International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2017 IJSRCSEIT | Volume 2 | Issue 2 | ISSN : 2456-3307

Wearable Face Recognition System to Aid Visually Impaired People

Poonam Liladhar Agrawal, Prof. D. D. Patil

Department of Computer Science & Engineering, Hindi Seva Mandal's, Shri Sant Gadge Baba College of Engineering & Technology, Bhusawal, Jalgaon, Maharashtra, India

ABSTRACT

Visually impaired people faces lot of problems in day to day life. Our goal is to make them lead a life which is of security and safety for their own wellbeing. The inability to recognize known individuals in the absence of audio or haptic cues severely restrictions the visually impaired in their social interactions and puts them at risk from a security viewpoint. Different systems have been developed to aid them so; they can help themselves without the help of second person. In recent years, several prototype systems have been developed to aid this people with the face recognition task. Overview of face recognition system is summarized for aiding the blind and low-vision people. In which one system uses a Microsoft Kinect sensor as a wearable device, performs face detection, and also generates a sound associated with the identified person, virtualized at his/her estimated 3-D location.

Keywords : Visually impaired, face recognition, wearable system, system, recognition.

I. INTRODUCTION

The World Health Organization has estimated that they are about 285 million vision impaired people in this world, of which 39 million are blind and the 246 have low vision [1]. Vision impairment is a barrier for the daily activities and there is constant striking for the new system to help them. Daily tasks such as walking, reading and the things recognizing becomes difficult for visually impaired users. System supporting new technology can assist them in some of the tasks. One of the challenge faced are the face recognition problem. It generally takes place when they are in social situation when the conversation has to be interrupted not only by words but also by non verbal means that is the facial expressions. As, technology are advancing wearable device have been develop to assist this. It would be useful to know someone position without him/her to speak so that he can turn to it and engage him in their conversation. For, this hardware platform should be portable and cost effective to reach the majority of visually impaired people. So, for helping the visually impaired people different system have been developed. Face recognition system is one of them which help the user the person in front of us. Section two comprises of survey done on different system. Section 3 comprises of two different technologies used for face recognition.

II. METHODS AND MATERIAL

LITERATURE SURVEY ON DIFFERENT SYSTEM

A. NAVIGATION SYSTEM

The Navigation system mainly focuses on two components; sensing of the abrupt surrounding environment against obstacle for the visually impaired person and notice about the obstacle by means of vibration along with voice feedback system. The system mainly consist of design and developing at multiple depth, obstacle detection and RGB sensor, control for detecting at the ground level obstacle and developing sound recording and playing module.

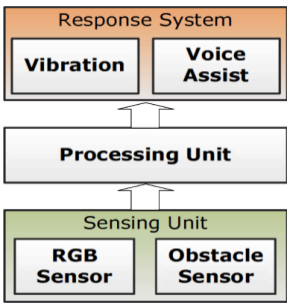

Figure 1. System architecture of navigation system[2].

The concept of obstacle sensor when the infrared signals are transmitted from the obstacle in a direction and then IR receiver detects it and again bounces back to the object. This result in detection of object and even the distance. The RGB sensor detects obstacles using depending upon their intensities red, green and blue color intensities. The object which are facing towards ground. The output will be in the form of 3 different values of colors. Processing unit will detect accordingly whether the detected object is grass, road or zebra crossing trough pattern matching. Response system will alert with them with vibration and voice. As, visually impaired people are more efficient in hearing voice or audio can help have low. Where if they have less hearing capacity, vibration is a perfect indicator.

Table 1. Voice feedback at different situations

Different possible situations	Announcement which will appear in headphone
User is moving on the grass	You are moving on grass
User is on the road	You are walking on road
User is on zebra crossing	You are on zebra crossing
User is on upstairs	Alarm or specific tune will be generated
User is on downstairs	Different specific tune will be generated

The Hardware required for the system are AVR 8/16 development board, RGB sensors, IR sensors, Headphone, Voice Recording IC, Power supply, Vibrator, Wearable devices. It is less costly device and does not required pre training or knowledge of the advanced technologies. It is effective and easy to handle for the illiterate person [2].

