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ATM Accessing System for the Visually Impaired Using Image Processing

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Abstract - *The main problem faced by blind people during financial transactions especially in ATMs. In the existing ATMs, Braille is inscribed on the keypad to facilitate blind. But what if the blind people does not know Braille, how to insert a card? The friend accompanying him might get to know the password or someone else can come to know his PIN number. A stranger might try to help the blind win the trust and rob him. So, to overcome this problem a safer and secure ATM accessing system was developed using image and video processing. According to the study from the reports and documentation that reveals about 314 million people are visually challenged worldwide. This paper reviews various method used for implementing easily accessible and secure Automated Teller Machine (ATM) systems for visually challenged people. Gesture recognition system is created to provide gestures, a unique tag of interpretation after recognition and classification to form an intuitive and many convenient way of interaction.*

Key Words: ATM Machines, Hand gesture recognition, Blind, Image processing, Security.

1. INTRODUCTION

About 285 million people around the world are visually impaired and about 35 million people are blind. There should be a system to help the differently abled ones to access ATM. Automated Teller Machine referred to as a cash machine, a cash dispenser and "The hole in the wall" among other names. The ATM is a computerized telecommunications device that allows financial institutions (e.g. bank or building society) customers to directly use a secure method of communication to access their bank accounts. Being a self-service banking terminal, ATM's accepts deposits and dispenses cash. Most ATM has also let users carry out other banking transactions such as check balance, pay bill, change PIN, and request a mini-statement. ATM's are activated by inserting a bank debit card into the card reader slot. The card will contain the customer's account number and PIN (Personal Identification Number) on the cards magnetic stripe.

1.1 Ease of Use

When a customer is trying to withdraw cash for example, the ATM calls up the banks computers to cognitive challenges still may have serious accessibility issues which may limit use of such facilities. Information and communication technology (ICT) is at its cutting edge and key for everyday life, facilitating access to essential services such as those of the banking sector. ATMs have made it possible for bank transactions but the blind have not fully embraced their utilization compared to the normal users.

The following challenges and inconveniences faced by the blind people:

- Inability to locate the ATM. This is due to the fact that they can't see or even tell the corners where the systems are installed.
- Inability to see the ATM screens clearly. This also can be due to the location of the ATM. It is even difficult for them view the contents of the ATM menu on the screen.
- Waiting in the queue for long hours due to breakdowns or network problems from the central bank server, if the other users in the queue experience difficulties in using the machine because of their inability, this will mean you also waiting a little bit longer in the queue. With their inability to see, the visually impaired users will now and gain use trail methods inserting the ATM card, which they can repeat doing wrongly. This problem remain more common with blind ATM users since they are not familiar with their ATM cards and can't even see how they look other than touch and feel.
- Getting money from the dispenser. Because of the same inability that they do not see, the blind users will struggle to collect their money after dispensation.

- Because most ATM screens had been designed to be used by the normal user with no cognitive challenges, the blind may not perform some operations. Generally, the blind users will find the instructions how to perform operations quite difficult to understand. Even on mastering the interactive screen, the blind users may find different ATMs with different menu options whose arrangement is opposite to the corresponding menu keys.
- In an event that they visually impaired requires further transactions, such as check balance or print statement or even top-up a mobile phone it will even be more difficult for such a person given that there are no such straight provisions.
- The visually impaired may have to wait stranded in an event that the ATM swallows the card.
- The visually impaired will always find it difficult entering of keying in PIN numbers, since some ATMs may lack Braille systems as well as choosing the transaction option may also remain a challenge.

2. METHODOLOGY:

The user first shows the color coded card in front of web camera. Performs the color space selection. System identifies the correct user name and allow the user to show pin numbers through hand gestures. Hand gestures will be taken as inputs that will be captured by the web camera. Performs the color space selection to make sure all hands look the same with respect to intensity. Then extract the hand from background using binarization technique. Perform Morphological operations to remove unwanted pixels from the image. Count the fingers which are opened to identify the gesture shown. Then store these gestures into an array of pin which will be compared with the card shown. Then it checks with the database of accounts, if it matches then transaction begins otherwise it ends the transaction.

