Design and Development an Interactive System for the Visually Impaired To Access The ATM

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Abstract: Blind people face many problems in their lives. One of them would be being dependent on someone else for financial transactions. The friend accompanying him might get to know the password or someone else can come to know of his pin number. A stranger might try to help the blind win the trust and rob him. So, In the existing ATMs, special type of inscription is installed called Braille on the keypad to facilitate blind, which might not be known to all. So, the paper proposes to design and develop a safer and secure ATM accessing system for the blind to secure their pin codes during financial transactions especially in ATMs which, Security has been taken as major concern. As the present society, is increased with crime and thefts particularly on banking sectors and in need of efficient authentication and authorization process based on password pin authentication among the many authentication system for accessing the Bank accounts that has been proposed and implemented. In this concept, a database will be created and maintained with hand gesture of each account holder with respect to their accounts, by comparing the hand gesture of the account holder with existing account holders database maintained at Banks. Once it is compared with existing records, it will be functioned in two ways. Authorize or Un-authorize, if the process is authorized then the system machine will allow the person to access their account. And if it is un-authorized then, a SMS will be generated immediately to bank. This project is developed has been developed for blind people with hand gesture recognition. Third person can also access through the OTP generated in the registered mobile number of the account holder for some personal reasons of account holder.

Keywords: Image Processing; ATM; Access; Sign Language

I.   INTRODUCTION

Visual impaired population in the world is about 285 million and about 35 million are blind. There are 3 kinds of blindness-night blindness, complete blindness, and Colour blindness. One of the problems they face in their day to day routine is during ATM transactions. Though ATMs are inscribed with Braille it does not completely eliminate the problems faced by blind people.

Various issues faced by them are -What if the blind person using the system does not know Braille and does not know how to use it, the blind person is most of the time accompanied by someone who helps him in his transactions, that person may accidently or purposely see the authentication details of the blind person and may misuse the same for his own use. Since blind person cannot know that he may be watched by a stranger and may rob the blind person. The blind person also cannot be confirmed about the correctness of the money he opted and the amount he received.

Existing solution - Talking ATM is an automated teller machine that provides audio output instructions to a person who cannot read an ATM screen to help him to independently use the machine. All audible information is delivered privately through a standard headphone jack on the machine or a separately attached telephone headset. Information is delivered to the customer either through pre-recorded sound files or via text-to-speech synthesis. A user plugs a standard headset into the jack and can hear instructions such as "continuing further transaction", "press 2 for deposit". There is an audible instruction for first time users and audible information describing these features.

II.   LITERATURE SURVEY

Hand gesture aims to bridge the gap between the user and traditional physical hardware devices. Given the high learning curve in understanding how to use foreign technologies, it hopes to break away from conventional control mechanisms and explore an intuitive way to control these devices. Hand gesture provides a tangible interface that relies on hand gestures to wirelessly control any device or software. By removing the distance between the user and traditional hardware devices, the goal of and gesture is to make the feel more like an extension of the body as opposed to an external machine. Simple hand gestures are captured and this input is used to wirelessly control. Multiple variables are controlled simultaneously shown as hand gesture outputs a constant control signal. It has many advantages and scope in many fields it does have many disadvantages too. 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. Hand posture recognition still an open research area .Different techniques and tools have been applied for handling gesture recognition system, vary between mathematical models like Hidden Markov Model and Finite State Machine to approaches based on software computing methods such as fuzzy clustering, Genetic Algorithms (GAs) and Artificial Neural, since the human hand is a complex articulated object with many connected joints and links. Typically the implementation of gesture recognition system required different kinds of devices for capturing and tracking image/ video image such as camera(s), instrumented (data) gloves, and colored marker. Those devices are used for modeling the communication between human and environments rather than traditional interface device such as keyboards, and mice which are inconvenient and unnatural for HCI (human computer interface) system. Many methods for hand gesture recognition using visual analysis have been proposed for hand gesture recognition. In the recent years, there has been tremendous research on the hand sign recognition. The technology of gesture recognition is divided into two categories.

A. Vision-based

In vision-based methods computer camera is the input device for observing the information of hands or fingers. The Vision Based methods require only a camera, thus realizing a natural interaction between humans and computers without the use of any extra devices. These systems tend to complement biological vision by describing artificial vision systems that are implemented in software and/or hardware.

