Universal ATM Card


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Abstract – A Universal ATM is one of the most improvised ways of transaction. The ATM card would have an entry password after which the list of banks where the user has got accounts will be displayed, the user will have to select one from the list and then follow the procedure by entering the password and then specifying the amount of cash he wishes to withdraw. This card could be used at petrol bunks as well for automatic filling of petrol for the desired amount, it helps in reducing labor. Everything would become transparent without any possibility of fraud. This requires a change in the entire banking sector which would be laborious at the beginning but would lead to hassle free payment in the future. We have used LPC2148 controller and have replaced magnetic strip cards with RFID cards. We have limited our scope to petrol bunks alone, but this could indeed be extended to various other applications like the parking lot, milk cards etc.

Keywords – ATM; LPC2148; RFID; RFID card; single card

I. INTRODUCTION

ATMs have made it possible for consumers to travel in a safer manner because they no longer have to carry large amounts of cash with them. Instead, they could access money anywhere in the world with the help of the ATM. Therefore the development of more efficient technologies over time gradually allows people to use less energy to perform the same task. The currently employed ATM cards are magnetic stripe cards. A magnetic stripe card “Ref. [1]” is a type of card capable of storing data by modifying the magnetism of tiny iron-based magnetic particles on a band of magnetic material on the card. The magnetic stripe, sometimes called swipe card or magstripe, is read by swiping past a head. The card Reader is a part of the ATM machine that identifies the particular account number. To understand the account information of the user, the data from the card is passed on to the host processor. The host processor thus uses this data to get the information from the card holder’s bank. ATM Processing is similar to credit card processing, except with ATM Machines the processing center uses ATM networks instead of credit networks. To begin with, the ATM machine will be programmed with a TID (terminal ID number). This is the number that identifies the ATM machine on the system. ATM transaction processing can be done via standard telephone line or via the internet. ATM Depot can process an ATM transaction via a standard telephone line using a toll free number or if an ATM is so equipped, via an Ethernet connection using an internet service. Once the method of connection is determined, and the ATM has been setup and programmed to use an ATM processing the ATM is ready to be loaded. After Cash is loaded into the ATM a customer enters the ATM card, enters the PIN (personal identification number) and the authorization process begins. The ATM "TID" along with other identifying information lets the cardholder's bank know that the transaction is taking place on the ATM. Now the ATM can connect to the ATM networks through the processing center and then to the cardholder’s bank. If there are sufficient funds in the ATM cardholders account for the withdrawal request, the transaction will be completed. Once transactions are approved, the ATM receives the authorization and dispenses the cash requested. The ATM can also be used if someone just wants to check their account balance or transfer funds before or after withdrawing cash “Ref. [2]”.

II. RFID SYSTEM

The RFID cards are electronically programmed with unique information. There are many different types of RFID systems out in the market. They are categorized according to their frequency ranges. Some of the most commonly used RFID kits are have been listen out in Table [2]. The parts of an RFID system have been explained below.

A. Antenna or Coil

The antenna emits radio signals to activate the tag and is used to read and write data to it. They are the conduits between the tag and the transceiver, which
controls the system’s data acquisition and communication. They produce an electromagnetic field which is packed in a transceiver and a decoder to act as a reader. When an RFID tag passes through this electromagnetic zone, it detects the reader’s activation signal. The reader decodes the data encoded in the tag’s integrated circuit (silicon chip) and the data is passed to the host computer for processing.

B. RFID Tags

These tags store information. There are various options of storing data on the tag “Ref. [3]-[5]” they are

<table>
<thead>
<tr>
<th>RFID TYPES</th>
<th>FREQUENCY RANGE</th>
<th>DISTANCE OF OPERAION</th>
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<tbody>
<tr>
<td>LOW</td>
<td>30 KHz to 500 KHz</td>
<td>3m to 5m</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>900KHz to 1500MHz</td>
<td>5m to 17m</td>
</tr>
<tr>
<td>HGH</td>
<td>2.4GHz to 2.5GHz</td>
<td>5m to 17m</td>
</tr>
</tbody>
</table>

Read only, write once and read-write. Here we use read-write tags.

