



A HANDY VOICE GUIDER TO ASSIST CLOTHING COLOR AND PATTERN FOR VISUALLY IMPAIRED PEOPLE

¹Brijesh N, ²Thejas G S

¹M.Tech., ²Assistant Professor, S.I.T, Tumakuru

Email: ¹kottari.biju@gmail.com, ²thejas.sit@gmail.com

Abstract— HCI (Human Computer Interaction) is a research among the people and the computer communication and to what scope computers are or are not developed for successful interaction with humans. As the name states, HCI consists of three parts: The User, The Computer itself, and the ways they go together. HCI can help visually impaired people in their daily needs; here we try to help in knowing their cloth colors and patterns. Visually impaired people are not fully blind, but they can identify objects, but they are not able to know the details of the object. Making choice of clothes with suitable color and pattern is a complex task for visually impaired people. Automatic clothing pattern recognition is also a challenging research problem due to rotation, scaling, illumination, and especially large intraclass pattern variations. To help them here developed a camera-based prototype system that recognizes clothing patterns in five categories (horizontal lines, vertical lines, checked, plain, and irregular) and identifies eleven clothing colors. The system consists of a camera, a microphone, an ARM Development Board, and a portable speaker for audio description of clothing patterns and colors. The clothing patterns and colors are described to blind users verbally. This system can be controlled by speech input through a microphone.

Index Terms— Visually Impaired, HCI, Pattern, Color, ARM Board.

I. INTRODUCTION

According to WHO as of now there are about 285 millions of people are visually impaired out of which 246 million people had low vision and 39 million people were blind [12]. Out of this, India has over 15 million blind; India is now home to the world's largest number of blind people [13]. Visually impaired people used supervise this task with the help of their family members or they used to use Plastic Braille labels know only patterns or they used to take help of sample stitched pattern tags or they used to wear clothes with uniform color and pattern.

HCI (Human Computer Interaction) is a research among the people and the computer communication and to what scope computers are or are not developed for successful interaction with humans. As the name states, HCI consists of three parts: The User, The Computer itself, and the ways they go together. To improve life quality of visually impaired people here we develop an automatic system to detect colors and patterns. We designed a system with camera which capture the image of the cloth and send this image to the processing unit which detects patterns and colors and gives the output as a speech to the visually impaired user; the system can totally detect 11 colors and 4 patterns. Every time the user runs the system, it detects pattern and colors which help visually impaired people to improve their life quality.

Here, visually impaired people take help of the camera system to know their cloth colors and patterns. The system consists of three major components 1) sensor part, which includes

camera for capturing cloth images, a microphone for speech command input and portable speakers for voice output; 2) Image processing and analysis stage here captures cloth image and process this image to detect clothing color and pattern with the help of ARM development board; 3) output stage, An audio output is provided from the recognized clothes color and pattern.

In an Extension of the system can detect five categories like horizontal lines, vertical lines, plain, irregular and checks. Colors like Red, Green, Blue, Black, White, Grey, Orange, Cyan, Pink, Yellow and Purple.

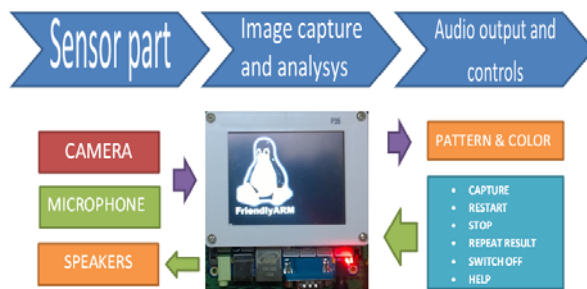


Fig. 1 Overview and Architecture of the ARM Board Based Clothing pattern recognition system for visually impaired people

Organization of Paper; In section II here summarized the related work and the researches that have been done till date, and the main works done for the needs of visually impaired people. In section III we have been limited this by saying that what are the basic abilities that should be satisfied by a visually impaired person. In section IV show how patterns are classified and some of the example images are shown. In section V this is the main part here we say how patterns are detected and colors are identified main process will be shown here In section VI system design and the interface designs will be shown, all the hardwares will be shown and the working flow of the system will be shown as explained. In section VII our project results will be demonstrated and future work will be discussed in this section and finally section VIII concludes our paper..

