A Sign Language Based ATM Accessing For Blind

Meghana J

Undergraduate Student, Dept. Computer Science and Engineering, Jyothy Institute of Technology, Visvesvaraya Technological University Thataguni Post, Bengaluru-560082, India

NayanaLakshmi K

Undergraduate Student, Dept. Computer Science and Engineering, Jyothy Institute of Technology, Visvesvaraya Technological University Thataguni Post, Bengaluru-560082, India

Prerana B K

Undergraduate Student, Dept. Computer Science and Engineering, Jyothy Institute of Technology, Visvesvaraya Technological University Thataguni Post, Bengaluru-560082, India

Varshitha K

Undergraduate Student, Dept. Computer Science and Engineering, Jyothy Institute of Technology, Visvesvaraya Technological University Thataguni Post, Bengaluru-560082, India

Nagaraj A

Associate Professor, Dept. Computer Science and Engineering, Jyothy Institute of Technology, Visvesvaraya Technological University Thataguni Post, Bengaluru-560082, India

Abstract: The Blind people often have difficulty accessing ATM machines to withdraw money and have to go to the bank. It wastes their time, which makes them uncomfortable. To overcome this problem, most ATM keypads provide Braille embossed keys with the intention of guiding a blind person to access the system. Although useful, Braille unknown blind people fail to access these systems independently. Therefore, to overcome this problem, other ways to access ATM machines should be explored. Sign language is a way of using gestures to communicate with a system in a secure environment. This paper surveys the various methods proposed for sign language recognition.

Keywords: Sign Language; Gestures; Microcontroller; Survey; Blind; ATMs

I. INTRODUCTION

Blindness means loss of useful vision. Blindness can be temporary or permanent. Damage to any part of the eye, the area of the optic nerve or brain that causes vision, can lead to blindness. The World Health Organization (WHO) estimates that 285 million people worldwide are visually impaired - 39 million are blind and 246 million have low vision (severe or moderate vision loss), which accounts for 90 percent of global vision. In developing countries, 65% of the visually impaired and 82% of the blind are over the age of 50, but at this age only 20% of the world's population [1]. There are many (indeed, innumerable) causes of blindness. The main causes of blindness are diabetes, macular degeneration, glaucoma, traumatic injuries, vitamin A deficiency, premature retinopathy, vascular diseases of the retina or optic nerve and infectious diseases of the cornea. Diseases are included. Chemical poisoning from toxic factors such as retina, ocular inflammatory disease, retinitis pigmentosa, primary or secondary malignancy of the eye, congenital abnormalities, hereditary diseases of the eye and methanol.

There are three main types of blindness:

- Colour blindness is the inability to distinguish between colors, especially green and red, which can be distinguished by others. This is not really true blindness.

- Night blindness is difficult to see in low light conditions. It may be genetic or acquired. This is not a condition of blindness.

- Snow blindness is a loss of vision after exposure to very large ultraviolet light. Snow blindness is usually temporary and is caused by inflammation of the corneal surface cells. Even in the most severe cases of snow blindness, the individual is still able to see shapes and movement.

This paper collates the popular methods proposed in recent years for the recognition of sign language gestures. Section 2 summarizes the survey conducted and Section 3 concludes the paper.

II. LITERATURE SURVEY

In this section, papers published from 2012 has been reviewed and summary of the same is presented below. The findings have been tabulated in Table 1.

