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). Implement all the below described methods.
Bibliography: 1, 2, 3, 4

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)

$$H \in [0,50] \;\&\; S \in [0.23,0.68] \;\&\; V \in [0.35,1]$$

5)

$$H \in [0,50] \cup [340,360] \;\&\; S \geq 0.2 \;\&\; V \geq 0.35$$

(R,G,B) to ***(Y,Cb,Cr)*** conversion:

$$Y = 0.299R + 0.587G + 0.114B$$

$$Cb = -0.1687R - 0.3313G + 0.5B + 128$$

$$Cr = 0.5R - 0.4187G - 0.0813B + 128$$

R,G,B $\in [0,255] \rightarrow$ ***Y, Cb, Cr*** $\in [0,255]$.

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)

$$Cr \leq 1.5862\ Cb + 20\ \ \&$$
$$Cr \geq 0.3448\ Cb + 76.2069\ \ \&$$
$$Cr \geq -4.5652\ Cb + 234.5652\ \ \&$$
$$Cr \leq -1.15\ Cb + 301.75\ \ \&$$
$$Cr \leq -2.2857\ Cb + 432.85$$

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**.

Optional: show me an image that, in your opinion, “says more than 1000 words”.