II. RELATED WORKS

Assistive systems are being developed to improve the life quality and safety for those with

special needs, built a clothing recommendation system for specific occasions [2] (e.g., wedding or dating). Hidayati et al proposed a method for genre classification of upper-wear clothes [3]. The two systems are both designed without considering key factors for blind users developed a system to assist blind people to match clothes from a pair of clothing images. This system can provide a user with the information about whether or not the clothing patterns and colors match. Including indoor navigation and way finding, display reading, banknote recognition, rehabilitation, etc. [4], [5], [6], [7], [8], [9], [10]. However, this system is not able to automatically recognize clothing patterns.

A system was developed that used to match with a pair of images already stored in the system and compare those with that to give output [11] this system was not able to automatically recognize clothing color and pattern. An automatic recognition system was developed that used mini laptop or a mobile phone or a wearable computer to recognize the speech commands and to give a speech output [1]. Our system is fully built to one hardware device that is capable of doing all the jobs like voice recognition, image capturing, speech output, just we need to do small configuration like connecting all devices to the main hardware like camera to the USB Host and Speaker to the audio jack.

III. VISUALLY IMPAIRED PEOPLE UNDERSTANDING LEVELS

Visually impaired people are those whose eyesight is not fully blind, but partial blind, they have a very low ability to see objects around them, visually impaired people face difficulties in normal daily activities like driving, reading, walking and selecting their cloth colors and patterns. This visually impairment can be caused due to their health disorder like diabetics, blood pressure, etc. Cause cataract, glaucoma problem. A cataract is a clouding of the eye lens leading to a decrease in vision. Glaucoma is a term describing a group of ocular (eye) disorders that result in optic nerve damage, often associated with increased fluid pressure in the eye (Intraocular Pressure) (IOP) [15].

Visually impaired people should have some good physical abilities to become a user of this device are like listed below

Hearing a voice or a speech and to understand those speeches after hearing them.

Speak with some basic voice commands like CAPTURE, STOP, RESTART and EXIT.

The user of this handy device shouldn't be mentally retarded or weak in analyzing their basic need for their lively hood.

The user should have a very good practice of Touch and Feel. If the user is fully blind, then those persons should have a very good Touch and Feel, with the help of this those persons will be trained to use this device, however this will be a very complex task even to understand and to use this device independently, but somehow we can try to help blind people but our project mainly focuses on the visually impaired.

These are the basic abilities that one should have for using this system.

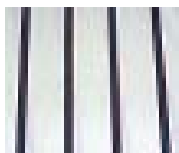
IV. CLOTH PATTERNS

Cloth pattern refers to the details in the cloth likewise lines like vertical and horizontal and the designs of the cloth, cloths with different colors, shades and design is said to be the pattern. Here we classify patterns into five categories (like a horizontal line, vertical line, plain, checks and irregular).

A. Horizontal Line Pattern:



The cloth image shows the horizontal line pattern; here we find the horizontal lines with the help of the Hough line detector, we get horizontal lines detected image, initially color image is converted into a grey scale image this image will be given as an input to the Hough line detector, finally after image processing we get a gradient image with highlighted horizontal lines, then the given cloth image is Horizontal Line pattern.



B. Vertical Line Pattern:

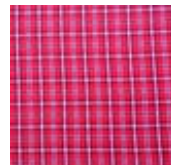
The cloth image shows the vertical line pattern, here we find the vertical lines with the help of the Hough line detector, we get vertical lines detected image, initially color image is converted into a grey scale image this image will be given as an input to the Hough line detector, finally after image processing we get a gradient image with highlighted vertical lines, then the given cloth image is Vertical Line pattern.