B. Clothing Pattern Recognition

Choosing clothes with the different colors and pattern it is difficult for the visually impaired people [3]. A camera-based system to help visually impaired people to recognize clothing pattern and colors. This system contains three major components:

1. Sensors including a camera to capture clothing images, a microphone for communication control input and speakers or Bluetooth, earphone for audio output.
2. Data capture and analysis to perform command control, clothing pattern recognition, and color identification by using a computer or a mini-computer or a smartphone that user may be having.
3. Audio outputs to provide recognition outcome of clothing patterns and colors, as well as system status.

This system recognizes complex patterns with different categories such as plaid, striped, pattern less and irregular also it can identify 11 colors such as red, green, orange etc. In order to handle different variation, different descriptors are used. A camera is mounted on a pair of sunglasses to capture clothing images. The clothing pattern and colors are described verbally with minimal voice. The user can input through the microphone which provide function selection and system control. The user request for the function to be performed and after completion the user will be notified recognized or not recognized. The next level is to identify colors and pattern and announce it. Repeat and save option are available to repeat and save the clothing image. A visually impaired people can set system commands such as start, turn off system, speaker volume and speed control commands. Bluetooth speakers can be employed to protect the privacy. For audio display, operating system and smart phones are used [3].

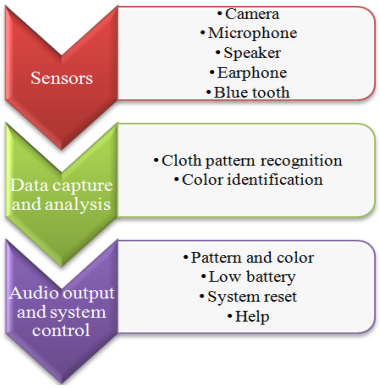

Figure 2: Overview of system

C. Currency Reader Using Camera Phone

In this system mobile pattern recognition asks the users to take a snapshot and then the system tries to recognize it [4]. If the image is not taken perfectly, the

recognizition fails and the user have to take a new image. But this is not possible for the visually impaired people. For this it process the image in real time, here currency reader reads the video stream and tries to locate and recognize every frame so user can get the camera that approaches the currency's The system is of bill recognition and result can be announced through phone or speaker. In order to recognize it, firstly background data is removed. After the black pixel touching the boundary separate from the background. After refining some noise that still exist it is refined using breadth first search (BFS) from the center to remove unwanted noise. After processing system knows exact pixels of image and the exact position of the feature area. This system was use for recognizing U.S dollar bills. It was a small system for helping the visually impaired people.

III. RESULTS AND DISCUSSION

Overview of Different Face Recognition System

A. iCare Interaction Assistant

Krishna et al. have developed the iCare Interaction Assistant, an assistive system that acquires video from a pinhole opening analog CCD camera embedded in a pair of eyeglasses, digitizes it and then transmit to a USB cable to a tablet PC. The video is analyze to distinguish faces using adaptive boost which are passed to a face recognition component which uses the Principal Components Analysis (PCA) and Linear Discriminant Analysis (LDA) algorithms for the face recognition. If a face is recognized in 5 consecutive frames, the name of the identified character is converted from text to speech and transmitted to the user via head phones. One main concern spoken by Krishna et al. is that even though some openly existing face databases contain images captured below a range of pose and illumination angles, however, none of them use a accurately calibrate device for acquiring these images, nor is each image clearly annotate with this information. Krishna et al. have therefore, put together their own database called FacePix which contains face images of 30 people with pose angles and illumination angles between -90 and +90 degrees annotate in 1-degree increment. Hence these two methods were selected for the face recognition module of the system. The system was tested with 10 known persons and PCA's performance was found to be better than LDA [8]. Since PCA's computational speed is also lower than that of LDA, hence it is the chosen for future development work on this device [5].

