Perspectives in Communication, Embedded-Systems and Signal-Processing (PiCES) – An International Journal
ISSN: 2566-932X, Vol. 5, Issue 7, October 2021

Gesture Recognition System for the Blind

Chandana V Reddy
Student, Dept. Electronics and Communication, East West Institute of Technology, Bangalore, India

Divya M Ramani
Student, Dept. Electronics and Communication, East West Institute of Technology, Bangalore, India

Geetha K
Student, Dept. Electronics and Communication, East West Institute of Technology, Bangalore, India, geethajai9611@gmail.com

Harshitha K
Student, Dept. Electronics and Communication, East West Institute of Technology, Bangalore, India

Dr. Srinivas Babu P
Associate Professor, Dept. Electronics and Communication, East West Institute of Technology, Bangalore, India

Abstract: Several assistive technologies are booming up now-a-days to help the specially abled – it could be guiding walking sticks for the blind community, optical readers, wheelchairs and many more. However, very less research has been conducted on helping the blind access ATMs. This paper focuses on existing gesture recognition techniques that can be hooked up with ATM machines for accessing them without the keys.

Keywords: Blind; Wearables; Gesture; ATM

I. INTRODUCTION

The world today has overcome several problems with the help of technology. Right from reducing communicating distance to serving humanity, several equipment, devices and solutions have been proposed. Several devices such as guiding cares and braille based mobile phones have been developed to assist the blind.

The estimated number of people visually impaired in the world is 285 million, 39 million blind and 246 million having low vision; 65 % of people visually impaired and 82% of all blind are 50 years and older.

ATMs have text displays for instructions and keypads for entering transaction information. However, without the help of a sighted assistant a blind person can't read the text display in order to enter the required information. Different banks provide different models of ATM machines, and their operations vary from model to model.

Blind users can remember the instructions and commands for a particular ATM machine, but it is difficult for them to operate the different types of ATM machines on their own. So they have to depend on a person who knows how to operate the machine for their banking.

Money is the basic essential for every person to fulfill their daily needs. For a normal person accessing ATM machine is a piece of cake, but it is not same for visually impaired, so in this project even they can access and control their money transactions. The improvement in technology of banking services has increased the urge for the approach among the visually impaired people.

This paper focuses on several papers that focus on solving the issue at hand – helping the specially abled access ATMs using different technologies. Also, hand gesture based ATM accessing system is also designed which is explained in the later sections of the paper.

II. LITERATURE SURVEY

A. *"A Novel Chinese Sign Language Recognition Method Based on Keyframe centered clips" [1]*

Shelling Huang, Chensi Mao (2018)

This paper emphasized on method that takes the natural characteristics of sign language into consideration, and the experiments demonstrate the superiority compared with other methods. More importantly, they proposed method that had the potential of recognizing enlarged vocabularies and long sentences. The limitation of this project was that its accuracy rate was 91.18%.

B. *A Wearable Device Supporting Multiple Touch and Gesture Based Languages for the Deaf-Blind.[2]*

Nicolas Caporusso, Antonio Brunette (2018)

In this paper, they introduced dB GLOVE, a device which can be worn and makes the deaf and blind independent. This system is user friendly through its natural interface and it is also similar to already existing touch and hand gesture based languages, such as Malossi and deaf-blind manual, in order to offer a unique device for connecting different communities with an affordable solution. But the drawback was that they obtained 763 correct answers out of 1071 responses.

C. Smart Wearable Hand Device for Sign Language Interpretation System with Sensors Fusion. [3]

B G Lee, S M Lee (2017)

This paper consists of sensor data that are collected and analyzed using a built-in embedded support vector machine classifier. Eventually, the alphabets that are identified is further transferred to a mobile through Bluetooth. An Android application was developed with a text-to-speech converter. But the drawback was that its accuracy rate was 65.7%.

D. Wearable Glove-Type Driver Stress Detection Using a Motion Sensor [4]

Boon-Giin Lee, Wan-Young Chung (2016)

This paper has presented an original method for predicting a driver's stress level based on the steering wheel movement derived from a wearable glove motion sensor. The results of the analysis indicated that by incorporating the "redundant" features elimination and stepwise feature selection of extracted features from an inertial motion unit sensor could reduce the SVM stress level prediction classifier's complexity yet maintaining the prediction rate at acceptable level. If the driver doesn't wear the glove properly it would cause the problem in getting result.

E. Recognition of sign language with an inertial sensor-based data glove.

Kyung-Won Kim, Mi-So Lee, Bo-Ram Soon (2016)

In this paper, they presented a sign language recognition system based on a data glove using Micro-electromechanical systems (MEMS) inertial sensors and magnetometers. The system consists of six LSM9DS0 sensors for capturing hand gestures, an MSP430F5529LP MCU, and a host application for acquiring data and recognizing signs. The recognition performance is expected to be improved with this alignment so, this would be the drawback of this project.