C. Plain Pattern:



The cloth image shows the plain pattern, if the cloth image has no horizontal lines, no Vertical lines and no any designs, then the Hough line detector fails to detect horizontal, vertical lines or any noise in it then the cloth image is Plain pattern.

D. Checks pattern:



The cloth image shows the checked pattern, if the cloth image has horizontal lines and vertical lines, and then if it forms squares then the cloth image is Checked pattern.

E. Irregular pattern:



The cloth image shows the irregular pattern, if the image has uneven lines and designs, then the Hough line detector looks for horizontal and vertical lines if it detects uneven lines then the cloth image is Irregular pattern.

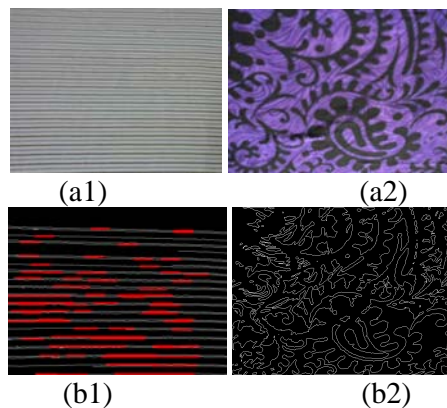
V. FEATURE EXTRACTION OF AN IMAGE AND COLOR RECOGNITION IN CLOTHES

A. Pattern Detection

Detecting pattern is a complex task as we all know patterns may vary according to the cloth image scaling, rotation, illumination, and especially large intraclass pattern variations. In image processing, pattern detection is one of the major research areas and development is going on very widely in this field.

Once the camera captures the image, it will be scaled to the required size later we get the required image resolution, then noise will be removed to get the clear image, then this image will be converted to a grey scale image after grey image conversion smoothing of image must be taken care carefully. Once this is completed Hough line detector scans the image and finds high lines, for the same next canny algorithm will be applied to this this algorithm helps us to detect edges in the grey image. The algorithm tries to draw the edges of the images this majorly helps us to know the pattern.

The figure 2 shows the sample image how the algorithm detects edges in the captured cloth image.



a1 and a2 are image captured by camera
b1 and b2 are detected lines of image a1 and a2
Fig. 2 edges of the image detected by the algorithm

With the help of this algorithm we can decide what kind of pattern is a horizontal line or vertical lines or checks or irregular.

The main working flow to detect a pattern is as shown in the figure 3



Fig. 3 pattern detection process work flow

B. Color Detection

Our clothing color detection system is based on acquiring a normalized color histogram for each image of the clothes in bi-conic (hue, saturation, luminance) HSI color space as shown in Figure 4. In reality an intelligently quantize color space based on the relationships between HUE, SATURATION and LUMINANCE. As color information is limited by both lack of saturation and intensity, it is necessary to separate chromatic from colorless space along surfaces defined by a function of saturation and intensity in the bi-conic space. In discriminating to each image of the clothes, the color classifier classifies the pixels in the image to the listed colors: *Red, Green, Blue, Yellow, Orange, Cyan, Grey, Purple, Pink, Black, And White*. Each image of an article of clothing is first converted from RGB to HSI color space. Then, HSI space is quantized into a small number of colors. In our color classification, we first detect colors of “White”, “Black”, and “Grey” based on saturation ‘*S*’ and luminance ‘*I*’. If the luminance *I* of a pixel is large enough, and saturation *S* is less than a special threshold, then we define the color of the pixel is “White”. Similarly, the color of a pixel is “black”, can be determined if the luminance *I* of a pixel is less enough and saturation *S* is also satisfied with the condition. Under the rest values of the luminance *I*, pixel of color “Grey” could be found in a defined small *S* radius range. For other colors (e.g. *Red, Green, Blue, Yellow, Orange, Cyan, Purple and Pink*.), HUE is displayed as a 360° color wheel. Figure 4 shows the HIS color

wheel, the color ranges are as specified. “Red” in the range between 345° - 360° and 0° - 9° , “Orange” in the range between 10° - 37° , “Yellow” in the range between 38° - 75° , “Green” in the range between 76° - 160° , “Cyan” in the range between 161° - 200° , “Blue” in the range between 201° - 280° , “Purple” in the range between 281° - 315° , and “Pink” in the range between 316° - 344° .

