Human Skin Tone Detection

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Abstract— *Human skin tone variation can be easily seen from person to person within the same ethnic group or different ethnic group. The skin tone is analysed by melanosome size, significant and progressive variation in size and ethnicity. In face recognition the shape of the face gets identified but background used in real time is usually complex with varying lighting conditions. Automatic skin detection has been intensively studied for human-related recognition systems. The Gaussian model for skin detection is with its generality but they lack in their accuracy. Hence we suggest a new statistical colour model for skin detection called an elliptical boundary model. Detection and tracking of human face and hands are used for gesture recognition and to handle the domain transfer problem. The elliptical boundary model overcomes the limitations of the Gaussian model with better performance based on six chrominance spaces on the face, giving a much higher correct detection ratio with faster speed. For that, we are processing with two main domains that are Full stack development which handles the frontend and backend of the application and Machine Learning algorithms which handles the detection of the skin tone. Here we are dealing with image processing techniques for input and the output will find the skin tone of that particular image that we are processing. The applications that involve skin tone detection are face detection, gesture recognition and image filtering. Hence they overcome the different illumination conditions as different domains of skin pixels. The objective of the project is to detect the skin tone from a human face image with various tone characteristics. We are detecting the basic tone differentiation (Fair, Mild or Dark).*

Keyword: Machine learning - Skin tone detection

I. INTRODUCTION

Human skin tone detection is the process of analysing the skin with its tone. The detection is one of the most applicable methods in human detection, Face detection and various other detections. The objective the work is to provide an efficient and accurate method to detect human skin tone in images. We use machine learning algorithm to precisely identify the skin tone and provide you with the result stating in which category the given skin tone fall into. Here we are dealing with image processing techniques for input and the output will find the skin tone of that particular image that we are processing.

Machine Learning:

Machine learning algorithm that teaches the computer to act as humans and learn from examples. Machine learning (ML) is a part of artificial intelligence (AI) that shows software applications, to become accurate at predicting outcomes without errors. Machine learning algorithms use historical dataset as input to predict new output values.

Image processing

- Face is recognized from the given picture.

- Facial features are identified.

- Dark colour pixels are removed from the image for better results.

- Skin pixels are extracted.

- The extracted pixel colours are matched with the colours which we want to categories the input colour into. (Dark mild or fair)

- Final output result will be sent along with the visual representation.

II. EXISTING SYSTEM-

The Rotation Invariant Ellipsoid Projection Model

In the existing system the complete projection of two ellipsoids will bring some problems, such as the color distortion and data boundary unreliable. These problems are mainly caused by the ellipsoid rotation during the projection. Hence, we need to discard the rotation and keep only the scale zooming and the translation. The key idea is to change the shape of the target ellipsoid. For the original target ellipsoid (μ_t, Σ_t), we change it with (μ_t, Σ'_t) which means we keep the ellipsoid center unchanged but new axis orientations and axis scales.

An overview of our face detection algorithm is depicted which contains two major modules:

1. Face localization for finding face candidates and
2. Facial feature detection for verifying detected face candidates.

The algorithm first estimates and corrects the color bias based on a lighting compensation technique. The corrected red, green, and blue color components are then nonlinearly transformed in the $Y C_b C_r$ color space. The skin-tone pixels are detected using an elliptical skin model in the transformed

space. The parametric ellipse corresponds to contours of constant Mahalanobis distance under the assumption of Gaussian distribution of skin tone color. The detected skin-tone pixels are iteratively segmented using local color variance into connected components which are then grouped into face candidates based on both the spatial arrangement of these components and the similarity of their color. The size of a face candidate can range from 13×13 pixels to about three fourths of the input image size. The facial feature detection module rejects face candidate regions that do not contain any facial features such as eyes, mouth, and face boundary. A detected face enclosed by an ellipse with the associated eyes-mouth triangle.

