

Indian Sign Language Recognition System for ATM's to Assist Visually Challenged People

¹Bhavya R, ²Champa H

Abstract

According to the latest's research it was found worldwide that about 285 million people are visually impaired were 36million people are found blind and 246 million people have low vision either severe or moderate visual impaired. Blindness can be caused by genetics, infection, disease or injury. The blind person face lots of problems in their daily routine like travelling out spaces, navigating outside the spaces that they are accustomed to like ATM's were they face lots of problem during transaction. Despite that the ATM's are inscribes by Braille that does not completely eliminate the problem faced by them as they the blind is accompanied by one or the other person most of time during transaction who help them out by directing them but what if the accompanied person embezzle during transaction or what if the person has no idea about Braille language. So we plan to design a secure and safer ATM accessing system to help out the blind.

General Terms- Video Processing, hand gesture recognition, security, MATLAB.

Keywords- ATM machines, hand gesture recognition, visually impaired, video processing

INTRODUCTION

According to the latest's research it was found worldwide that about 285 million people are visually impaired were 36million people are found blind and 246million people have low vision either severe or moderate visual impaired . Blindness can be caused by genetics, infection, disease or injury. The blind person face lots of problems in their daily routine like travelling out spaces, navigating outside the spaces that they are accustomed to like ATM's were they face lots of problem during transaction[5].Despite that the ATM's are inscribes by Braille that does not completely eliminate the problem faced by them.

The various impacts are – the blind is accompanied by one or the other person most of time during transaction who help them out by directing them but what if the person embezzle during transaction by seeing the authentication details of the blind

person, what if the person has no knowledge about Braille and does not know how to use it, since blind person can't see he/she can be watched or robbed by the robber. The blind person will not have knowledge of correctness of money he opted and received. Existing system that are available at present are Talking ATM which is automated teller machine which instructs the person through headset who cannot read on the ATM screen, here all the audible information is delivered privately, but this system does not guarantee about the security of the pin .The other technology is the device based recognition system were the person is given a glove which is of high precision and it is embedded with many sensors, wires, cables and controller .the disadvantage of the device based system is, its very bulky and difficulty to carry around .

As solution to the above mentioned scenarios we plan to develop a video processing based secure algorithm for accessing ATM machine using Indian

Sign Language for numbers which is the most natural way of gesture recognition system that eliminates the above mentioned problems.

LITERATURE SURVEY

Hand gesture recognition provides an easy way to interact and communicate with the machines of different types. Gestures are considered as the most natural expressive way for communications between human and computers in virtual system {leap motion sensor and RF classifier}[5]. Magic Glove aims to bridge the gap between the user and traditional physical hardware devices. Simple hand gestures are captured from the Magic Glove and this input is used to wirelessly control a modified RC car. Controlled variables include speed, steering, lights and sounds using a combination of flex, force and gyroscopic sensors. Multiple variables are controlled simultaneously as Magic Glove outputs a constant control signal.

Though Magic Glove has many advantages and scope in many fields it does have many disadvantages too. The sensors used in the Glove should be of high precision else if low precision sensors are used the system may fail to capture the gestures appropriately. Since sensors are a part of the system it is not very cost effective. The Glove is embedded with many sensors and wires which make the whole system very bulky and difficult to carry around. The system along with controllers, cables and sensors is very complex and not very easy to understand by common man [1].

PROPOSED SYSTEM

The proposed system eliminates the visually impaired person from carrying his gloves when travelling out spaces for accessing the ATM and issues related to authentication by proposing an Indian Sign Language recognition system using Vision-based Gesture Recognition system for Securing pin. This technique is cost efficient and has advantages like authentication of pin number and need not carry any external devices during accessing the ATM.

Software and Hardware Requirements

A webcam of 5Mp resolution is used to record the gestures for better quality which is connected to laptop which gets processed by real time video processing system. Headset is used to instruct the person. Our project is carried out using MATLAB version R2011b and above.

METHODOLOGY AND IMPLEMENTATION

Block diagram

The design comprises of a box inside which a camera is fitted to one end and a hollow at the bottom of the box where the person is asked to insert his/her hand and flash the card which eliminates the problem of being embezzled. The camera is in turn connected to a laptop/pc which uses a real time video processor where the required algorithm is being processed to uniquely identify the person. The other end of the laptop/pc is connected to the display and the headset, where the person has been instructed to show the pin number using gestures. The system interprets the gestures and acknowledges the person appropriately. The block diagram is shown in Fig 1.