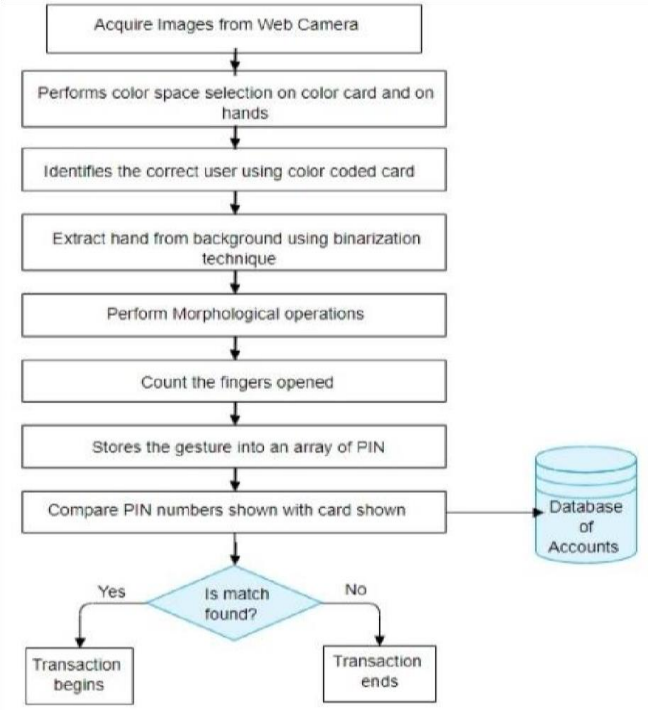

Fig 1: Methodology

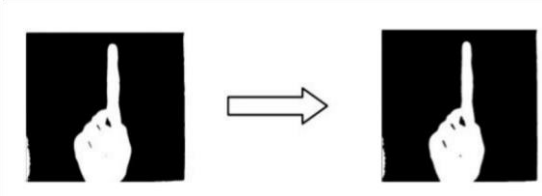

Fig 2: Erosion

Erosion: Removes unwanted pixels from the images. Erosion is one of two fundamental operations in morphological image processing from which all other morphological operations are based. It was originally defined for binary images, later being extended to grayscale images, and subsequently to complete lattices.

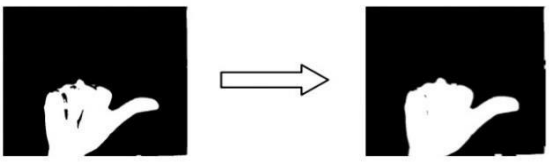

Fig 3 Dilation

Dilation: Adds pixels to the boundaries of objects in an images. It is one of the basic developed for binary images, it has been expanded first to grayscale images, and then to complete lattices. The dilation operation usually uses a structuring element for probing and expanding the shapes contained in the input image. Operations in mathematical morphology.

3. DATA FLOW DIAGRAM

Data Flow diagram is a structured analysis and designed method. It is a visual tool to depict logic models and expresses data transformations in a system. It supports decomposition to illustrate details of the data flows and function.

1. LEVEL 0

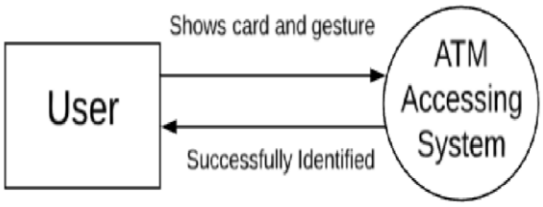

Fig-1: Level 0 DFD

In the data flow diagram level – 0 as shown, the user shows the card and hand gesture to the system than the system allow the user to successful transaction.

