INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD ISSN: 2455-0620 Volume - 7, Issue - 5, May – 2021
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value: 86.87 Impact Factor: 6.719
Received Date: 30/04/2021 Acceptance Date: 15/05/2021 Publication Date: 31/05/2021

Survey Paper on Skin disease detection

[1]Preet shah, [2]Sejal Thakkar
[1]Student, [2]Assistant Professor,
[1, 2] Computer Engineering Department, IITE Indus University, Ahmedabad, India
Email – [1]preetshah986@gmail.com [2]seju101ster@gmail.com

Abstract: *In assigning health priorities, skin diseases are sometimes thought of, in planning terms, as small-time players in the global league of illness compared with diseases that cause significantly mortality, for example, COVID-19/HIV/AIDS. Nonetheless, skin infections are the most generally perceived clinical issues. Various procedures for skin infection recognition have been proposed during a few past years. Nonetheless, an exhaustive overview on the point is as yet absent. We attempt to fill this vacuum by exploring most broadly utilized strategies and methods and gathering their mathematical assessment results.*

Key Words: *skin diseases, COVID-19/HIV/AIDS, utilized strategies, mathematical assessment results.*

1. INTRODUCTION:

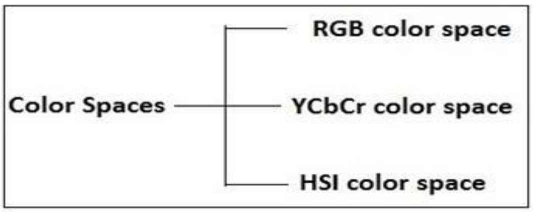
In an agricultural nation like India there is a lot lesser awareness about the diagnosis of the skin infection issue and furthermore a more noteworthy number of patients don't get appropriate treatment in view of absence of specialists. Skin color identification techniques deals with two significant issues one is variable human skin tone and second one is complex background. Human skin tone variety can be handily seen from one individual to another inside same ethnic gathering or diverse ethnic gatherings. What's more, the background utilized progressively is normally perplexing with variable lightening conditions. Consequently, a decent skin color detection and recognition algorithm is needed to function admirably under these conditions. In this paper we examine pixel- based skin detection strategies, that arrange every pixel as skin or non-skin independently. The skin recognition techniques utilized in this paper are situated in singular color spaces utilized in earlier skin detection strategies like HSV: a variant of hue and saturation, Normalized RGB, basic RGB, YUV, transformation from CIE, including Farnsworth and CIE L*a*b*, YCbCr, HIS, and so forth Three of these color spaces are clarified in the current paper. Further conversation of color spaces and skin detection can be found in references.

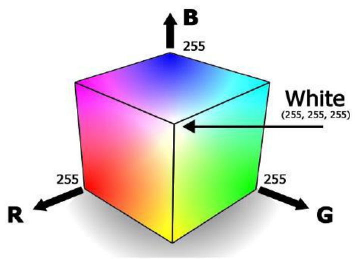
2. COLOR SPACES:

At the point when a bunch of colors are addressed utilizing mathematical expression it is called color space. Diverse color spaces are utilized for various applications computer graphics, image processing, tv broadcasting, and computer vision. The choice of color space can be considered as the primary step in skin-color classification.[12] A wide range of color spaces are utilized like RGB, HSv, HSI, YCbCr, CIE-Lab, CIE-Luv. The RGB color space is the default color space for most accessible image formats. Other color spaces can be obtained from a linear or non-linear transformation from RGB. Picking YCbCr color space serves to a greater extent as RGB is named as basic color space while YCbCr is named as orthogonal color space. The color space change is expected to diminish the cover among skin and non-skin pixels accordingly supporting skin-pixel classification to give powerful boundaries against fluctuating illumination conditions. Thus, it has been a typical practice to drop the luminance part for skin classification.

3. RED, GREEN AND BLUE COLOUR MODEL (RGB):

RGB is a colorspace begun from CRT display applications, when it was advantageous to depict color as a blend of three colored beams (red, green and blue). It is quite possibly the most broadly utilized color spaces for processing and storing of digital image data. Any color can be made by blending the three base colors. Depending upon what amount is taken from each base color, any color can be made. Reversing this procedure, a particular color can be separated into its red, blue and green components. These values can be utilized to discover comparative colored pixels from the image.