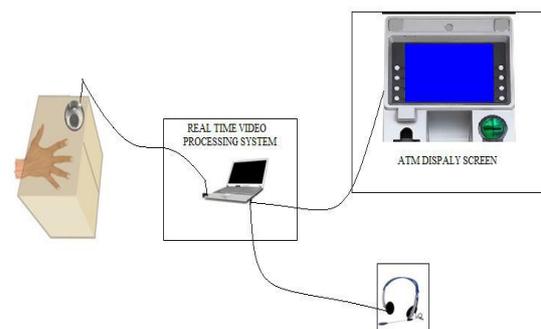


Fig 1: Proposed block diagram

Architecture

Fig 2 gives the complete architecture of ISL for ATM to assist the visually impaired person. As the person approaches to ATM he is asked to insert the card and later asked to show the pin number as the captured images from web camera are processed through real time video processor where the key which is the actual pin number allotted to the person

is stored through the card in parallel to which the pin number shown by the user are compared with the key and the result is displayed as pin accepted or rejected ,if accepted it gives out a message saying pin number successful and if rejected the user is asked to follow the process again .

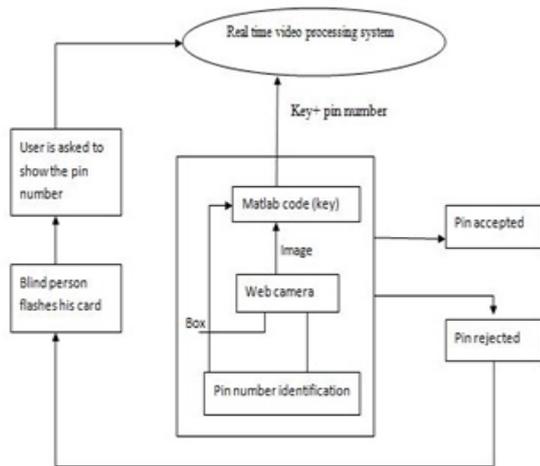


Fig 2: Architecture of ISLRS

Algorithm

In this section we explain the flow to carry out the process and the implementation as shown in Fig 3.

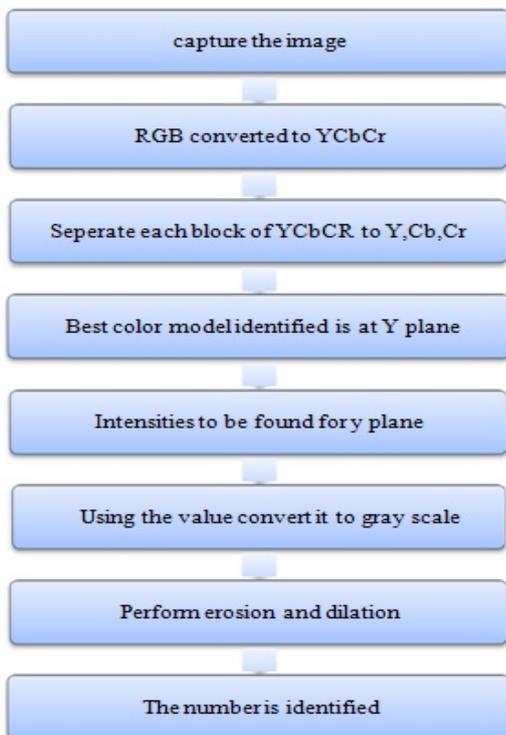


Fig 3: Algorithm

The captured RGB image should be converted to YCbCr to find the intensities in the Y plane which differentiates the foreground from background. The conversion is as shown in Fig 4. This process is carried out using the conversion formula.

$$Y = 0.299*R + 0.587*G + 0.114*B$$

$$Cb = -0.168736*R - 0.331264*G + 0.5*B$$

$$Cr = 0.5*R - 0.418688*G - 0.081312*B$$

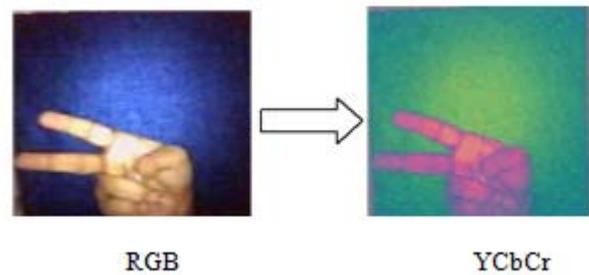


Fig 4: RGB to YCbCr conversion

Gesture recognition

The gestures of the hand are captured and seperated from the background using the intensities from the y plane at different gray scale .This values are further used in segmentation, noise removal and feature extraction as shown below.

The hand gesture are separated from background as shown in Fig 5. Hence, focus is only on hand part of the captured image. This is accomplished by separating background and hand gesture at different intensity values.