Paper	Description	Drawback
Real-Time Translation of Indian Sign Language using LSTM (2019) [2]	A sensor-based gloves can be used to convert the sign language gestures using the fingering moments of the person.	Low accuracy
Atm Machine for Blind People (2016) [3]	Voice chips are used to produce sound through speaker. Main component of this project is the flex senor that change the resistance depending on the amount of bend on the sensor	Mainly concentrates on deaf people thus difficulty in communicating with people who does not know sign language.
Two Dimensional (2d) Convolutional Neural Network for Nepali Sign Language Recognition (2018) [4]	The static hand gestures are captured, and the pictures are translated into their respective meanings, using a 2D convolutional neural network. This procedure is mainly used to help the visually impaired people.	The accuracy obtained by using this technique is slightly as the number of signs increases from 5 to 9
Data-Glove for Japanese Sign Language Training System with Gyro-Sensor (2018) [5]	A data glove system that employs a gyro sensor and heuristic algorithm to detect words with palm-turning actions in Japanese sign language.	Need to implement an enrolling function to determine appropriate threshold values for different individuals.
Performance Enhancement by Combining Visuals Clues to Identify Sign Language Motion (2017) [6]	Gloves with colored regions and optical camera are the key elements used in the sign language recognition method. The moment of the colored region are used to identify the motions of hand and fingers.	Low accuracy
Android Mobile App for Real Time Bilateral Arabic Sign Language Translation Using Leap Motion Controller (2017) [7]	For the translation of real time Arabic sign language e, an android mobile application is introduced. The mobile application is designed such that it makes the bi lateral communication for the deaf community easier.	Currently by using this system only 15 sign language words can be obtained. Meanwhile, the recognition of continuous sign language sentences are much complex.
Talking Hands-An Indian Sign Language to Speech Translating Gloves (2017) [8]	For the recognition of sign language, we will be using different sensors which will be integrated onto a glove for detection of gestures and for converting them into speech with the help of a Bluetooth module and android smart phone.	With the use of variety of sensors like flex sensors, gyroscope and accelerometer, the position and orientation of hand gestures can be successfully obtained.
Sensor Based Hand Guesture Recognition System for English Alphabets used is Sign Language of Deaf-Mute People (2018) [9]	A sensor-based device is used to decipher the sign language of a hand gesture for a English alphabet. A hand glove, when put on by a mute person accurately recognizes the hand gestures as 26 letters.	This system uses a simple algorithm to recognise the English alphabet of ASL and real time.
Intelligent glove for sign language communication (2019) [10]	The flex sensor has measured the bent of fingers and movement of a hand transform alphabet and text then show output in form of voice by passing a mini speaker which trapped to a glove for better understanding between disable and normal people.	It has only 7 alphabets and 4 basic words which accuracy less than 100%.
Electronic Device Control Using Hand Gesture Recognition System for Differently Abled (2018) [11]	A real time hand gestures recognition system is used to detect the hand gesture in mid-air and also to control the appliances related to the input gestures. It is hence the combination of hand gesture recognition with real time hand detection by using HOG (Histogram of oriented radiance).	Low quality camera or the physical constraint of training data set.
Design of ATM Accessing System for Blind using Real-Time Video Processing through Gestures (2015) [12]	The possibility of simple hand gesture based input which provides secure transactions.	Gestures should be shown properly, and Indian sign language should be known.
Skill Specific Spoken Dialogues Based Personalized ATM Design to Maximize Effective Interaction for Visually Impaired Person (2014) [13]	To assimilate into conventional ATMs and enable the effective interaction of visually impaired users with the machine.	Fast cash menu option's amounts unpredictable for user to choose from main menu.
Hand Gesture based Interface for Aiding Visually Impaired (2012) [14]	K-means Clustering algorithm- will recognize and classify 36 different hand gesture patterns On the basis of generated bit sequences we can assign different tasks to support human computer interaction or sign language.	Threshold values are experimentally defined, Maximum parameters are based on assumption.

Sign Language Recognition Based on Intelligent Glove Using Machine Learning Techniques (2018)]15]	Machine learning algorithm (DROP3) to store each alphabet with sign language with less data sets to train the algorithm	Only classifies for alphabets.
Smart glove-based gestures recognition system for Arabic sign language (2020) [16]	Low Cost smart glove system to recognize hand gestures in Arabic Language.	Cannot be adapted for more than one user at same time, Requires modifying system for board pod
Human Computer Interaction based on Gestural Recognition/ Sign Language to Text Conversion (2018) [17]	Development of an HCI system that will convert sign language to text for hearing impaired people.	Only employed for static gesture.
Sign Language Communication and Authentication using sensor Fusion of Hand Glove and Photometric Signal (2017) [18]	Sign Language Interpretation system by a combination of data glove and photoplethysmography sensor measurements collecting concurrently from data glove and PPG devices.	Sensors recommended was based on only six subjects involved and only four experiments were conducted.

Table 1. Literature Survey

Similar attempts have been made to develop such systems in [19-22]. Furthermore, survey on existing techniques in provided in [23].
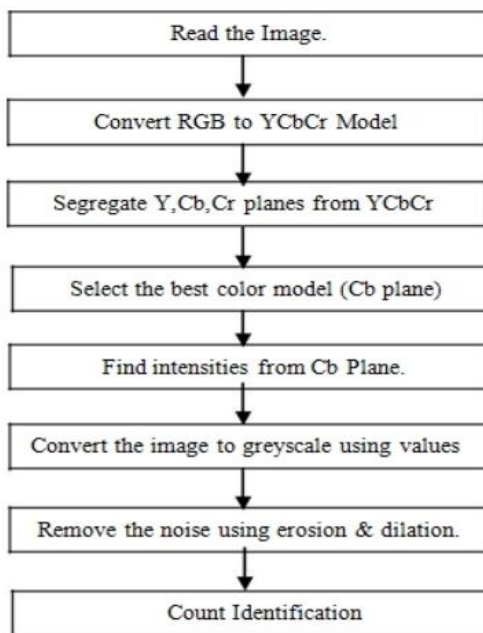
III. METHODOLOGY

Fig 1. Flow chart

A. Color Conversion

The default color model is RGB where R is for Red, G is for Green and B is for Blue. Each color values varies from 0 to 255 which requires 8 bits for the representation. If all the three colors are combined together one has to work with 8x3=24 bits/pixels, which might be expensive with respect to memory and time.