B. Glove-based

In glove based systems [7], data gloves are used which can archive the accurate positions of hand gestures as its positions are directly measured. The Data-Glove based methods use sensor devices for digitizing hand and finger motions into multi-parametric data. The extra sensors make it easy to collect hand configuration and movement. However, the devices are quite expensive and bring much cumbersome experience to the users some of the earlier gesture recognition systems attempted to identify gestures using glove-based devices that would measure the position and joint angles of the hand. However, these devices are very cumbersome and usually have many cables connected to a computer. This has brought forth the motivation of using non-intrusive, vision-based approaches for recognizing gestures Also the sensors used for the detection of the sign language and the gesture recognition in the system that are available in the market are quite costly. In computer recognition of spoken language, speech data is captured using a microphone connected to an ADC. Similarly a data-capturing device is also required in order to recognize sign language; in this case measuring the position.

C. Hand Gesture

Gesture recognition enables humans to communicate with the machine (HMI) and interact naturally without any mechanical devices. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly. This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant. Consider a robot navigation problem, in which a robot responds to the hand pose signs given by a human, visually observed by the robot through a camera. We are interested in an algorithm that enables the robot to identify a hand pose sign in the input image, as one of five possible commands (or counts). The identified command will then be used as a control input for the robot to perform a certain action or execute a certain task. For examples of the signs to be used in our algorithm, see Figure 1. The signs could be associated with various meanings depending on the function of the robot. For example, a "one" count could mean "Open page", a "five" count could mean "Close". Furthermore, "two", "three", and "four" counts could be interpreted as "transaction page", "cash withdrawal" and "Deposit".

III. PROPOSED TECNIQUE

A. Proposed Model

Over the last few years, number of researches is conducted on hand gesture recognition for human computer interaction using MATLAB. Several performance comparisons are conducted to improve the technique. Here, the hand gestures are taken by a camera. Image transformations are carried out on the RGB image to convert into YCBCR image. The YCBCR image transformed into binary image. This algorithm needs uniform and plane background. Edge detection algorithm is used to find the edges in the image. By making use of edge detection the orientation of hand is detected. The features like centroid, peaks detection, Euclidean distance and thumb detection are found. In this paper, they have considered five bits to represent the hand image. That is first bit represents whether the thumb is present or not. If it is present, the bit is given as 1 else 0. Remaining four bits represents the four.

a) System Level Flowchart

The gist of the complete work is as shown in Fig 1. As per any Image Processing work, the video is captured from the webcam which is connected to the system. Processes like.
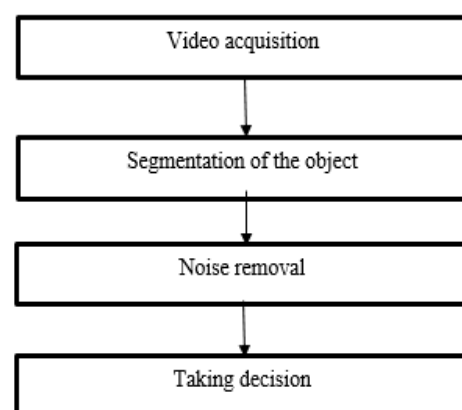
Fig 1.   Working flowchart

B. Hardware and Software Requirements

A webcam with resolution 5mp is used to capture gestures of better quality which is connected to a desktop/laptop which has operating system Windows XP and above, processor core i5 and above. Headset is used to acknowledge the person. Our project is carried out using matlab version being r2013a and editor being segmentation, noise removal and gesture identification is done here.

IV.   DESIGN AND IMPLEMENTATION

A. Setup Design

The design comprises of an enclosed box inside which a webcam would be fitted. There will be a hollow through which a person can insert his palm and flash his card. This is used to uniquely identify a person. The other end of the box will be connected to a system which consists of required algorithm which intern is connected to earphones. After flashing the card, through earphone he would be asked for his password. The blind has to enter his password through gestures. The system interprets the gestures and acknowledges accordingly through headphone.