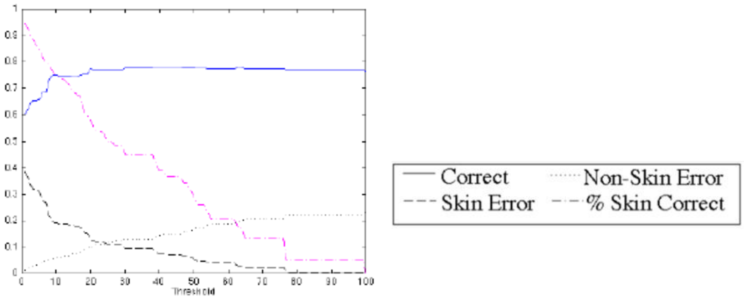




1.RGB Color Model

Rgb color space isn't liked for color based detection and color analysis on account of blending of color(chrominance) and intensity (luminance) data and its non-uniform qualities.[6] The change of RGB to normalized RGB can be acquired by the process of normalization. To lessen the effect of lightening the components of RGB color space are normalized. The normalized part when included gives resultant total equivalent to unity (R+G+B = 1). This connotes that third component have no huge job and it tends to be dropped to lessen dimensionality. In normalized RGB color space, the color data can without much of a stretch be isolated from the intensity data.

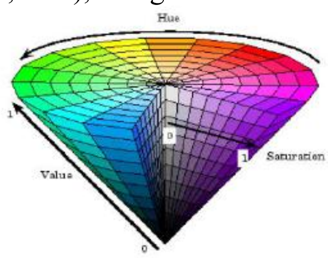
$$r = \frac{R}{R+G+B} \qquad g = \frac{G}{R+G+B} \qquad b = \frac{B}{R+G+B}$$



Normalized RGB

4. HIS, HSV, HSL – Hue saturation intensity:

The hsv color space is more natural to how individuals experience color than the RGB color. Hue-saturation based colorspaces were presented when there was a requirement for the client to indicate color properties mathematically. Hue characterizes the prevailing color (such as red, green, purple and yellow) of a space, saturation estimates the colorfulness of a space with respect to its brightness. Saturation is characterized as property that goes from red to pink while intensity otherwise called brightness or value as the property of color which fluctuates from black to white. As saturation shifts from 0 to 1.0, the comparing colors fluctuate from 0 to 1.0, the relating colors become progressively brighter. Hue has the property that it is invariant to features at white light sources, and furthermore, for matte surfaces, to surrounding light and surface direction comparative with the light source. With RGB the color will have values like (0.5, 0.5, 0.25), though for HSV it will be (30°, √3/4, 0.5).



HSV Color Model

To get change from RGB to HIS color, normalized the value of intensity in the range [0,1] and express hue and saturation according to these equations:

$$H = \frac{R + G + B}{3}$$

$$S = \frac{1 - \min(R,G,B)}{I} = 1 - \frac{3}{R + G + B}$$

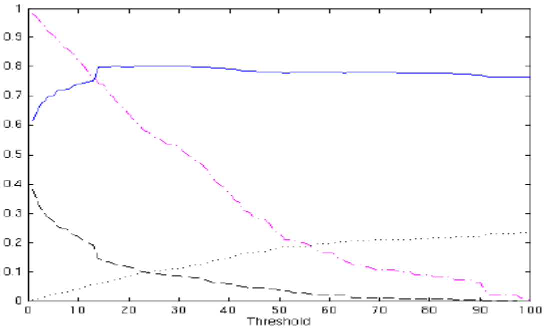
The polar coordinate arrangement of Hue-Saturation spaces, resulting in cyclic nature of the colorspace makes it badly designed for parametric skin color models that need tight cluster of skin colors for best execution. An alternate portrayal of Hue-Saturation utilizing Cartesian coordinates can be utilized:

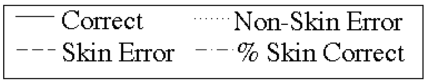
$$X = S\cos H, \quad Y = S\sin H$$

5. Skin Detection using HSV Color Space:[8]

The algorithm for the detection of human skin color in color images is clarified as follows.