III. PROPOSED SYSTEM-

We are processing with two main domains that are Full stack development which handles the frontend and backend of the application and Machine Learning algorithms which handles the detection of the skin tone. Here we are dealing with image processing techniques for input and the output will find the skin tone of that particular image that we are processing. The applications that involve skin tone detection are face detection, gesture recognition and image filtering. Hence they overcome the different illumination conditions as different domains of skin pixels. The objective of the project is to detect the skin tone from a human face image with various tone characteristics. We are detecting the basic tone differentiation (Fair, Mild or Dark).

- Gathering image as input and processing into images

- Attributes generation and Creation of Dataset of the person

- Extensive comparison with input dataset and test images

- Evaluating facial features using Algorithms to detect the results.

IV. MODULES-

1. System Module:

The system is the connectivity oriented that reaches the frontend and backend. Our project is to provide a user-friendly application where the key is in image of the person and skin tone of that particular image. The specific requirements are

- Upload image file.

- Predicting skin tone.

- Delivering the tone colour.

2. Group Module:

After image process, features are extracted from the positive set of images. Each feature obtained is a single value by subtracting sum of pixels under the black rectangle to the sum of pixels under the white rectangle. This process is done from one image to another in the input set created.

V. HARDWARE AND SOFTWARE REQUIREMENTS-

1. Hardware Requirements:
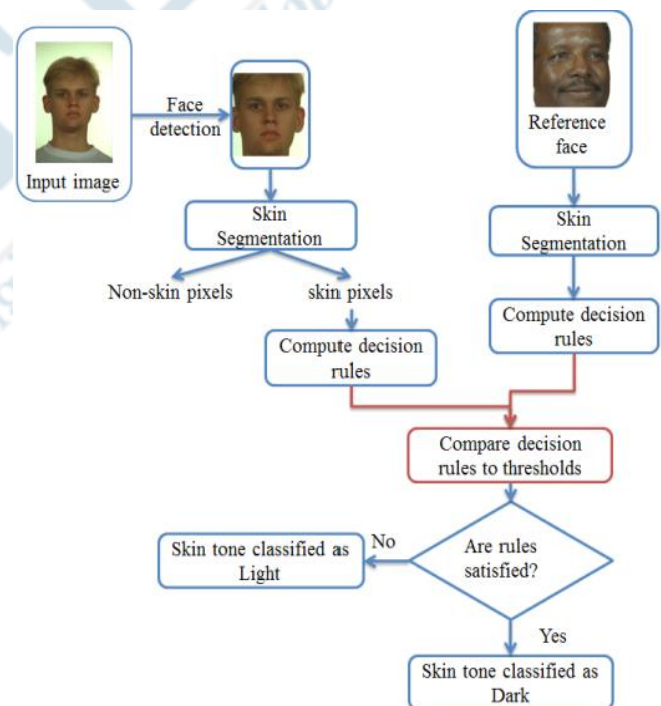
- System: Any system that can run browser

2. Software Requirements:

- Operating system: Windows 7/ XP/ 8.0/ 8.1/ 10 or MacOS.

- Browser: Chrome, Firefox, Safari, Opera

3. System Architecture:

- Frontend:
  o HTML, CSS framework-Bootstrap4,python

- Backend:
  o Machine Learning

- Database:
  o MYSQL

VI. SYSTEM WORK-FLOW

VII. FUTURE SCOPE

- More detailed and accurate pre-models can be added in order to develop Facial Color Variation Recognition system.

- To automate this process by show the tone detection result in web application or desktop application and which can be optimized to its utmost efficiency by implementing in an Artificial Intelligence environment.

- This project can be enhanced for processing 3D work and in real-time application.

- They can able to find the intricate skin tones rather basic common tones.

VIII. ACKNOWLEDGEMENT

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IX. CONCLUSION

We can use this kind of bar to show the result in index page.

Once the extraction of skin tone is done by ML the obtained data (i.e, the color of the skin tone) is again reach the server and the database gets saved and finally the result will appear in front-end page for the user.

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