We converted the RGB image to YCBCR and HSV model and extracted Y CB CR H S and V separately.

The other color model that have been experimented with. They are:

- Grayscale - The importance of using grayscale images is related to the degree to which colors change between byte values. Grayscale images are best because shades change byte by byte slowly.

- YCbCr - Color space refers to the intensity of color and exploits the characteristics of the human eye. Our eyes are more sensitive to intensity than color. The intensity component is stored with greater accuracy because the amount of information can be reduced. Color images formed by Y, CB and Cr components.

- HSV - HSV color model is used when choosing colors or colors for veins because HSV reflects better how people relate to colors than the RGB color model. The HSV color wheel also contributes to high quality graphics.

B. Segmentation

It is typically performed to locate the hand object and boundaries in image. It assign labels to every pixel in image such that the pixels which share certain visual characteristics will have the same label. It detects a partition in which objects fall within the same cluster are close to each other clusters. An image was captured via the front camera of the laptop.

C. Noise Removal

EROSION : Choose a 3*3 square at left top(window), check the center pixel below the square if the colour is black then paste it in a new matrix. If the center is white check all around the pixel are black even anyone is black we don't copy we make that copied black in copied image, else copy paste white image.

DILATION : After erosion there would be some part of finger lost we need to retrieve it back. Hence we choose a structuring element as disc of some radius .here we check the center pixel of surroundings is white then paste white for that pixel.

D. Counting

Counting was performed using a counting algorithm.

IV. RESULTS
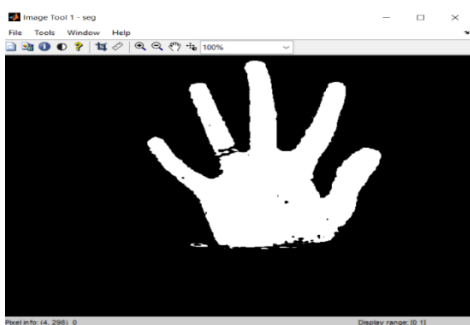

Fig 2.   RGB image showing 5

Fig 3.   Segmented Image Showing 5

Fig 4.   Eroded image showing 5

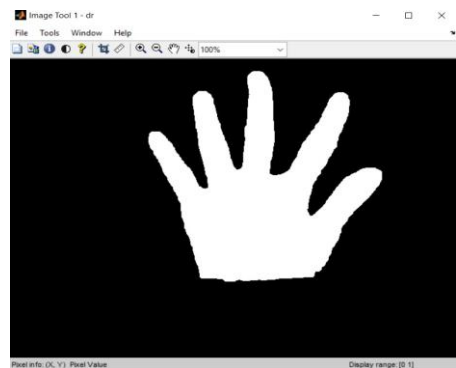

Fig 5.   Dilated Image Showing 5

V. CONCLUSION

Thus in our project we help the blind people to use the ATM without any third party assistance. It is a simple machine where even illiterate can use it without any difficulty. There are three languages provided for the user to use the system at his/her convenience. Each user is given a unique identification number (PIN number) to access the ATM. The user enters his password through gestures. This whole ATM is proposed under a closed box which with an acknowledgement is provided for each and every transaction the user needs to carry out. Thus this provides security for the user.

REFERENCES

[1] https://en.wikipedia.org/wiki/Visual_impairment#:~:text=The%20World%20Health%20Organization%20uses%20the%20following%20classifications%20of%20visual%20impairment.&text=20%2F30%20to%2020%2F60,visual%20impairment%2C%20or%20severe%20low

[2] Ebey Abraham, Akshatha Nayak and Ashna Iqbal "Real-Time Translation of Indian Sign Language using LSTM" 2019 Global Conference for Advancement in Technology (GCAT)Bangalore, India. Oct 18-20, 2019.

[3] K. SASIREKHA*, M. NIVETHA, A. INDUMATHI and D. RENUKADEVI "ATM Machine For Blind People".

[4] Drish Mali, Rubash Mali, Sushila Sipai and Sanjeeb Prasad Panday (PhD)"Two Dimensional (2D) Convolutional Neural Network for Nepali Sign Language Recognition" 978-1-5386-9141-bchs0/18/$31.00 ©2018 IEEE.