Fig 2.   Architecture of the Proposed System

B. Algorithm of ATM accessing for blind

In this section we have explained the process flow and implementation as shown in Fig 3.
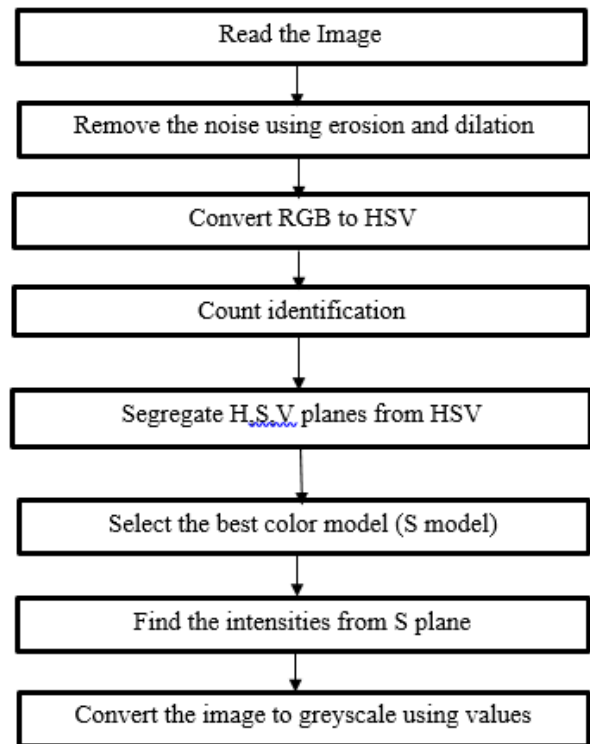

Fig 3.   Process flow and implementation

C. Conversion of RGB Image

The captured RGB image must be converted to Cyber model and obtain the image of Y plane only as background and foreground can be clearly distinguished as shown in Fig 4. The following formula can be used for conversion.

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

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

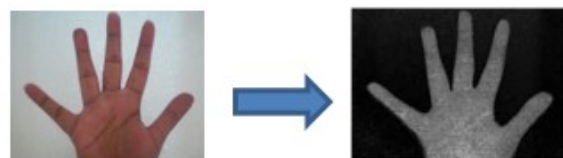$$Cr = 0.5*R - 0.418688*G - 0.081312*B$$

Fig 4.   Conversion from RGB to HSV

D. Identification of Hand

The hand gesture should be separated from background as our focus is only on hand part of the captured image. This is accomplished by separating out background and hand gesture at different gray levels as shown in Fig 5. This process is called segmentation.

Fig 5.   Image segmentation

E. Morphological Operations

Morphology is set of image processing operations that process images based on shapes. 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 hand ie exactly opposite of erosion[5].

Fig 6.   Image erosion

Fig 7.   Image dilation

F. Identification of Gestures

Counting is done to determine how many fingers are opened and which of them are open based upon this test results the actual count is obtained.

V.   RESULTS

The gestures are captured continuously as a video and are mapped to identify the numbers. When the correct 4digit sequence of numbers comprising for his recognition and next they have to show the password once the password is obtained the user can carry out further transactions else he would have 3 chances to reshow his password failing which the user is identified as a robber.

A. Advantages

- Firstly Blind people need not depend on anyone for his/her transactions. It provides higher security.

- Even a person who does not know Braille or an illiterate person can easily do his/her transactions.

- It is Safe and error-free authentication through enclosed box.

- Most importantly it's cost effective.

B. Disadvantages

- The few disadvantages are that the Gestures should be shown properly.

- Indian sign language should be known.

VI.   APPLICATIONS

- This system can be used for house security purpose.

- The proposed system provides authentication hence can be used in bank safe lockers.

- It can be used in police station to prevent high profile prisoners from escaping.

VII.   FUTURE SCOPE

Different mechanisms can be used to authenticate the user into the system before showing the password.

VIII.   CONCLUSION

The ATM processing system is developed to demonstrate the possibility of simple hand gesture based input which provides secure transactions. The efficiency of the system is based on how well the system interprets the change in hand gestures. Our proposed system is helpful not only for blind but even illiterate people can use the system and blind need not learn Braille as well. All that they need to know is the Indian sign language of numbers.

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