Textile Robot for Matching and Pick Up Clothes Based on Color Recognition

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ABSTRACT

The paper help the visually impaired to select the apparel and independent in their decision. The application could be matches the apparel based on the dominating color. Android mobile phone is used for getting voice input from visually impaired person. Voice application was developed in the android mobile phone, which convert the voice into text and transmitted to robot through Bluetooth .The color said by the user, which is recognize by robot. Recognized color is matched by open CV python programming code. Then pick the clothes based on color recognition and place by the robot's pick and place arm.

Keywords: Clothes Matching, Visually Impaired, Android, Pick and Place arm, Python, Apparel and Dominant color.

1. INTRODUCTION

THERE exist 285 million individuals who suffer from visual impairment, as estimated by the world health organization; 39 million people are blind and 246 have low vision. 90% of the world's visually impaired and some of disabled people live in low-income settings. 80% of the blindness people are live with age above 55. Around 13.7% of which are blind. For visually impaired people When they go to the textiles for selecting the dresses they could not be able to choose the clothes. So choosing clothes with suitable colors is very difficult for them. They can manage this difficulty with the help of other people. Visually impaired, including color blind, individuals suffer from lack of autonomy in their selection of clothing where they must rely on other opinions. There are many challenges in developing a system that helps to visually impaired people with the task of determining clothing colors on their own, without help from others and they can face many difficulties in day to day life.

Despite of varies methods have been introduced for texture matching and color detection in the computer vision and image processing research, nowadays there is no device that should effectively supply matching choices for impaired people. In this paper, we developed raspberry pi based prototype to match the clothes by using robot and then cloth is picking up and place into desired location. In order to develop this application four main components are have been developed: 1.Voice application to recognize the voice and converted into text; 2.Matches the clothes input color with previously user's saved color; 3.Color recognition algorithm to extract the dominant colors of an apparel image for a color detection; 4.Automation algorithm to pick and place the clothes automatically; this application was developed and tested on raspberry pi 3 (Model B+) and the result showed that the matched clothes in desired location to the user.

The paper is organized as follows: Section 2 introduces literature review; section 3 introduces the proposed application. Section 4 presents the development environment, while section 5 discuss in detail about the result of proposed system. Finally, section 6 concludes the paper and future work.

2. LITERATURE SURVEY

Assistive systems for help the physically disabled people to improve the life quality and safety of such people including indoor navigation and way finding, display reading, banknote recognition, rehabilitation, and many more.

Thogaricheti Ashwini [3] developed a camera-based model system that notice clothing patterns in four categories (plaid, striped, pattern less, vertical and irregular etc.) and identifies 11 clothing colors. To recognize clothing patterns, they propose a Hough line Transformation for the detection of pattern and canny detection for detection of edges in the clothing pattern. We proposed the CCNY Clothing Pattern dataset and other different pattern datasets to our method. Using various other performances our method is under the study.

Anuradha.S.G [5] the open CV is used for capturing image and clothes pattern is identified by Hough transformation. The clothing patterns are categories as five types like (plaid, striped, pattern less, horizontal-vertical, irregular etc.) and it identifies 11 clothing colors. The system mainly integrates with the microphone, camera, Bluetooth, earpiece for audio signal. The output of our system is given by audio signal.

Noha kareem [4] proposed the application for matches apparel image input with users previously saved closet items, and then provides the user with the possible matching item suggestions. In order to develop this application five main components have been developed: 1. Two Region of interest (ROI) extraction components facilitating feature and colour extraction; 2. An outline detection component to determine whether an item is a top, skirt or a pair of trousers; 3. A colour recognition component to extract dominant colours of an apparel image; 4. A descriptive colour verbal feedback; 5. A

matching component based on item outline and colours to coordinate with others in the user's closet.

Hsu et al [10] developed a system that provides similar matches to a given input item to offer custom-recommended shopping options. The system receives an input image of an item and returns similar items in terms of outline, color and texture, each with different significance–based weight. They first separated the item from its background through a binarization algorithm.

3. METHODOLOGY OF THE SYSTEM
In this system, the clothes color is detected by color detection algorithm using open CV library and matching the clothes by contrast color given by the designer. The camera captures the image of clothes having different colors and matches the clothes as per information given in the python code. The colors like red, green, blue are stored in the raspberry pi board and open CV library is loaded in the raspberry pi for processing the image captured by the camera and voice application is developed to get the voice input and then voice input from the user is converted into text message and through Bluetooth which is then transmitted to the Raspberry Pi board.

The text message is processed by the Raspberry Pi board and the camera, which is connected with board that capture the image, the captured image is processed by image processing technique. The image of cloth is analyzed for various colors like Red, blue etc.