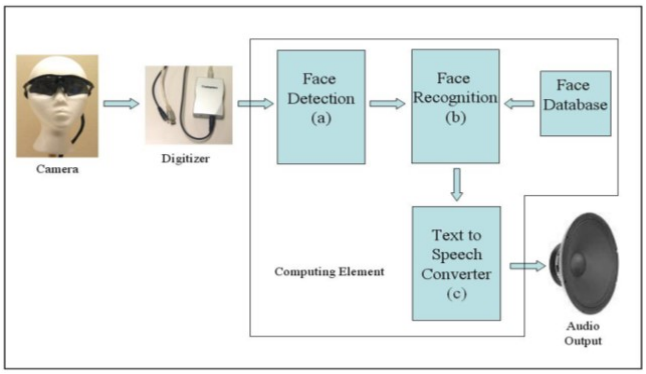

Figure 3:- Block diagram of the iCare interaction Assistant system [6].

B. Kinect- Based System

According to this system it provides real-time wearable face recognition system. As, it recognizes the face it sends a 3-D audio feedback to the user. It provides functionality such as navigation, people localization and recognition, object recognition and the textual information translation. It mainly uses the RGB-Depth technology that comprises of RGB camera to capture color images, an infrared (IR) emitter to emit IR light beams and IR depth sensor to compute the distance between the object and sensor [7].

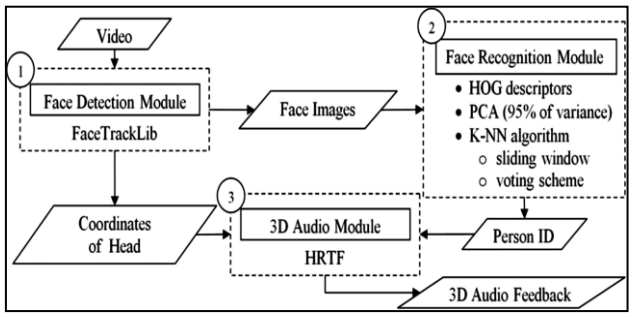

Figure 4:- Figure System architecture of kinetic-based face recognition system [7].

The diagram shows three models: face detection module (FDM), face recognition model (FRM), and 3D audio module. In the FDM, the system employs off-the-shelf face detection software (i.e., Microsoft Face Tracking SDK for Kinect for Windows—FaceTrackLib5). The Face Track Lib uses color, depth, and skeleton information to detect and track human faces in real time. Then, the FDM sends the bounding

box around the detected face (i.e., face image—with average size of 64 × 72 pixels) to the FRM. In FRM HOG descriptor shows good result for face identification. The FRM uses Real time face recognition system we use the training set that produced the best accuracy rate in the experiment sliding window size of 60 frames, 48 samples/class in the training set, and $K = 1$. First, for each frame with a detected face, they compute its HOG descriptor. Next, we center the descriptor data and multiply it by the PCA rotation matrix in order to reduce its dimensionality. Then, we use the KNN algorithm to classify the sample, and finally, we conduct the voting scheme. In this case, the voting scheme is performed only on the streaming video frames with a detected face (nondetection frames are ignored). The real-time system returns the 3-D audio feedback of the identified person every 60 votes, achieving a frame rate close to 30 frames/s in a high-performance laptop. The system also identifies unknown people i.e., people not registered in the system. We use a distance threshold for classifying a person as "not recognized," which was set empirically based on observed distance values. When the distance from frame the distance, is unknown class wins a vote. Therefore, if the unknown class wins the voting, the system will return the audio feedback "not recognize". 3-D module gives feedback to the visually impaired user; the 3DAM uses both the coordinates—in the Kinect's coordinate frame [9]. The 3DAM renders a virtual sound at a particular location by filtering the monaural sound from pair of transfer function called heat-related transfer function. The resultant sound is presented using headphones that he could hear the sound coming from which area. The most accurate approach is this but it includes expensive apparatus and complex procedures.

Table 2. Comparison of Face Recognition approaches

Approach	**Face Recognition technology/algorithm**	**Input device**	**Output device**	**Uses**
iCare Interaction Assistant	LDP and PCA	Camera	Verbal output through phones via headphone	Face Recognition
Kinect-based Recognition	RGB-Depth	RGB Camera	Stereo headphones and portable computer	Person recognition, object recognition and navigation

IV.CONCLUSION

Overview of different system has been summarized to resolve the problems of visually impaired people. Mainly, the face recognition systems help to solve real time problems i.e. people recognition and face recognition. The iCare Interaction Assistant uses the algorithms such as PCA and LDA. These algorithms are the best ones for providing face images. A Kinect wearable face recognition system uses RBG-D image, as an efficient algorithm to detect faces in all direction. Nevertheless, several issues are still needed to be addressed.

