LOW COST COLOUR AND CLOTHING PATTERN RECOGNITION FOR VISUALLY IMPAIRED PEOPLE

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ABSTRACT

Choosing clothes with complicated patterns and colours could be a difficult task for visually impaired individuals. Clothing pattern recognition is a camera-based paradigm system that acknowledges covering patterns in four classes (plaid, striped, pattern less, and irregular) and identifies eleven covering colours.Based on statistics from the World Health Organization(WHO), there are more than 161 million visually impaired people around the world, and 37 million of them are blind.Choosing clothes with suitable colours and patterns is a challenging task for blind or visually impaired people.They manage this task with the help from family members, using plastic braille labels or different types of stitching pattern tags on the clothes or by wearing clothes with a uniform colour or without any patterns. The hardware as a easily wearable glasses is designed which communicate the pattern and colour of cloth immediately when it is said to scan. Automatically recognizing clothing patterns and colours may improve their life quality.

Keywords: Clothing Pattern, Visually Blind, Kiel, Arm Board.

I. INTRODUCTION

Based on statistics from the World Health Organization (WHO), there are more than 161 million visually impaired people around the world, and 37 million of them are blind. Choosing clothes with suitable colours and patterns is a challenging task for blind or visually impaired people. They manage this task with the help from family members, using plastic brail labels or different types of stitching pattern tags on the clothes, or by wearing clothes with a uniform colour or without any patterns. Automatically recognizing clothing patterns and colours may improve their life quality. Automatic camera-based clothing pattern recognition is a challenging task due to many clothing pattern and colour designs as well as corresponding large intra-class variations. Existing texture analysis methods mainly focus on textures with large changes in viewpoint, orientation, and scaling, but with less intra-class pattern and intensity variations. It has been observed that traditional texture analysis methods cannot achieve the same level of accuracy in the context of clothing pattern recognition.
Here, in this paper introduce a camera-based system to help visually impaired people to recognize clothing patterns and colours. The system contains three major components:

1) Sensors including a camera for capturing clothing images, a microphone for speech command input and speakers (or Bluetooth, earphone) for audio output.

2) Data capture and analysis to perform command control, clothing pattern recognition, and colour identification by using a computer which can be a desktop in a user's bedroom or a wearable computer (e.g., a mini-computer or a smart phone).

3) Audio outputs to provide recognition results of clothing patterns and colours, as well as system status.

In an extension to this, our system can handle clothes with complex patterns and recognize clothing patterns into four categories

- Plaid.
- Stripped.
- Pattern-less.
- Irregular.