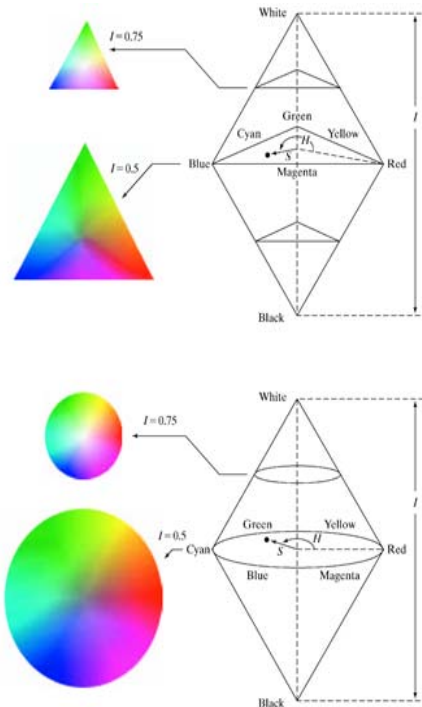


Fig. 4 HIS color space

VI. SYSTEM DESIGN

A. Hardware Architecture

Hardware components used:

- CAMERA
- MICROPHONE
- ARM DEVELOPMENT BOARD
- SPEAKER

1) Camera Logitech C270 HD camera with 720 pixels

It has 3MP sensor resolution, which can capture live like images this helps to get a clear image of the cloth this helps us in the detection of pattern and color. With the help of USB it can be connected to the ARM development board.



Fig. 5 Hardware used in our project

2) Microphone

It is already inbuilt in the ARM Development board, using this voice recognition process can be done and even some of the system functions can be performed and to handle exceptions in the process.

3) ARM Development Board, Mini 2440

Figure 6 shows the overview of the ARM development board it consists of a CPU with 400 MHz Samsung S3C2440 ARM926T, 64 MB of ram with 32 bit Bus, 1Gb NAND flash, 256 BYTES of EEPROM, external SD CARD slot, RS232 Serial Port, one USB port, 3.5 mm stereo Jack for Audio Output, inbuilt microphone, one RJ45 Ethernet port, real time clock with battery, 7” Touch display with 41 pin connector for Friendly ARM Display and VGA board, 5V power supply adapter and powered by the Qtopia Operating system [14].

Here we connect camera to USB host, speakers to 3.5 mm audio jack and we use a microphone that is inbuilt in the system finally power up the system with the 5v power adapter these are the basic configurations that must be done to run our system.

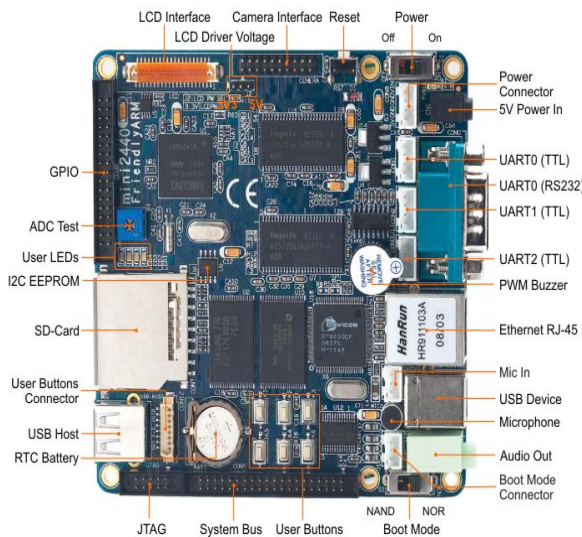


Fig. 6 ARM Development Board component Overview

4) Speakers

Portable rechargeable speakers are used, this helps visually impaired people to know their cloth color and pattern in a form of voice.