2. LEVEL 1

In this level the user shows the card and hand gesture to the video processor. Identified user name and pin numbers are sent to the comparator, both of these will be compared,

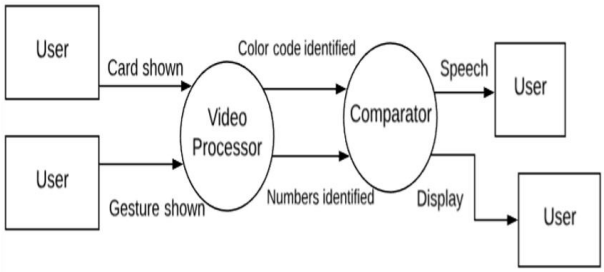

Fig 2: Level 1 DFD

if they match user will be identified and allow to do further activities.

4.LITERATURE SURVEY

The design and implementation of sign language interpreter is discussed in this paper. Interpreter is a hand glove along with some sensors and circuitry placed on the arm of the person wearing it for making signs. The main objective of this device is to detect the change in gestures and convert them into human understandable form to fill the communication gap between deaf or mute and normal people. The system can be upgraded easily for more understandable conversation by making use of other sensors like gyroscopes along with the already used accelerometer. This will help to judge the orientation of signs in a better way. [1]

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. Magic Glove aims gap the difference 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 a new and smart way to control these devices. By removing the distance between the user and traditional hardware devices, the goal of Magic Glove is to make the feel more like an extension of the body as opposed to an external machine. Magic Glove provides a tangible interface that relies on hand gestures to wirelessly control any device software. [2]

This system provides an easy to use human computer interface for differently abled people as well as for others. It allows the input character and symbol from any position without restrictions. Glove based systems and vision based systems are the two approaches generally used for gesture recognition. The main aim of this paper is to provide a way to control electronic appliances using hand gestures. The method used here, there is no need to touch switches to turn on/off an appliance. The main objective is to develop an alternative human interactive system using web camera as input. The clicked real time image is processed using pre-processing T tests, Feature extraction, Hand gesture recognition. [3]

The aim of this paper is to present a system for hand gesture recognition to provide an interface for aiding visually impaired users on the basis of detection of some useful shape base features like orientation, area, centroid, extreme, location, presence of fingers and thumb in image. The approach discussed in this paper solely depends on the shape of the hand gesture. Gesture recognition system is created to provide gestures a unique tag of interpretation after recognition and classification to form an intuitive and more convenient way of interaction. There is a great emphasis on using hand gesture as a latest input modality in various applications of computers through the use of computer vision. The algorithm includes the following steps- Image Segmentation, Orientation, Detection, Feature extraction, Classification and bits generation. [4]

This paper describes the following steps: - 1. Acquires Image/Video: - It is the first stage of the architecture where the image is taken via camera or any other media device.
2. Extract frames of gesture: - In this phase the acquired image is transformed into binary image with the help of certain methodologies so as to be processed for the next phase.
3. Compared with sorted gesture data: - Now the transformed image is compared through several samples of data set which is stored in devices so to get the desired meaning of the data and action to be performed.
4. Results: - If the processed data matches with the stored data then as a result certain defined action is performed related to that particular input in case if it fails to do so then again an input is taken and further steps are repeated.
Gesture Recognition Techniques:
Principal Component Analysis (PCA) is a technique that allows representing picture as points during a low-dimensional space.
OTSU's Algorithm: - OTSU is a process in which the conversion of a RGB image into binary or grey scale image with the help of python. [5]

5. CONCLUSION

An automated teller machine(ATM) is an electronic banking channel, which grants customers to complete basic transaction. Without the assistance of a branch representation. Thus, using our project, blind people can login to account and enquiry about balance, regional languages are provided for the blind people and they can choose while login to their bank account. Hand gestures, color space, binarization technique like Otsu's algorithm, morphological operations etc. are some of the technologies which are used to design a secure ATM for blind people.

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