a) System and Interface Design

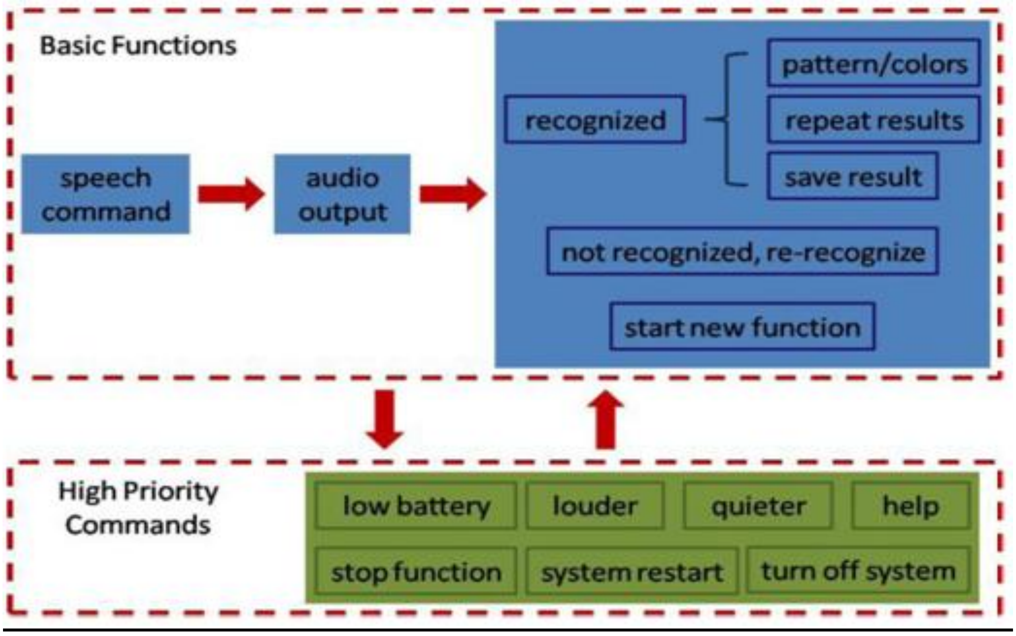

Fig 1: System interface design for the proposed camera-based clothing pattern recognition system by using speech commands. The high priority commands can be used at any time to overwrite the basic functions.

II. PROPOSED SYSTEM

a) Radon Signature

The clothing patterns of plaid and striped are both anisotropic. In distinction, the wear patterns within the classes of pattern less and Irregular Square measure isotropic. To form use of this distinction of directivity, we have a tendency to propose a completely unique descriptor, i.e., the Radon Signature, to characterize the directivity feature of wear patterns. Radon Signature (Radon Sig) relies on the atomic number 86remodelthatis usually wont to discover the principle orientation of a picture. The image is then turned in step with this dominant direction to realize rotation invariableness.

b) System and interface design

The camera-based wear recognition aid epitome for blind individuals integrates a camera, an electro-acoustic transducer, a laptop, and a Bluetooth electro-acoustic transducer for audio description of wear patterns and colours. A camera mounted upon a try of dark glasses is employed to capture wear pictures. The wear patterns and colours are represented to blind users by a verbal show with smallest distraction to hearing. The system may be controlled by speech input through an electro-acoustic transducer. So as to facilitate blind users to move, speech commands input from an electro-acoustic transducer are wont to offer perform choice and system management. The interface style includes basic functions and high priority commands.

- **Basic functions**: A blind user can verbally request the function he/she wants the clothing recognition aid to perform. The recognition results will be presented to the blind user as audio outputs including recognized, not recognized, and starts a new function. As for the recognized function, the next level functions include pattern/colors to announce the recognized clothing pattern and dominant colors; repeat results to repeat the recognized result; and save result to save the clothing image with associated pattern and color information in the computer.
- **High priority commands**: A blind user can set the system configuration by several high priority speech commands such as system restart, turn-off system, stop function (i.e., abort current task), speaker volume and speed control commands (e.g., louder, quieter, slower, and faster), and help. The high priority commands can be used at any time. A user can speak help, and the clothing recognition system will respond with the options associated with the current function. Bone conducted earphones or small wireless Bluetooth speakers can be employed to protect privacy and minimize background sounds.

c) Recognizing clothing patterns and colours

The extracted global and native options are combined to acknowledge article of clothing patterns by employing a support vector machines (SVMs) classifier. The popularity of clothing colour is enforced by quantizing clothing alter the HIS (hue, saturation, and intensity) space.

i. Clothing Pattern Recognition

In this system, by empirically setting the size of the visual vocabulary to 100, and apply three scaling levels to decompose clothing images. The statistics of wavelet sub bands features are therefore formed by a vector with a dimension of 48. In the computation of the Radon Signature, and evenly sample 60 projection directions from 1to 180 DEG, The feature vector of the RadonSig has a dimension of 60.The combined feature vector is used as the inputs of SVMs classifier with RBF kernel. In our experiments, the optimal parameters of RBF kernel are found by 5-fold cross-validation, and the one-versus-one scheme is used.

ii. Clothing Colour Identification

Clothing colour identification relies on the normalized colour bar chart of every covering image within the HSI colour house. The key plan is to quantize colour house supported the relationships between hue, saturation, and intensity. Specifically, for every covering image, our colour identification technique quantizes the pixels within the image to the subsequent eleven colours: red, orange, yellow, green, cyan, blue, purple, pink, black, grey, and white. If a clothing image contains multiple colours, the dominant colours (i.e., pixels larger than5%of the whole image) will be output. The clothing patterns and colours mutually provide complementary information. The proposed colour identification achieves 99% matching accuracy in the experiment.

