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Research Article

REAL-TIME SKIN DETECTION

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ABSTRACT

Recent development in the areas of computer vision detonated the emergence of a new paradigm of ubiquitous and smart environment. This paper purports to explain about the real-time skin detection of employees and its efficacy in serving academic and industrial world. This can conform in monitoring and planning their security.

INTRODUCTION

There are many situations and applications where there is need to detect the presence of humans. Like presence of humans in mines, nuclear sites or any other sensitive areas. Also detecting humans can help in security applications in sites of burglary. Recording the data of every human being requires creation of a database which can store the candidate's information and as number of candidates increase it becomes difficult to manage and cost increases as memory requirement increases.

SYSTEM IMPLEMENTATION

The notification system makes use of web camera of laptop to detect skin of human being. Computer vision is used as platform to run the Python script which extracts the feature of human being. The script runs the code which supports python language. The Python language is used to import frames from camera and skin is detected. It also uses other softwares like numpy for libraries.

There are various methods to achieve it like sensing the heat radiated by body. One of the way to detect humans can be skin detection which is being used here. To accomplish this skin detection, skin detection is being framed as an extension to colour detection. However, under different lighting conditions, this approach might not perform so well and we would likely have to continue to change range of HSV value ranges. Also as skin tone of every person of different ethnicity might be different and it would make it difficult for a program to detect the skin accurately.

System description

The code accepts the commands and it searches the frames of images sent by camera for that skin colour. After finding the match, the details of the human being are fetched, i.e. skin is detected and is shown in the adjacent window.

PERFORMANCE AND EXPERIMENTS

The experimental setup required for the proposed system is very simple. Besides the hardware setup the software's must also be installed. In this project we used python script and for that python must be installed in the system as well as open cv is required supplementing these numpy is also required for additional libraries.

Algorithm

Step1: Import necessary packages.
Step2: Provide pre-supplied video to detect the skin.
Step3: If video path is not given use webcam to detect the skin.
Step4: Define upper and lower boundaries for pixel intensities to be considered skin.
Step5: Check if video switch is supplied if not go to webcam.
Step6: If switch is supplied give path.

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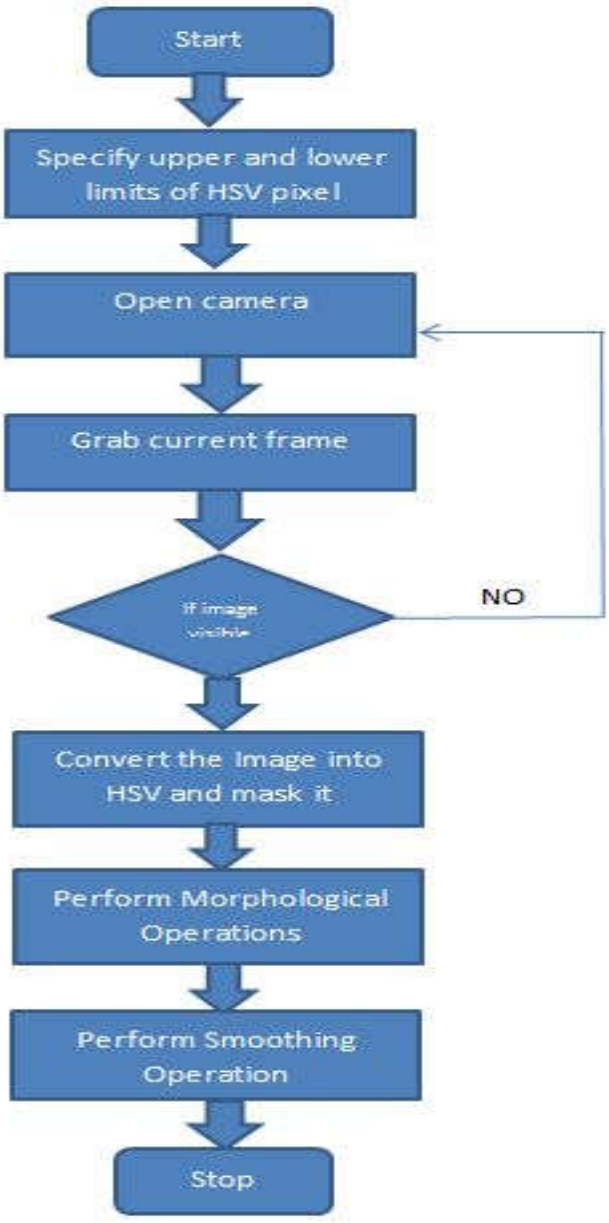
Step7: Grab the frames in the video.
Step8: Resize the frame and convert into HSV.
Step9: Apply HSV frame and upper and lower boundaries for HSV to get mask.
Step10: To remove false-positive skin regions use series of erosion and dilation.
Step11: Use Gaussian blur to remove noise and then apply this mask to frame.
Step12: Show side by side original frame and frame with skin detected.
Step13: If 'q' is pressed break the loop and close open windows.

Flowchart



Equations

To perform morphological operation, we first convolve (*c*) the binary image with a binary structuring element (*s*). Convolution of a binary image *f* with a 3x3 structuring Element *s* is :

$$c = f \text{ X } s \quad (1)$$

The integer-valued count of the number of 1's inside each structuring element as it is scanned over the image and *S* be the size of the structuring element (number of pixels). The standard operations used in binary morphology include:

Erosion: $\text{erode}(f, s) = \theta(c, S)$ (2)

Dilation: $\text{dilate}(f, s) = \theta(c, 1)$ (3)

Opening: $\text{open}(f, s) = \text{dilate}(\text{erode}(f,s),s)$ (4)

RESULTS

When the real time frames from the camera of human being are recorded, the details of the frames are fetched and the data is sent and the colour of skin is matched whether it is in the range if applied input.