Fig 5: Segmented image

Logic for segmentation:

$$O/p(x, y) = \begin{cases} \text{white,} & \text{if } Y_{min} \leq i/p(x, y) \leq Y_{max} \\ \text{Black,} & \text{otherwise} \end{cases}$$

Morphological Operations

The morphological operations apply structuring element to an input image creating an output image of same size. The basic morphological operations are dilation/erosion. They are used to remove noise present in the image. Erosion is used to remove noise present in the background while dilation removes noise present in the region of interest i.e. exactly opposite of erosion. The Fig 6 and Fig 7 shows erosion and dilation obtained.



Fig 6: Erosion

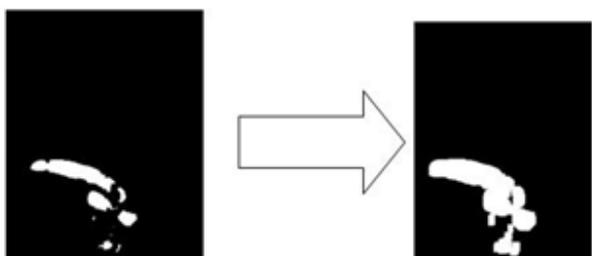


Fig 7: Dilation

Number Identification

Counting is performed to identify how many fingers are opened and which of them are open based upon this test results the actual count is obtained using some logic.

RESULTS

Initially, the user flashes the card. Then, the hand gestures are captured continuously as a video and

are identified as numbers. When the correct 4digit sequence of numbers comprising the pin is obtained the user can carry out further transactions else he would have to follow the procedure again failing which the user is identified as a robber.

ADVANTAGES

The major advantages of our project are listed as below:

1. Blind people need not depend on anyone for his/her transactions. It provides higher security.
2. Even a person who does not know Braille or an illiterate person can easily carry out his/her financial transactions.
3. It is error-free and safe, because the password provided by the user through enclosed box will not be visible to the other users (Shoulder surfing).
4. Most importantly the designed module is cost effective. Due to its low cost and reduced design complexity, the setup is considered to be a user friendly.

APPLICATIONS

1. This system can be used for house security purpose.
2. The proposed system provides authentication hence can be used in bank safe lockers.
3. It can be used in police station to prevent high profile prisoners from escaping.

FUTURE SCOPE

This proposed technique of Hand Gesture Recognition system and flashing the card can be implemented in different methods using various techniques. The procedure of Hand Gesture Recognition system can also be implemented further in following sections:

1. For Withdrawal of money.
2. For Balance enquiry.

3. To show the hand gestures & move to the respective floor in elevators (the floor numbers are identified from the Hand gesture inputs).
4. The procedure used in this, like flashing the card can also be implemented in following sections:
5. Showing the PIN number and flashing the card can be used in polling booth.
6. It can be used in security purpose in office.

CONCLUSION

The progress in science and technology is grown up worldwide that demonstrate the new technology and new things to humans which is a non-stoppable technology as day by day the technology provides a better future. The proposed system based on video processing is developed for the ATM's as it makes a clear possibility by providing a secure transaction by giving input as in form of simple gestures. The system is found to be more impregnable, as it is protected from unauthenticated person. our proposed system is helpful for the visually challenged people as the person need not carry the gloves while travelling outspaces for withdrawal of money as Indian sign language is easy in learning the proposed system can be used by any individuals as he need not know Braille language.

REFERENCES

1. Pratibha Pandey, Vinay Jain, "Hand Gesture Recognition for Sign Language Recognition" A

Review", International Journal of Science, Engineering and Technology Research (IJSETR), Volume 4, Issue 3, March 2015.

2. Aarthi M, Vijayalakshmi P, "Sign Language To Speech Conversion" 2016 Fifth International Conference On Recent Trends In Information Technology.

3. Mandeep Kaur Ahuja, Amardeep Singh, "Hand Gesture Recognition Using PCA" International Journal of Computer Science Engineering and Technology (IJCSET), Volume 5, Issue 7, pp. 267-27, July 2015.

4. Jayshree R. Pansare, Maya Ingle, "Vision-Based Approach for American Sign Language Recognition Using Edge Orientation Histogram" 2016 International Conference on Image, Vision and Computing.

5. Ching -Hua Chuan, Rric Regina, and Caroline Guardino "American sign language Recognition System using leap motion sensors 13th International Conference on Machine Learning (ICMLA) and Applications, 2016.

6. 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 Application.

Author's Profile

^{1,2}Department of Electronics and Communication Engineering, T. John Institute of Technology, Bangalore, India