III. IMPLEMENTATION OF CLOTHING PATTERN

a) Radon Signature (Hough Transform)

Clothing images provides larger changes in the intra class, which results in the major challenge for clothing pattern identification. However, in a global point of view, the clothing Patterns directionality is more persistent across various divisions and can be used as an important proprietary to classify various clothing patterns. The clothing patterns of plaid and striped are both anisotropic. In variance, the clothing patterns in the division of pattern less and irregular are isotropic. By make use of the novel descriptor, to show the difference of directionality, .i.e., the Radon Signature, to characterize the directionality feature of clothing patterns. Radon Signature (Radon Sig) which is commonly used to detect the principle orientation of an image that is based on Radon The image is then rotated according to this ruling direction. In order to achieve the rotation invariance. The Radon transform of a 2-D function f (x, y) is defined as

$$R(r,\theta) = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} f(x,y)\delta(r - x\cos\theta - y\sin\theta)\,dxdy \ldots\ldots (1)$$

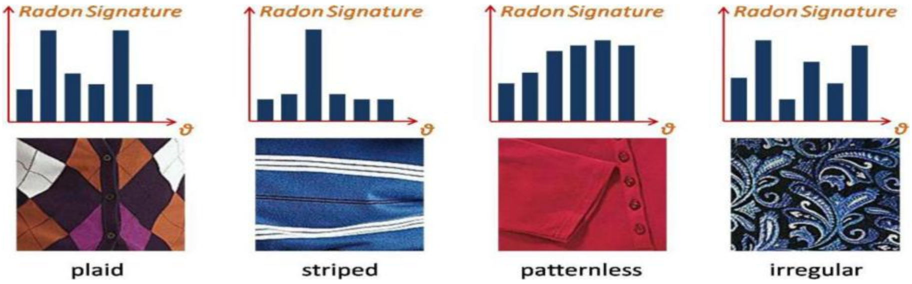

Fig 2: Clothing patterns samples and associated RadonSig descriptors.

b) Statistics of Wavelet Sub bands

The discrete wavelet transform (DWT) disintegrates an image multiple high-frequency channels under multiple scales Wk ,j (I); and into low-frequency channel Dj (I) under a coarser scale k = 1, 2, 3; j = 1, 2, . . . , J, where J is the number of scaling levels. For each level of j, the four wavelet sub bands contains one low-frequency channel Dj (I) and three high-frequency channels Wk ,j (I).The high frequency channels Wk ,j (I) ; k = 1, 2, 3 encode the discontinuities of an image along horizontal, vertical, and diagonal directions, respectively. In this paper, by apply J = 3 scaling levels of DWT to disintegrates each clothing image. Statistical features are well suited to estimate the texture which require a background clutter and will have uniform statistical properties .DWT gives a generalization of a multi resolution spectral analysis tool. Hence its excerpt the statistical features from wavelet sub bands to grab global statistical information of images. It is customary to compute the single

