

Enhanced Automated Teller Machine for Visually Disabled Persons

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Abstract

While ATM'S have added some convenience to our lives, a few risks have also been popped. The primary aim of the paper is to enhance the security aspects of the ATM so that the disabled can access ATM without anyone's help. The paper revolves around the concept of Text-to-Voice conversion and security technique. If this method is implemented even illiterate people can access the ATM safely.

Keywords

Automated Teller Machine (ATM), Serial Peripheral Interface (SPI), ARM Processor, ADA Compiler, Text-to-Voice Converter (RC 8660).

1. Introduction

An Automatic Teller Machine (ATM) [1] is a computerised telecommunication device that provides the clients of a financial institution with access to financial transaction in a public space without the need of a cashier of a financial institution.

By the introduction of ATM it is not necessary to always carry the money with them, in case they are on a long trip or vacation. The safety of money transaction is ensured while using an ATM [2]. Even when the people with good vision need safety to their money then what about the blind? If they can also access the ATM without anyone's help this ensure safety to their money.

2. Actual Method

ATM Machine works upon the Data written in Credit/Debit Card. While opening an Account in a Bank, we get a Debit Card. Backside of the Debit Card we can see some Black/Gold colored Alphanumerical Numbers.

This denotes the Bank A/C No. When we insert the Debit Card into the ATM Machine, it detects the A/C No. of the A/C Holder automatically.

Then it asks for the Password. We can have the facilities like **Withdrawing Money / Depositing Money / Viewing Last 10-20 Transactions / Recharging Mobile phones / Transferring Balance to other A/C** etc, after successful entry of Password.

3. Proposed Method

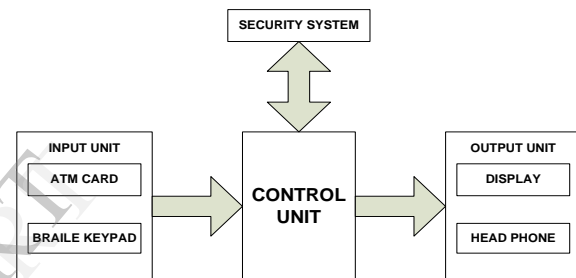


Figure 1: Proposed Method

- The block diagram shows the working model of the ATM by the proposed method.
- This method is implemented by interfacing a Braille keypad, a display, and a pre-recorder audio guidance through head phone and a control unit.
- The implementation is done with the help of SPI [3] protocol and text to speech module.
- A separate code for the visually disabled is encrypted in the ATM card such that when the control unit identifies it, the headphone is activated and the person can access his account with the help of the audio guidance.
- Display unit is Liquid Crystal Display.

4. Input System

4.1 Braille Keypad [4, 5]

A normal keypad as used by us will not assist the visually impaired in order to help them a Braille keypad is used.

What is Braille?

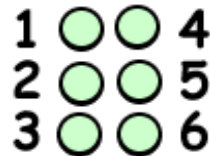


Figure 2: Braille Basic Keypad

The Braille is a tactile writing language of a raised dot, mainly used by the blind and visually impaired. It is developed for our haptic perception, a combination of sense of touch, movement and finger pressure. The dots are arranged in cells. Every cell consists of a majority of six dots in a small rectangle as shown in figure. A finger tip can feel the whole cell at once.

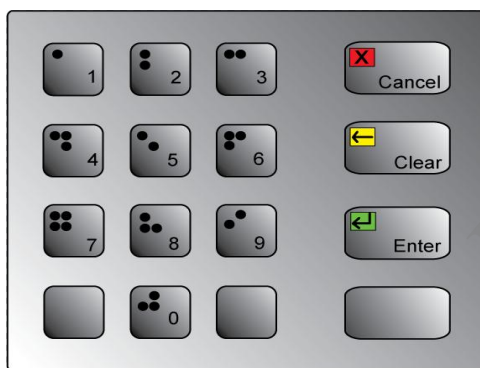


Figure 3: Braille Keypad for ATM

The Braille keypad is similar to that of the keypad normally used except for the Braille dots engraved on it has been designed such that both the normal person and the visually impaired can use a common ATM.

The numbers in the keypad are considered as interconnection of rows and columns. There are four input columns each at logic 1 (say 5v) and four grounded input rows.

5. ATM card

This ATM card is almost same as the actual ATM card. But the change is that it contains a special code encrypted for the visually disabled. Special characters like *, #, &, % are preceded before the number in the magnetic strip. For example, ATM card for normal person is 12345, for Visually Disabled it is encrypted as **12345.

6. Security System

6.1 Door Lock System

In this system the person entering the ATM has to specify the number of person entering the door. The sensor at the side of the door is reset for every digital entry. If the number of people entered is equal to the digital entry the door gets locked. After the completion of the transaction process the person has to press the button at the door side to open it. The sensor keeps on tracking the number of person leaving the door if it's equal to the digital entry then the door again gets locked.

6.2 Siren System

This is an improvement in the original existing security system in this when the pin number is entered in the reverse order then the siren placed outside the ATM is ringed so that the people surrounding the ATM can come to rescue and also a signal is send to the police.