- Image is provided from the image data set which is the assortment of 30 color images.
- Image in RGB color space is changed over into HSV color space utilizing transformation HSV image is an assortment of three distinct images as hue, saturation and value.
- Histogram is processed for every one of the three parts and from the histogram, threshold value for three components can be obtained
- Masking is applied for skin pixels in the test image.
- Threshold is applied to the masked image.
- Threshold image is smoothened and filtered.
- The output image contains just skin pixels





HSV

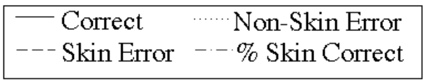
6. YCrCb:

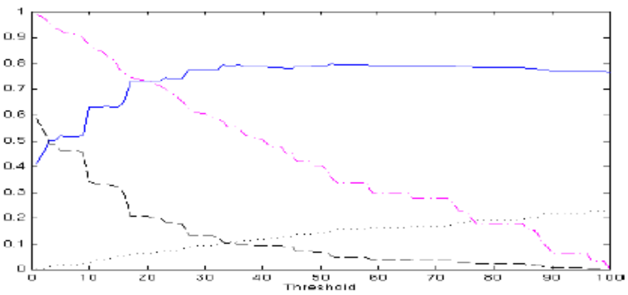
YCrCb is an encoded nonlinear RGB signal, usually utilized by European TV studios and for image compression work.[6] The orthogonal color spaces lessen the excess present in RGB color channels and address the color with statistically autonomous parts. In YCrCb color space Y relates to luminance, Cb compares to chromatic blue and Cr relates to Chromatic red. Since the portrayal makes it simple to dispose of some repetitive color data, it is utilized in image and video compression standards like JPEG, MPEG1, MPEG2, and MPEG4. The change simplicity and explicit separation of luminance and chrominance segments makes YCrCb color space. For skin detection issues, the most picked color space is YCbCr color space and is utilized by different specialists. YCrCb values can be acquired from RGB color space as per equations:[2]

$$Y = 0.299R + 0.587G + 0.114B$$
$$C_r = R - Y$$
$$C_b = B - Y$$

$$\begin{bmatrix} Y \\ Cb \\ Cr \end{bmatrix} = \begin{bmatrix} 0.2290 & 0.5870 & 0.1140 \\ -0.1687 & -0.3313 & 0.5000 \\ 0.5000 & -0.4187 & -0.0813 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix} + 128$$

RGB to Ycbcr Color Space Conversion





YC_rC_b

INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD ISSN: 2455-0620 Volume - 7, Issue - 5, May – 2021
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value: 86.87 Impact Factor: 6.719
Received Date: 30/04/2021 Acceptance Date: 15/05/2021 Publication Date: 31/05/2021

6. Comparative evaluation:

Pratheepan dataset for human skin detection is utilized as standard for comparing results. The dataset contains the images which are downloaded randomly from google for human skin detection research [6]. The HSV, YCbCr and RGB value of every pixel is contrasted with the standard values of a skin pixel and choice is made if the pixel is a skin pixel relying upon whether the values lie in a scope of predefined threshold values for every parameter. The ranges for a skin pixel in various color spaces utilized are as per the following [6]:

0.0<= H <= 50.0 and 0.23 <= S <= 0.68 and
R > 95 and G > 40 and B > 20 and R > G and R > B
and | R – G | > 15 and A > 15

Sr. No.	Total no of Pixels	Skin pixels detected (Our algo.)	Skin pixels in GT image	Nonskin Pixels detected (Our algo.)	Nonskin pixels in GT image	True Positive	False Positive	True Negative	False Negative	Precision	Accuracy
1	196608	54885	55836	140772	141723	54885	0	140772	951	100	99.5
2	176418	29828	23089	153329	146590	23089	6739	146590	0	77.4	96.1
3	114400	20497	21128	93272	93903	20497	0	93272	631	100	99.4
4	108600	51191	49420	59180	57409	49420	1771	57409	0	96.5	98.3
5	50000	19328	18926	31074	30672	18926	402	30672	0	97.9	99.1
6	128000	72237	47359	80641	55763	47359	24878	55763	0	65.5	80.55

Table shows accuracy calculations on the images using following definitions. True positive (TP) represents number of Skin pixels correctly identified as skin, True negative (TN) is number of Non-skin pixel correctly identified as non-skin, False positive (FP) is Non-skin pixel incorrectly identified as skin and False negative (FN) –Skin pixel incorrectly identified as non-skin. Precision and Accuracy calculated using following formulas:[6]

$$Precision = \frac{TP}{TP+FP}$$

$$Accuracy = \frac{TP+TN}{(TP+TN+FP+FN)}$$

For reasonable execution assessment of various skin color demonstrating strategies indistinguishable testing conditions are liked. Sadly, many skin detection techniques give results all alone, publicly unavailable databases The most celebrated preparing and test image data set for skin detection is the Compaq database. In the table underneath the best aftereffects of various techniques, revealed by the authors, for this dataset are introduced. Albeit various strategies utilize marginally unique division of the data set into preparing and testing image subsets and utilize diverse learning systems, the table should give a general image of the techniques performance.[2]