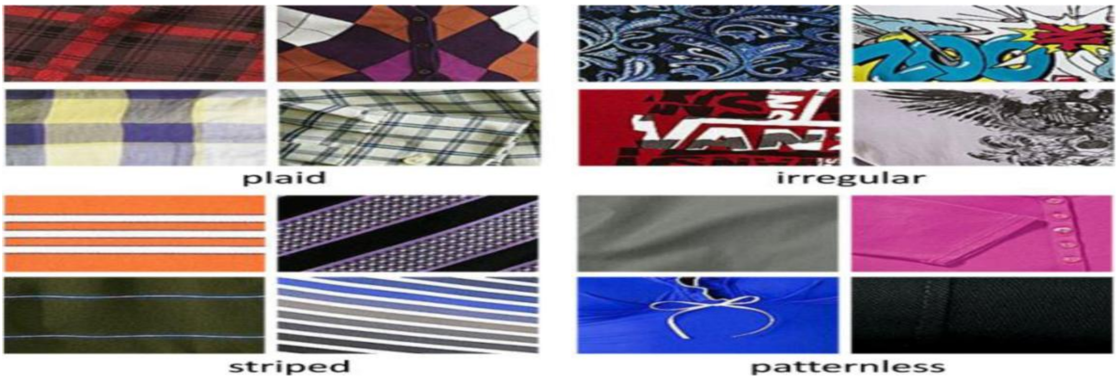

Fig 3: Four sample images of four clothing patterns categories

SIFT represents the local structural features; STA is the global statistical characteristics and RadonSig captures the property of global directionality. Fig 4 & Fig 5 displays the recognition results of different features as a function of training set size. For individual feature channels, SIFT and STA achieve comparable recognition accuracies. While the results based on a single channel of the RadonSig are worse than that of SIFT or STA, the performance of SIFT+RadonSig is better than that of SIFT+STA. Both of them outperform any individual feature channel. Therefore, for clothing patterns recognition, the global and local feature combination of SIFT and RadonSig is more effective than that of SIFT and STA. Furthermore, the combination of all three feature channels further improves the recognition results and dominates in all of different training set sizes. The comparisons of different feature channels and their combinations validate our intuition that the effectiveness and complementarities of our proposed feature channels I. The percentages of training images per class are 10%, 30%, 50%, and 70%, respectively The recognition accuracy of SIFT+STA+RadonSig using 30% of the images as the training set is comparable or even better than that of other feature channels using 70% of the images as the training set. This observation demonstrates another merit of our proposed approach that it is able to achieve a desirable result by using much less training data.

SIFT: This descriptor is the representation of interest points based on the reasons: 1) the descriptor with 128 dimensions is fairly distinctive and compact; 2) the illustration with careful design is strong to variation in illumination and viewpoints. 3) The massive comparison against other local image descriptor realized that the SIFT descriptor performed well in the context of image mapping. The bag of words (BOW) technique is further applied to accumulation extracted SIFT descriptor by naming each SIFT descriptor has a visual word and calculating frequency of each visual word. Illustrates the process of local feature extraction.

Discrete wavelet transform (DWT): It disintegrates an image multiple high-frequency channels under multiple scales $W_{k,j}(I)$; and into low-frequency channel $D_j(I)$ under a coarser scale $k = 1, 2, 3; j = 1, 2, \ldots, J$, where J is the number of scaling levels. For each level of j, the four wavelet sub bands contains one low-frequency channel $D_j(I)$ and three high-frequency channels $W_{k,j}(I)$.The high frequency channels $W_{k,j}(I)$; $k = 1, 2, 3$ encode the discontinuities of an image along horizontal, vertical, and diagonal directions, respectively.

