-8<=56<=119
Ch2: 85<=104<=126
68<=104<=140
Ch3: 140<=174<=198
123<=174<=225

YELLOW4 Post-Blur YCR_CB Ranges

Ch1: 78<=165<=237
-23<=165<=353
Ch2: 137<=142<=150
130<=142<=153
Ch3: 35<=64<=90
13<=64<=115

#Draft #1 Threshold Values

##HSV
[Hue,Sat,Val]
black_low =[140, 0, 41]
black_high =[125, 39, 61]

red_low1   =[0,165, 61]
red_high1 =[6,212,126]

red_low2   =[169,165, 61]
red_high2 =[179,212,126]

orange_low =[4,186,108]
orange_high=[13,255,255]

yellow_low =[21,148, 97]
yellow_high=[32,255,255]

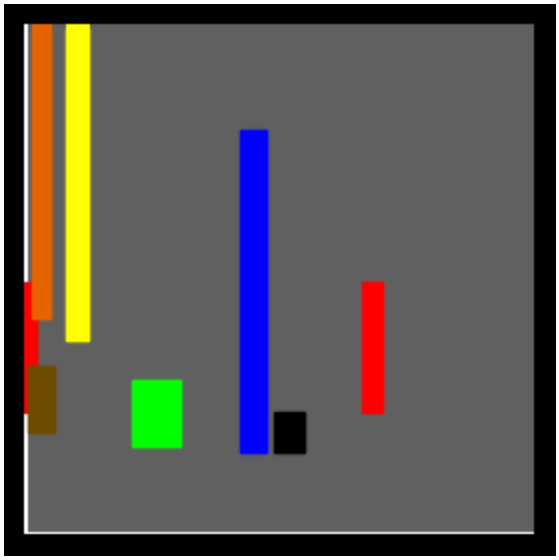
green_low =[54, 74, 44]
green_high =[78,140, 77]

blue_low   =[108,168, 41]
blue_high =[121,255,202]

brown_low =[2, 74, 51]
brown_high =[15,204, 84]
##The only problem with this set is that Red,Orange, and Brown overlap
in both the Hue,Sat,and Value space

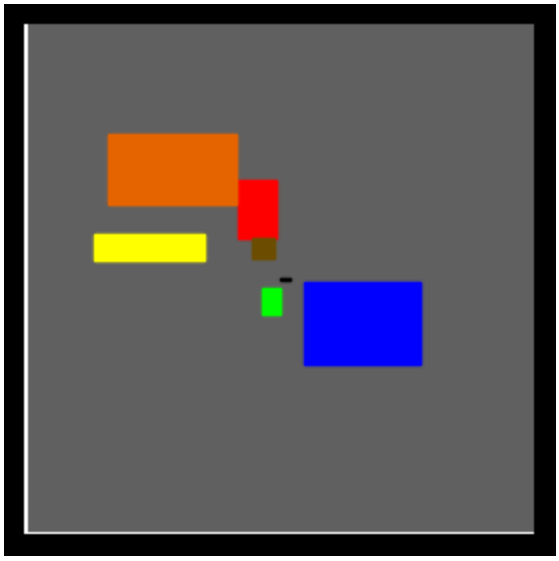
```
##YCR_CB
##          [  Y, CR, CB]
black_low  =[ 38,127,128]
black_high =[ 57,128,133]

red_low    =[ 31,148,107]
red_high   =[ 70,177,126]

orange_low =[ 49,165, 62]
orange_high=[162,200,106]

yellow_low =[ 78,137, 35]
yellow_high=[239,150, 90]

green_low  =[ 36,110,119]
green_high =[ 64,123,128]

blue_low   =[ 18, 85,140]
blue_high  =[117,126,198]

brown_low  =[ 31,138,114]
brown_high =[ 66,148,125]
####
```

^vValue,<>Hue ColorSpace Visualization



HSV Thresholding Overlap. Note how there is a lot of overlap with small Hue values for Orange, Red, and Brown.

^vCR,<>CB ColorSpace Visualization



YCR_CB Thresholding Overlap. Note how there is some ambiguity with Orange, Red, and Brown. There is less overlap, but at this point in time, I don't know if either colorspace is better for differentiating Orange, Red, and Brown.