A. Overall design

A visually impaired user gives a voice command to the system as CAPTURE once the system analysis this command it sends start capture image instruction to the camera, then camera captures cloth image and it stores in the memory. Image captured will be scaled to the required size. The image then will be converted to grey scale and if any noise is present in the converted image those noises will be removed and smoothed to the required level. The main function of the system is divided into two parts as pattern recognition phase and color detection phase, In pattern detection phase first we detect Hough lines in the image, then canny algorithm will be applied to the same image this detects edges in the captured image this is the main function in pattern detection figure 2 Shows the detected lines in the image using this algorithm.

With the help of this we get a line drawn on the design edges of the cloth image, these lines are seen whether it forms squares if so, then the pattern is checked, if it fails to get squares, then it is said to be either vertical lines or horizontal lines this can be said by the orientation of the lines in the detected image. If the algorithm fails to detect lines on the image, then the captured image is off no pattern then it says plain pattern.

Color detection with the help of normalized color histogram of each color image, with the

value of Hue, Saturation and Intensity with these values we can say the colors present in the captured clothing image.

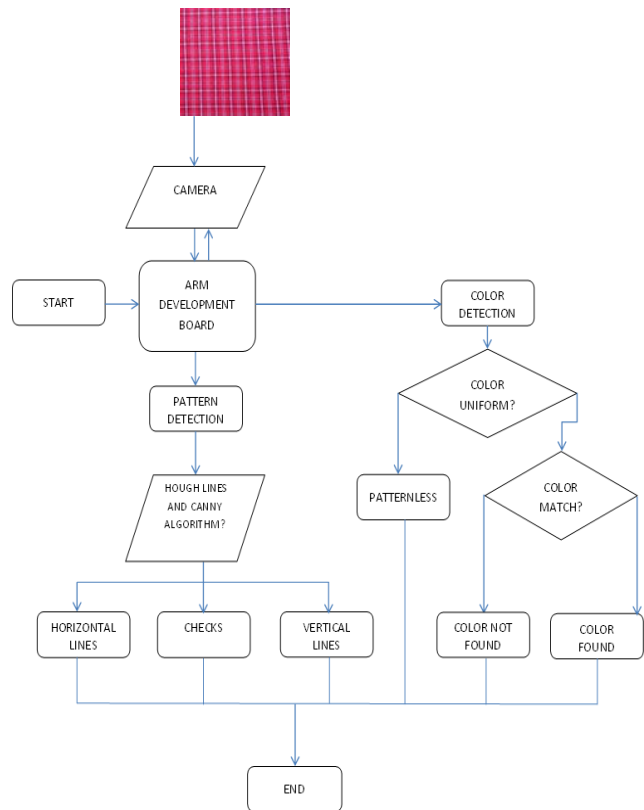


Fig. 7 working flow diagram

VII. RESULTS AND FUTURE WORK

The table shows the result of our project and is listed below. With the help of this result, we can see how a visually impaired person can handle the system. Our system detects 11 colors and patterns as we have divided into 5 types as discussed.




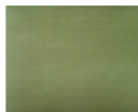
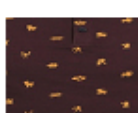
This project can be further enhanced to help fully blind person in doing their daily tasks, help them in indoor navigation.

We can try to enhance and implement this project in a super mart to help people in finding their items in marts and to know their picked objects details and objects like grocery, biscuits, packed food items, etc.

We can use this in clothing shops, like if a customer come to shops pick their selection generally they try to wear that in a dressing room instead of this we can show them the photo as if they had worn the cloth this helps them to search for multiple selections without trying to wear those clothes and as usual it can help them to say

what is the color of the cloth? And what is the pattern? Like this we can not only help visually impaired people, but can also help normal persons in improving their experience in cloth selections.