The software is programmed to recognize these colors. Colors are detected and identified, for example the captured image has red color then red color is detected and Some 15 to 20 colors can be detected approximately. The detection of color depends on camera resolution and lighting effects and after detection of cloth color, the cloths is picking up by the arm of the robot and places it into desired location and move to another section and matches the cloth with the desired skirt or trouser item.
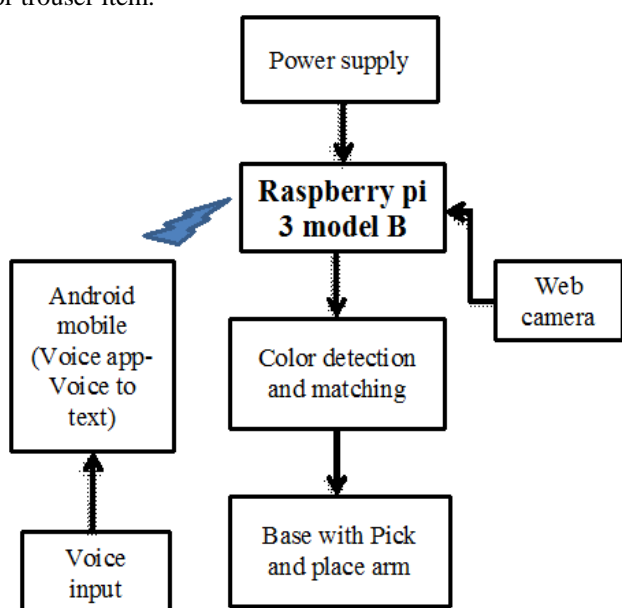

Fig.1. System block diagram

Cloth color is identified based on the open CV library of each clothing image in the HSI color space for making the detection more easily compared to RGB. The main idea is to quantize color space based on the relationships of Hue, Saturation, and Intensity. In particularly, for each clothing image, a color identification method quantizes the pixels in the image to the following colors like blue, green, red, gray, cyan...etc. If a clothing image contains multiple colors, the dominant color which has more number of pixels in image is taken as color output. The recognition of clothing color is implemented by quantizing clothing color in the HSI .This method provides new and improved quality of life for visually impaired people.

4. DEVELOPMENT ENVIRONMENT
A. Recognition of Colors
Color detection is by open CV library, first image captured color is processed as Changing Color-space .There are more than 150 color-space conversion methods available in OpenCV. But we will look into only two which are most widely used ones, BGR Grey and BGR HSV. In color conversion process, the function color vision 2 is used.

- Take each frame of the image
- Convert from BGR to HSV color-space
- Then threshold the HSV image for a range of blue color
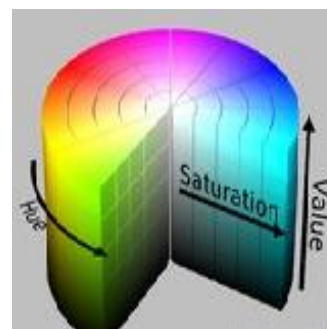- Now extract the blue color alone

Fig.2. RGB additive primary model

B. RGB to HSV Model Conversion
The Hue, Saturation and Value is stands for HSV. The value represents intensity of a, which is decoupled from the information in the represented image. The hue and saturation components are related to the way human eye perception. HSV is often called HSB (B for brightness). Hue varies from 0 to 1 when goes from red to green then to blue and back to red. H is then defined modulo 1 as is seldom mono chromatic, saturation(S) represents the amount of white mixed with the monochromatic. Value (V) does not depend on the, but represents the brightness. Hue and Saturation are chrominance and Value is intensity. The transformation equations for RGB to HSV model conversion:
$S=V-min(R, G, B)/V$
The range is defined as of blue color in HSV
Lower_blue = np.array ([110, 50, 50])
Upper_blue = np.array ([130,255,255])
Threshold the HSV image to get only blue colors
Mask = cv2.inRange (HSV, Lower_blue, upper_blue)

For example the above blue color is detected by range provided in the python coding and HSV image is threshold to get the exact blue color is matched.

The detected color is blue

Fig.3. Color detection

Based on the detected color, clothe is to be matched.

C. Color Matching
To provide the user with outfit coordination results, the system is to return compatible matches, to the input item image, in terms of outline and color. In this system the item's most frequent color is used to find complementary and analogous matches. Thus only the most dominant color in that apparel's material is considered in the outfit matching. The results are by the item outline by items in the user's closet with the opposite outline. Thus for trousers and skirts, tops results are returned, and vice versa. The matching process is by matching colors - two analogous and one complementary, elaborated upon later - are computed using the most dominant color in the apparel .The color is matched by python coding.

D. Pick and Place Arm
A pick and place arm of the robot is used to pick up the clothes and place it in a desired location .It is a cylindrical robot providing movement in horizontal, vertical axes. A pick and place arm robot consist of rover, end effector, actuators, sensors and controller.

Rover: It is the main body of the robot consist of rigid body like cylindrical shape and link.

End Effector: It is the body connected to last joint of the rover which is used for the purpose of gripping and handling clothes.

Actuator: They are the drivers of the robot .it actuates the robots. Here the dc motors are used.

Sensors: It is used to sense the internal and external state to make sure that robot functions smoothly. Sensors involve touch sensors and IR sensors.