Whenever the code is run in python the window pops up and web camera of laptop is accessed. When the image (number of frames) of human being are given as the input it automatically fetches the information of colour of skin. The window where the only part of skin is detected then pops up and shows the skin in the adjacent window.

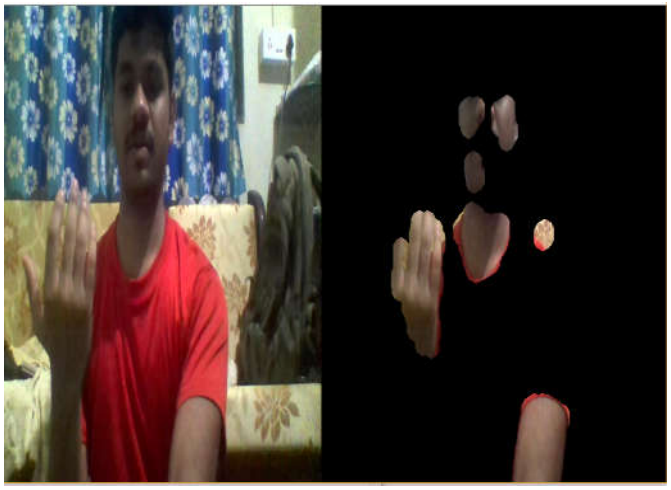


Fig 1 Original image and detected skin image.

RESULT ANALYSIS

Detection of only that part of body where skin is visible.

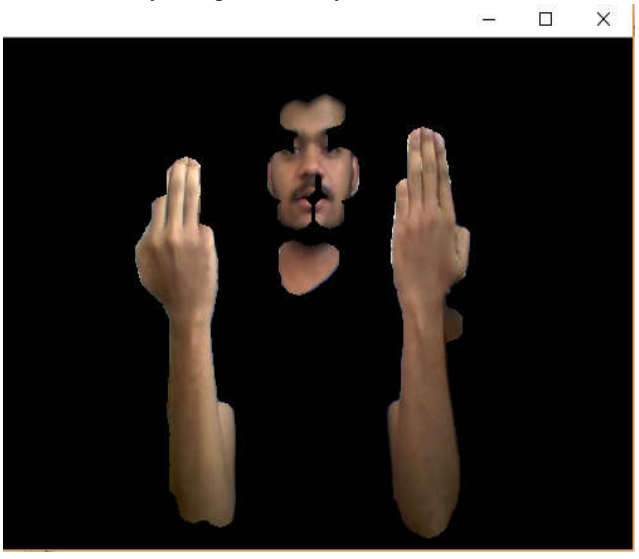


Fig 2 Result 1

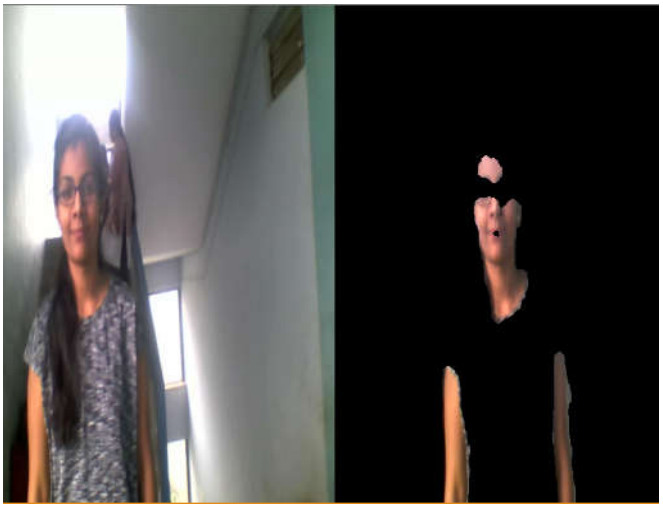


Fig 3 Result 2

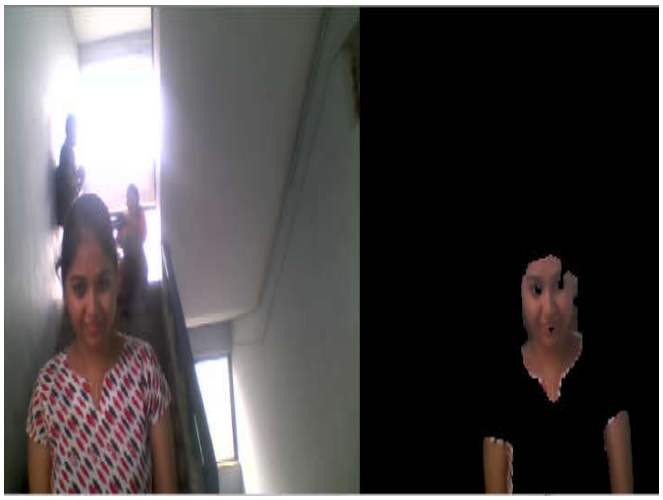


Fig 4 Result 3

Fig 5 Result 4

To accomplish our skin detection, we framed the skin detection as an extension to colour detection. We supplied upper and lower ranges of pixel intensities in the HSV colour space to detect skin.

While this is not the perfect or robust approach, simplicity of our algorithm makes it easy to implement and basis for more robust solutions.

CONCLUSION

Skin detection can help in variety of applications in day to day life. It can be used to detect presence of person anywhere. It can be used in security applications. Also can be used presence of humans in sensitive areas e.g. mines, nuclear plants. This concept of security can be used in many other fields too, reducing human interference and promoting automation.

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