TABLE 1
RESULTS OF OUR PROJECT

IMAGE	PATTERN	COLOR
	HORIZONTAL LINE	BLUE
	VERTICAL LINES	BLACK, WHITE
	CHECKS	RED, BLACK
	PLAIN	GREEN
	IRREGULAR	BROWN, ORANGE

VIII. CONCLUSION

Automatic handy cloth pattern detection system helps visually impaired people to know their cloth pattern and color, patterns like horizontal lines, checks, vertical lines, irregular and plain. This helps visually impaired people to improve their lifestyle, this gives them immense pleasure and happiness to lead their life.

REFERENCES

- [1] Xiaodong Yang, Shuai Yuan, Ying Li Tian 'Assistive Clothing Pattern Recognition for Visually Impaired People', IEEE trans. Human-Mach. Syst., vol. 44, no. 2, pp. 234-243, 2014.
- [2] S. Liu, J. Feng, Z. Song, T. Zhang, H. Lu, C. Xu, and S. Yuan, 'Hi, magic closet, tell me what to wear', in Proc. ACM Multimedia, 2012.
- [3] S. Hidayati, W. Cheng, and K. Hua, 'Clothing genre classification by exploiting the style elements', in Proc. ACM Int. Conf. Multimedia, 2012, pp. 1137-1140.
- [4] D. Dakopoulos and N. G. Bourbakis, 'Wearable obstacle avoidance electronic travel aids for the blind: A survey', IEEE Trans. Syst., Man, Cybern. C, vol. 40, no. 1, pp. 25-35, Jan. 2010.
- [5] F. Hasanuzzaman, X. Yang and Y. Tian, 'Robust and effective component based banknote recognition for the blind', IEEE Trans. Syst., Man, Cybern. C, vol. 42, no. 6, pp. 1021-1030, Nov. 2012.
- [6] A. Huete, J. Victores, S. Martinez, A. Gimenez, and C. Balaguer, 'Personal autonomy rehabilitation in the home environment by a portable assistive robot', IEEE Trans. Syst., Man, Cybern. C, vol. 42, no. 4, pp. 561-570, Jul. 2012.
- [7] R. Manduchi and J. Coughlan, '(Computer) vision without sight', Commun. ACM, vol. 55, no. 1, pp. 96-104, 2012.
- [8] S. Shoval, J. Borenstein, and Y. Koren, 'Auditory guidance with the navbelt- A computerized travel aid for the blind', IEEE Trans. Syst., Man, Cybern. C, vol. 28, no. 3, pp. 459-467, Aug. 1998.
- [9] E. Tekin, J. Coughlan, and H. Shen, 'Real-time detection and reading of LED/LCD displays for visually impaired persons', in Proc. IEEE Workshop Appl. Comput. Vision, 2011, pp. 491-496.
- [10] X. Yang and Y. Tian, 'Robust door detection in unfamiliar environment by combining edge and corner features', in Proc. IEEE CVPR Workshop Comput. Vis. Appl. Visually Impaired, 2010, pp. 57-64.
- [11] Shuai Yuana, YingLi Tiana, and Aries Arditi, 'Clothing Matching for Visually Impaired Persons', in Technology and Disability, Vol. 23, no.2, pp. 75-85, 2011.
- [12] Who. Int, 'WHO | Visual impairment and blindness', 2015. [Online]. Available: <http://www.who.int/mediacentre/factsheets/fs282/en/>. [Accessed: 17- Jul- 2015].
- [13] The Times of India, 'India has largest blind population - The Times of India', 2015. [Online]. Available: <http://timesofindia.indiatimes.com/india/India-has-largest-blind>

population/articleshow/2447603.cms.

[Accessed: 17- Jul- 2015].

[14]Friendlyarm.net, 'Mini2440 | S3C2440
ARM9 Board - FriendlyARM', 2015.

[Online]. Available:

<http://www.friendlyarm.net/products/mini24>

40. [Accessed: 17- Jul- 2015].

[15]Wikipedia, 'Glaucoma', 2015. [Online].

Available:

<https://en.wikipedia.org/wiki/Glaucoma>.

[Accessed: 24- Jun- 2015].