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IV. RESULTS

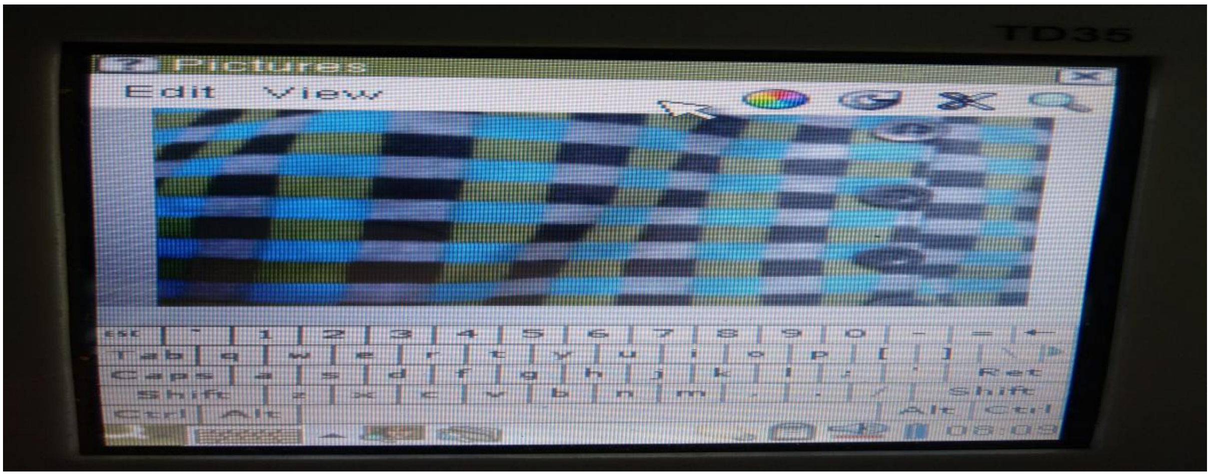

Fig 4: Finding the pattern and colour of a cloth

Above figure is the image that is captured by the camera used on the device and is given as image to the ARM board for the analysis of clothing pattern and colour.

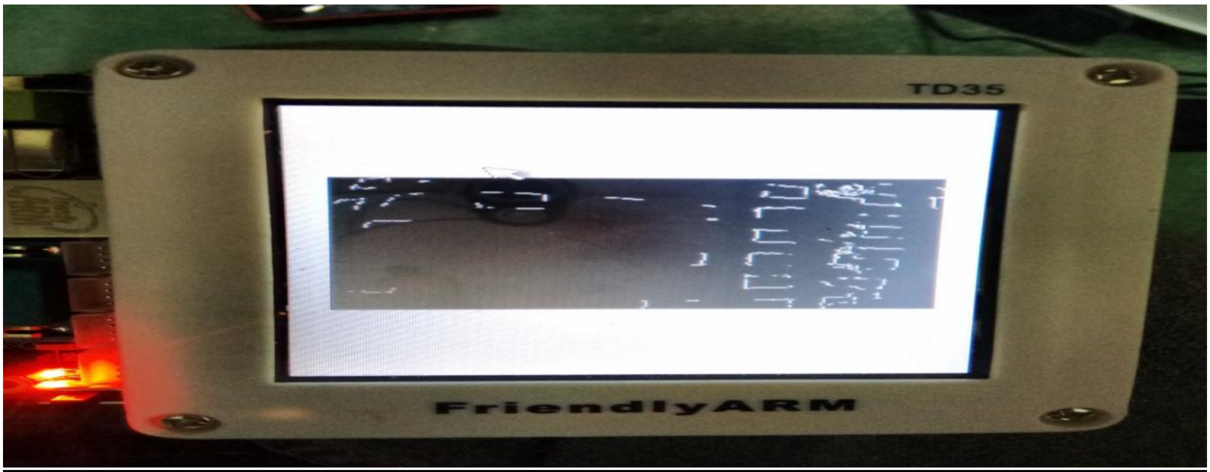

Fig 5: Showing the vertical and horizontal lines of a clothing pattern

The software ware that is used is open CV which processes the image using all the algorithm to lines and patterns as shown in the figure 5 and the device gives the feedback through the earphone connected.

V. CONCLUSION

Assistive devices are a key aspect in wearable systems for biomedical applications, as they represent potential aids for people with physical and sensory disabilities that might lead to improvements in the quality of life. Globally, an estimated 40 to 45 million people are totally blind, 135 million have low vision and 314 million have some kind of visual impairment. In most industrialized countries, approximately 0.4% of the population is blind while in developing countries it rises to 1%. It is estimated by the World Health Organization (WHO) that 87% of the world's blind live in developing countries. Here, a system is proposed to recognize clothing patterns and colors to help visually impaired people in their daily life.

Radon Signature is used to capture the global directionality features statistical descriptor (STA) to extract the global statistical features on wavelet sub-bands and Scale Invariant Feature Transform (SIFT) to represent the local structural features. The combination of multiple feature channels provides complementary information to improve recognition accuracy. The collection of dataset on clothing pattern recognition including four-pattern categories of plaid, striped, pattern less, and irregular, the method also provides new functions to improve the life quality for blind and visually impaired people.

Future work will focus on handling large occlusions by using more discriminative features like door knobs and other hardware, Detecting and recognizing more types of indoor objects and icons on signage, in addition to text for indoor way finding aid, to assist blind people travel independently.

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