Controller: It is used to control the actuators based on the sensors feedback and it control the motion of each and every joint and movement of the end effector.

E. Motor Controller
A motor controller is a device or group of device that serves to govern in some predetermined manner the performance of an electric motor. A motor controller valor include a either manual or automatic process means for starting and stopping the motor, choosing forward or backward rotation, constitute and rectify the speed, normalize else limiting the torque, and conserve against overloads and errors.

There are many types of starters:
1) Direct On Line (DOL)
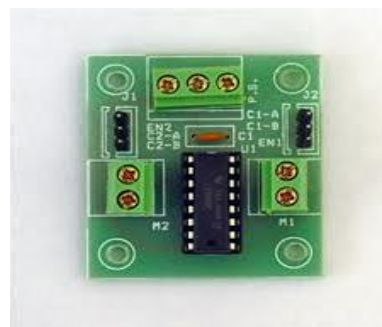2) Start delta starter
3) Auto transfer starter

Fig.4. Motor controller board

Every electric motor has to have some sort of controller will have differing features and complexity depending on the task that the motor will be performing. The easiest way is a switch to connect a motor to a power source, which is in small appliances or power tools. The switch either manually operate or relay else contactor connected to some form of sensor to automatically start and break the motor. The switch may has several posture to choose different connections of the motor. This may allow reduced voltage starting of the motor, reversing control or selection of multiple speeds. Overload and over current protection may be omitted in very small motor controllers, which rely on the supplying circuit to have over current protection.

5. RESULT AND DISCUSSION
We have proposed in our system to recognize clothing colors to help visually impaired people in their daily life. Our proposed system uses the detection of the colors and matching it gives some new approach to the impairment person. Here the below table indicates some input detected colors and producing the matching colors. Here we are using OPENCV techniques and methods for our system.

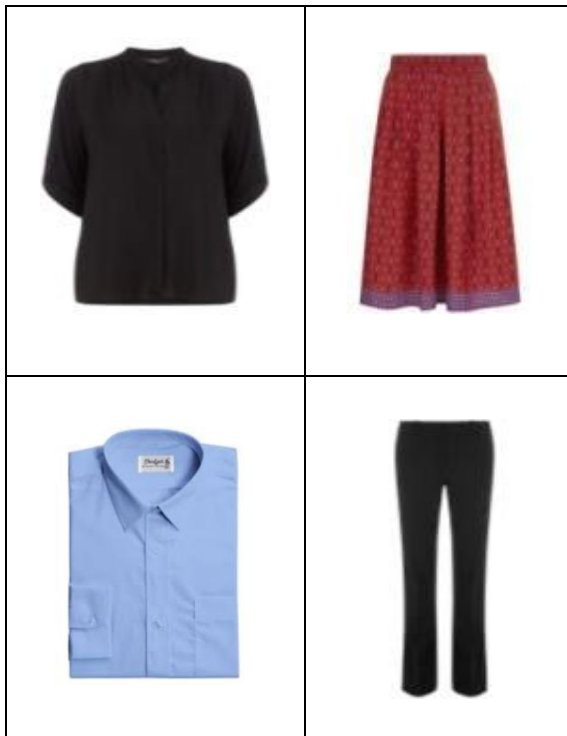| Input as a speech (told color)	Matched clothes

Fig.5. Output figure

The clothes based on the color given by designers in a python coding is matches the shirt with its pant and is pick up by the pick and place arm of the robot. The matching of clothes is based on the dominant colors and the open CV is a library used for processing the image captured by web camera and is used for detecting the color said by the user and finally matches the clothes.
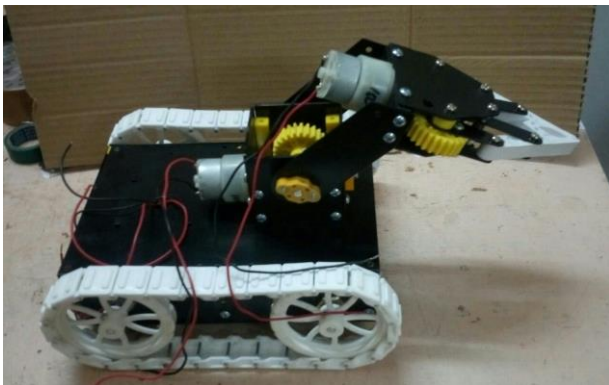

Fig.6. A snapshot of our demo system

6. CONCLUSION AND FUTURE WORK

This paper discussed about the development of an android mobile application for outfit coordination. The application could be used in shopping and home environments to help visually impaired individual to decide what items to purchase independently as well as to assist him to independently decide and not depend on any person. The proposed system matches the clothes and automatically moves to section and pick up the clothes said by the user and match according to code assigned by the designers and place it to the desired location. In the future work of our system we include the edge detection and recognition of clothing pattern. We can apply morphological operations also extend systems to identify patterns and colors of different types for blind people.

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