6.3 Photograph System

The camera in ATM takes photo of each person at the time of transaction. This Photograph is stored in the Database. The stored details will be in the database for at least six months. This will be used to find any illegal transactions made in any particular ATM cards.

7. Control Unit

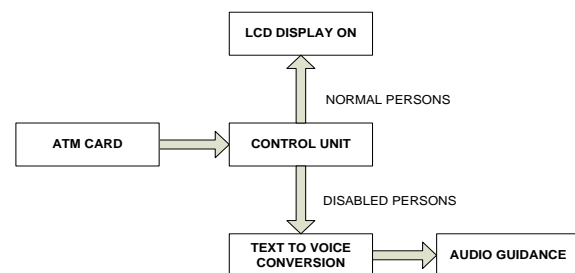


Figure 4: Overall Control Unit

The Control Unit is the ARM processor. The main advantage of using ARM processor is that, it can be used for future expansion very easily.

It can be interfaced with more than 10,000 external devices. So it is more preferable than PIC microcontroller.

ADA compiler [11, 12] is used as a compiler to burn the programs in ARM Processor

The Control unit works in two modes. When the card is inserted, the control unit checks for the special encrypted code.

Mode 1: If the encryption is not present then the display continued to be turn on and audio guidance is deactivated.

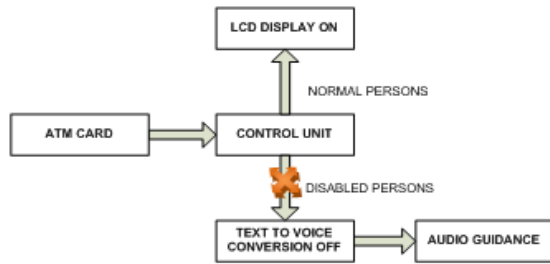


Figure 5: Mode 1 Control Unit

Mode 2: If the encryption is present then the display gets turned off and the audio guidance is activated else the transaction is done through the display as interface like the actual method.

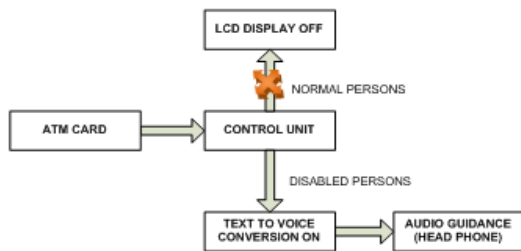


Figure 6: Mode 2 Control Unit

- ARM processor is used for this application, because of its wide advantages even though its costly
- SPI Protocol is used for communication with the peripherals.
- The compiler used for burning the program is ADA compiler.

8. Output unit

8.1 Audio Guidance

Once the control unit recognizes the blind disabled, the next step is to cut-off the display and activates the audio assistance. In order to do transaction in privacy, the audio guidance is given through a head phone, so that only that particular person can hear the audio instructions [10].

To provide assistance with audio for the transaction to be performed, it is necessary to spell out the keys pressed on the keypad, by the disabled. For this purpose, a Text-to-Voice converting module is employed. RC8660 Double Talk IC serves the need of Text-to-Voice conversion.

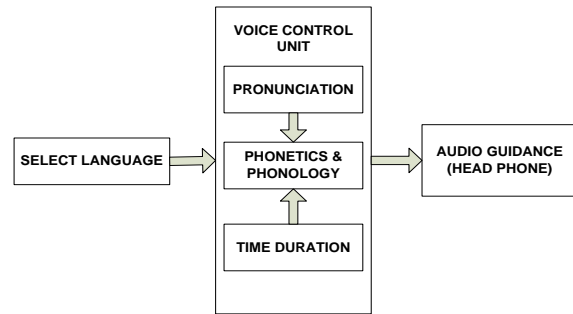


Figure 7: Voice Control Unit (Text to Voice Converter)

- Any text written to RC8660 is automatically converted to speech.
- The Text-to-Voice modes of the RC8660 utilize an English lexicon and letter-to-sound rules to convert the text it receiver into speech.

The instructions for assisting the disabled are pre-recorded in the RC8660 [13], so that, the person need just follow the instructions played through audio. By this way, the audio guides disabled in deciding the key to be pressed in the keypad, and also reads out the pressed key. The further steps to be carried out are also through audio.

For the same arrangement to be used by illiterates too, the only change is to give voice assistance with the language known to them. This can be done on a regional languages basis.

9. Conclusion

Thus the visually impaired people can access the ATM without the help of others. The account information and transaction are made private by designing the machine as above. The balance verification, balance calculations are all performed using the ARM processor. By the introduction of this ATM we can boost up the confidence of the visually impaired such that in the future they will not rely on anyone to help them and they can act on their own without any fear that their privacy is stolen.

10. Future Works

This idea can implanted in data today life application so as to make the life of the visually impaired as normal as the physically well-being people.

- The electronic polling machine with Braille encryption can help them cast a secret and independent vote etc.
- For lift control the Braille system can be used and integrated with the voice playback system so that they may not fear that something might go wrong.

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