Inspired from the above methods, we propose a method to access the ATMs for the blind community.

III. PROPOSED METHOD

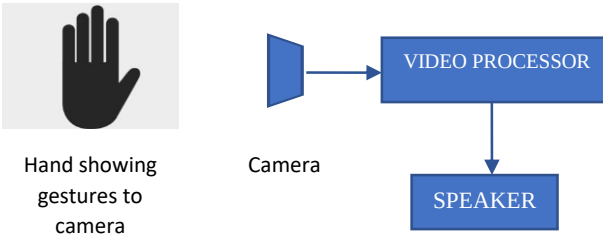

Fig 1. Block diagram of proposed method

The above block diagram shows the accessing technique of the ATM machine as per the proposal [5].

This block diagram mainly consists of three components, they are:

- Camera
- Video processor
- Speakers

Firstly, instead of inserting the card, the user will have to show his account details using gestures. Once the details have been fed to the system, the system then prompts the user to show the password in front of the camera. Once the details ad password match, the user is then allowed to perform transactions.

The live feeding of the camera can detect object and use them as input to perform the further tasks. Video processor is been used to detect and count the object that moves in the sequence. The image captured requires flexible analysis and processing functionality and this can be done using MATLAB.

IV. CONCLUSION

First set of gestures will be authenticated and then by matching the pin with username by using hand gestures and finally the visually impaired person can access the ATM machine for further use. The hand gesture based input provides safe and reliable transactions which is demonstrated in this ATM processing system. The efficiency of the system depends on how rapidly the system encounters the change in hand gestures. The proposed system is helpful for blind who does not even know braille language, as well as the illiterates. They only need to know the Indian sign language of numbers through hand gestures.

REFERENCES

[1] S. Huang, C. Mao, J. Tao and Z. Ye, "A Novel Chinese Sign Language Recognition Method Based on Keyframe-Centered Clips," in IEEE Signal Processing Letters, vol. 25, no. 3, pp. 442-446, March 2018.

[2] Caporusso N., Biasi L., Cinquepalmi G., Trotta G.F., Brunetti A., Bevilacqua V. (2018) A Wearable Device Supporting Multiple Touch- and Gesture-Based Languages for the Deaf-Blind. In: Ahram T., Falcão C. (eds) Advances in Human Factors in Wearable Technologies and Game Design. AHFE 2017. Advances in Intelligent Systems and Computing, vol 608. Springer, Cham

[3] B. G. Lee and S. M. Lee, "Smart Wearable Hand Device for Sign Language Interpretation System With Sensors Fusion," in IEEE Sensors Journal, vol. 18, no. 3, pp. 1224-1232, 1 Feb.1, 2018.

[4] B. Lee and W. Chung, "Wearable Glove-Type Driver Stress Detection Using a Motion Sensor," in IEEE Transactions on Intelligent Transportation Systems, vol. 18, no. 7, pp. 1835-1844, July 2017.

[5] S. R. Rupanagudi et al., "A high speed algorithm for identifying hand gestures for an ATM input system for the blind," 2015 IEEE Bombay Section Symposium (IBSS), Mumbai, 2015, pp. 1-6.

[6] T. Starner and A. Pentland, "Visual recognition of American sign language using hidden Markov model," in Proc. IEEE Int. Conf. Autom. Face Gesture Recognit., 1995, pp. 1–52.

[7] C. Wang, W. Gao, and S. Shan, "An Approach based on phonemes to large vocabulary Chinese sign language recognition," in Proc. IEEE Int. Conf. Autom. Face Gesture Recognit., 2002, pp. 393–398.

[8] P. Jangyodsuk, C. Conly, and V. Athitsos, "Sign language recognition using dynamic time warping and hand shape distance based on histogram of oriented gradient features," in Proc. ACM Int. Conf. Pervasive Technologies Related Assistive Environments, 2014, pp. 1–6.

[9] G. Marin, F. Dominio, and P. Zanuttigh, "Hand gesture recognition with leap motion and Kinect devices," in Proc. IEEE Int. Conf. Image Process., 2014, pp. 1565–1569.

[10] J. Zhang, W. Zhou, X. Chao, J. Pu, and H. Li, "Chinese sign language recognition with adaptive HMM," in Proc. IEEE Int. Conf. Multimedia Expo., 2016, pp. 1–6.

[11] Akshay Dekate, Anam Kamal, Surekha K.S.-E&TC, AlT, Pune "MAGIC GLOVE- WIRELESS HAND GESTURE HARDWARE CONTROLLER" IEEE Electronics and Communication systems (ICECS)