Method	TP	FP
Bayes SPM in RGB [Jones and Rehg 1999]	80% 90%	8.5% 14.2%
Bayes SPM in RGB [Brand and Mason 2000]	93.4%	19.8%
Maximum Entropy Model in RGB [Jedynak et al. 2002]	80%	8%
Gaussian Mixture models in RGB [Jones and Rehg 1999]	80% 90%	~ 9.5% ~ 15.5%
SOM in TS [Brown et al. 2001]	78%	32%
Elliptical boundary model in CIE-xy [Lee and Yoo 2002]	90%	20.9%
Signle Gaussian in CbCr [Lee and Yoo 2002]	90%	33.3%
Gaussian Mixture in IQ [Lee and Yoo 2002]	90%	30.0%
Thresholding of I axis in YIQ [Brand and Mason 2000]	94.7%	30.2%

Performance of different skin detectors reported by the authors

7. CONCLUSION :

Real time human skin color discovery is needed in the majority of the vision-based applications. In this paper, we have given the depiction, comparison and, assessment consequences of mainstream techniques for skin detection and, modeling. We attempted to sum up the most eminent and critical contrasts between the strategies. A decent skin detection should have the option to segregate among skin and non-skin pixels for a wide scope of individuals with various skin types like white, yellow, brown and dark and have the option to perform well under various illumination conditions, for example, indoor, outside and with white and non-white illumination sources

REFERENCES:

1. Vladimir Vezhnevets and Alla Andreeva, A Comparative Assessment of Pixel-based Skin Detection Methods
2. A Survey on Pixel-Based Skin Color Detection Techniques Vladimir Vezhnevets ¤ Vassili Sazonov Alla Andreeva Graphics and Media Laboratory † Faculty of Computational Mathematics and Cybernetics Moscow State University, Moscow, Russia.
3. ZARIT, B. D., SUPER, B. J., AND QUEK, F. K. H. 1999. Comparison of five color models in skin pixel classification. In *ICCV'99 Int'l Workshop on recognition, analysis and tracking of faces and gestures in Real-Time systems*, 58–63.
4. A survey of skin-color modeling and detection methods P. Kakumanu, S. Makrogiannis, N. Bourbakis∗ *ITRI/Department of Computer Science and Engineering, Wright State University, Dayton OH 45435, USA*
5. The International Journal of Multimedia & Its Applications (IJMA) Vol.4, No.3, June 2012 DOI : 10.5121/ijma.2012.4305 57 AN INNOVATIVE SKIN DETECTION APPROACH USING COLOR BASED IMAGE RETRIEVAL TECHNIQUE Shervan Fekri-Ershad1, Mohammad Saberi2 and Farshad Tajeripour3 1,2,3Dept. Computer Science & Engineering and IT, Shiraz University Shiraz/ Iran
6. Human Skin Detection Using RGB, HSV and YCbCr Color Models S. Kolkur1, D. Kalbande2, P. Shimpi2, C. Bapat2, and J. Jatakia2 PHUNG, S. L., BOUZERDOUM, A., AND CHAI, D. 2002. A novel skin color model in ycbcr color space and its application to human face detection. In *IEEE International Conference on Image Processing (ICIP'2002)*, vol. 1, 289–292.
7. 3rd International Conference on Recent Trends in Computing 2015 (ICRTC-2015) Comparative Study of Skin Color Detection and Segmentation in HSV and YCbCr Color Space Khamar Basha Shaika, Ganesan P a, *, V. Kalista, B.S. Sathish a, J. Merlin Mary Jenithab Dermatological Disease Detection using Image Processing and Artificial Neural Network Saurabh Kumar Maurya1, Prerna Sharma2, Saurav3, Mansi Malik4
8. Skin Disease Detection using Image Processing Technique Prem J. Patil1, Sagar J. Buchkule2, Varsha S. More3, Sanket G. Abhale4 Proceedings of the 9th INDIACom; INDIACom-2015 2015 2nd International Conference on "Computing for Sustainable Global Development", 11th – 13th March, 2015 Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM), New Delhi (INDIA) Real-time Human Skin Color Detection Algorithm using Skin Color Map
9. Skin Cancer Detection Using Image Processing Uzma Bano Ansari1 M.E. Student, Department of Computer, TSEC,Mumbai Tanuja Sarode2