[5] Yuichiro Mori and Masahiko Toyonaga "Data-Glove for Japanese Sign Language Training System with Gyro-Sensor "2018 joint 10th conference and intelligent system and 19th International Symposism.

[6] Yuna Okayasu,Tatasunori and Maitai Dalhan "Performance Enhancement By Combining Visual Clues To Identify Sign Language Motion" IEEE 2017.

[7] Abdulla Eqab, Tamer Shanableh "Android Mobile App for Real-Time Bilateral Arabic Sign hdbLanguage Translation Using Leap Motion Controller" 2017 International Conference on Electrical and Computing Technologies and Applications (ICECTA).

[8] S Yarisha Heera, Madhuri K Murthy,Sravanti V S"Talking Hands" InternationalConference on Innovative Mechanisms for Industry Applications(ICIMIA 2017).

[9] Abhishek B. Jani1 (Member, IEEE), Nishith A. Kotak (Member, IEEE) and Anil K. Roy(Senior Member, IEEE)"Sensor Based Hand Guesture Recognition System for English Alphabets used is Sign Language of Deaf Mute People" 978-1-5386-4707-3/18/$31.00 ©2018 IEEE.

[10] Sanmuk Kaur "Electronic Device Control Using Hand Gesture Recognition System For Differently Abled".

[11] Nitipon Navaitthiporn , Preeyarat Rithcharung , Phitnaree Hattapath , C. Pintavirooj "Intelligent glove for sign language communication" The 2019 Biomedical Engineering International Conference (BMEiCON- 2019).

[12] Shruthi.G, Sarayu.K.P, Sangeetha.R, Sanjoy Das "Design of ATM Accessing System for blind using real-time video processing through Gestures" International Journal of Computer Applications (0975 –8887) Volume 119 – No.11, June 2015.

[13] Muhammad Shafiq, Jin-Ghoo Choi, Muddesar Iqbal,Muhammad Faheem "Skill specific spoken dialogues based personalized ATM design to maximize effective interaction for visually impaired person" A.Marcus (Ed.): DUXU 2014, Part IV, LNCS 8520, pp. 446–457, 2014.

[14] Meenakshi Panwar "Hand Gesture based Interface for Aiding Visually Impaired" 978-1-4673- 0255-5/12/$31.00c 2012 IEEE.

[15] Paul D. Rosero-Montalvo; Pamela Godoy-Trujillo, Edison Flores-Bosmediano, Jorge Carrascal-Garcıa,Santiago Otero-Potosi, Henry Benitez-Pereira and Diego H. Peluffo- Ordonez "Sign Language Recognition Based on Intelligent Glove Using Machine Learning Techniques" 978-1-5386-6657-9/18/$31.00 c 2018 IEEE.

[16] Neven Saleh, Mostafa Farghaly, Eslam Elshaaer and Amr Mousa "Smart glove-based gestures recognition system for Arabic sign language" 2020 International conference on Innovative trends in communication and Computer Engineering(ITCE2020).

[17] Andrews Samraj and Naser Mehrdel and Shohel Sayeed "Sign Language Communication and Authentication using sensor Fusion of Hand Glove and Photometric Signal" 2017 8th International Conference on Information Technology (ICIT).

[18] Zain Murtaza, Hadia Akmal and Wardah Afzal "Human Computer Interaction based on Gestural Recognition/Sign Language to Text Conversion".

[19] Dhruva N., Rupanagudi S.R., Neelkant Kashyap H.N. (2013) Novel Algorithm for Image Processing Based Hand Gesture Recognition and Its Application in Security. In: Unnikrishnan S., Surve S., Bhoir D. (eds) Advances in Computing, Communication, and Control. ICAC3 2013. Communications in Computer and Information Science, vol 361. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-36321-4_51

[20] 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, doi: 10.1109/IBSS.2015.7456642.

[21] N. Dhruva, S. R. Rupanagudi, S. K. Sachin, B. Sthuthi, R. Pavithra and Raghavendra, "Novel segmentation algorithm for hand gesture recognition," 2013 International Mutli-Conference on Automation, Computing, Communication, Control and Compressed Sensing (iMac4s), Kottayam, 2013, pp. 383-388, doi: 10.1109/iMac4s.2013.6526441.

[22] S. S. P G, P. S. Nayak, S. V, S. K, and S. S. G, "Blind Friendly ATM Software System", pices, vol. 1, no. 4, pp. 36-38, Aug. 2017.

[23] C. V. Reddy, D. M. Ramani, G. K, H. K, and S. B. P, "Gesture Recognition System for the Blind", pices, no. PaCER 2020, pp. 189-191, Jul. 2020.