Skin detection

Detect the "skin-pixels" in a color image. Create a new binary image, the same size as the input color image, in which the skin pixels are white (255) and all non-skin pixels are black (0).

A color pixel ***(R,G,B)*** is classified as "skin" if:

1)

$$R > 95 \;\&\; G > 40 \;\&\; B > 20 \;\&$$

$$\max\{R,G,B\} - \min\{R,G,B\} > 15 \;\&$$

$$|R - G| > 15 \;\&\; R > G \;\&\; R > B$$

2)

$$\left(\frac{R}{G} > 1.185\right) \;\&\; \left(\frac{RB}{(R+G+B)^2} > 0.107\right) \&\left(\frac{RG}{(R+G+B)^2} > 0.112\right)$$

An ***(H,S,V)*** pixel is classified "skin" if:

3)

$$(V \geq 0.4) \&\; (0.2 < S < 0.6) \&(0 < H < 25 \mid 335 < \mathrm{H} \leq 360)$$

4)

$$H \in [0,50] \;\&\; S \in [0.23,0.68]$$

5)

$$(S \geq 10 \& V \geq 40 \&\; S \leq 110 - H - 0.1V) \mid H \leq 75 - 0.4V$$

An ***(Y,Cb,Cr)*** pixel is classified "skin" if:

6)

$$Y > 80 \;\&\; 85 < Cb < 135 \;\&\; 135 < Cr < 180,\; Y,\; Cb,\; Cr \in [0,\; 255]$$

7)

$$80(77) \leq Cb \leq 120(127) \;\&\; 133 \leq Cr \leq 173$$

Use skin pixel classification to detect the face in a portrait image (find a minimal square that frames the human face).

Create an **emoticon image**.