V. FUTURE SCOPE

With detection of facial features, the next research is the ability to recognize the human emotion such as sadness, happiness and other emotions. It will detect the human face, like the brow and the mouth to determine the expression. The expression will provide the basic signs of an emotion in all human beings.

VI. ACKNOWLEDGEMENT

I would like to thank the almighty God to shower his blessings on me. I would also like to thank our honorable Principal, Dr. R. P. Singh, Head of Department of Computer Science & Engineering and my Guide Prof. D. D. Patil. My Sincere thanks to all the respected teaching faculties of Department of Computer Science & Engineering, Hindi Seva Mandal's, Shri Sant Gadge Baba College of Engineering & Technology, Bhusawal. My special thanks to my Parents for their continuous encouragement, blessings and support. At last I would like to thanks all the writers of reference paper that are referred by me.

VII. REFERENCES

[1]. S. Kef, J. Hox, and H. Habekothe, “Social networks of visually impaired and blind adolescents. Structure and effect on well-being,” Soc. Netw., vol. 22, no. 1, pp. 73–91, 2000.

[2]. Chaitali K. Lakde, Prakash S. Prasad, "Review Paper on Navigation System for Visually Impaired People", International Journal of Advanced Research in Computer and Communication Engineering, vol. 4, no. 1, January 2015.

[3]. X. Yang, S. Yuan, and Y. Tian, “Assistive clothing pattern recognition for visually impaired people,” IEEE Trans. Human-Mach. Syst., vol. 44, no. 2, pp. 234–243, Apr. 2014.

[4]. Xu Liu,” A Camera Phone Based Currency Reader”, University of Maryland, College park,Oct-2008.

[5]. Rabia Jafri1, Syed Abid Ali2, and Hamid R. Arabnia3,” Face Recognition for the Visually Impaired’, Proceedings of the International Conference on Information and Knowledge Engineering (IKE), 2013.

[6]. S. Krishna, G. Little, J. Black, and S. Panchanathan, "A wearable face recognition system for individuals with visual impairments," in Proceedings of the 7th international ACM SIGACCESS conference on Computers and accessibility, Baltimore, MD, USA, 2005, pp. 106-113.

[7]. Laurindo Britto Neto, Felipe Grijalva, Vanessa Regina Margareth Lima Maike, Luiz C´esar Martini, Dinei Florencio, Maria Cec´ılia Calani Baranauskas, Anderson Rocha, Siome Goldenstein,’’ A Kinect-Based Wearable Face Recognition System to Aid Visually Impaired Users”, IEEE Transactions on Human-Machine Systems, Vol.47,pp-52 – 64,19 September 2016.

[8]. X. Chen, P. J. Flynn, and K.W. Bowyer. PCA-based face recognition in infrared imagery: baseline and comparative studies. IEEE International Workshop on Analysis and Modeling of Faces and Gestures. Pp 127 – 134, Oct 2003.

[9]. F. Ribeiro, D. Florencio, P. Chou, and Z. Zhang, “Auditory augmented reality: Object sonification for the visually impaired,” in Proc. IEEE 14th Int. Workshop Multimedia Signal Process., pp. 319–324, 2012.

[10]. S. Kef, J. Hox, and H. Habekothe, “Social networks of visually impaired and blind adolescents. Structure and effect on well-being,” Soc. Netw., vol. 22, no. 1, pp. 73–91, 2000.

[11]. W. Zhao, R. Chellappa, and A. Rosenfeld. Face Recognition: A Literature Survey. Technical Report CAR-TR948, UMD CfAR, 2000.

[12]. S. Krishna, G. Little, J. Black, and S. Panchanathan, "A wearable face recognition system for individuals with visual impairments," in Proceedings of the 7th international ACM SIGACCESS conference on Computers and accessibility, Baltimore, MD, USA,pp. 106-113,2005.