C. RF Transceiver

The RF transceiver is the source of the RF energy used to activate and power the passive RFID tags. The RF transceiver may be enclosed in the same cabinet as the reader (active tags) or it may be a separate piece of equipment (passive). When provided as a separate piece of equipment, the transceiver is commonly referred to as an RF module. The RF transceiver controls and modulates the radio frequencies that the antenna transmits and receives. The transceiver filters and amplifies the backscatter signal from a passive RFID tag Fig[1].

![Fig. 1: Passive RFID Operation](image)

III. COMPONENT DESCRIPTION

A. LPC2148 ARM CONTROLLER

We are using LPC2148 which is an Advanced RISC Machine. It is a 32 bit controller which follows Von Neumann architecture. It has a 3 way pipelining and a memory of 4GB. A question might arise as to why not use PIC, we preferred ARM over PIC because of its faster response i.e. it operates at a speed of 60 MHz. It also has additional peripherals, though we have restricted the scope of our project to petrol bunks alone it could be used to many other applications which will employ those peripherals. It consumes less power and is used in applications were miniaturization is of utmost importance.

B. RFID EM18 READER MODULE

This is the reader module we have used. It operates at 5V DC. Its current rating is less than 500mA. It operates at a frequency of 125KHz. When the RFID card is brought into its vicinity area it produces a BEEP sound and the LED turn ON. Its read distance in 10cm. It has a built-in antenna. This reader is connected to UART0 of LPC2148. Once the card is detected and only if the baud rate of both the reader and the controller are the same information is transmitted

C. INTERFACING RELAY WITH LPC2148

Relays are devices which allow low power circuits to switch a relatively high Current/Voltage ON/OFF. A relay circuit is typically a smaller switch or device which drives (opens/closes) an electric switch that is capable of carrying much larger current amounts. The relay operations are controlled by using LPC2148 Primer Board. Here two relays are being used. The relay consists of a coil and a switch. When the coil is energized, the switch closes, connecting the two contacts together. ULN2803 is used as a driver for port I/O lines, drivers output connected to relay modules. The connector is provided for external power supply if needed. Table [1] gives the pin assignment details.

<table>
<thead>
<tr>
<th>PIN ASSIGNMENT WITH LPC2148</th>
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<tbody>
<tr>
<td>RFID MODULES</td>
</tr>
<tr>
<td>RELAY 1</td>
</tr>
<tr>
<td>RELAY 2</td>
</tr>
</tbody>
</table>

D. LCD AND KEYPAD

Here we have used a 16x4 LCD for display purpose. Being sufficiently wide it serves the purpose of an ATM display screen. It operates at 5V DC with a
duty cycle of 1/16. The keypad that we have opted for is a 4x4 matrix keypad. The rows are connected to an output port and the columns are connected to an input port.

IV. OPERATION

A. AT ATM CENTRES:

RFID cards are contactless smart cards. Compared to magnetic strip cards that are currently being used it has greater information storage capacity which is of utmost importance to us. Thus this card can store details of numerous bank accounts. Here we use passive tags. These tags need to be brought in close vicinity to the reader. We use passive tags for improvisation in security purposes “Ref. [6]”and as well to cut down on the cost. Once the card is brought in contact the reader detects its 12 digit number and asks for the pin number for authentication and once verified the list of banks accounts from various banks handled by that card is displayed. The user then selects a bank of his choice and now decides if he wants to withdraw cash [see Fig. 2] or just wants to know his account details. Based on his choice he makes a selection and then enters the PIN number to proceed further “Ref. [7]”.

B. AT PETROL BUNKS:

This universal ATM card that we have designed can as well be used in petrol bunks “Ref. [8]” for automatic filling of petrol for the desired amount. In such cases the card behaves as a prepaid card, so after swiping the card for the desired amount it automatically activates the pump. It consists of a buzzer section which indicates the activation of the pump. For such applications we select one of the banks as default so that the amount is automatically deduced from that account alone.

V. RESULTS

The code was written in Keil and then was simulated using Proteus simulator [see Fig. 3]. It was first designed for two users and as the results were satisfactory we went about with the hardware implementation part [see Fig. 4]. The next part involves implementation using .NET thereby maintaining a database. It had a good response when put proposed in our college. As mentioned earlier we limit the scope of our project to petrol bunks alone but there is much more development required to be brought about and must as well be extended to wide range of applications.

VI. REFERENCES


Fig. 3: Simulation output containing the bank selection for two persons who use their respective universal ATM cards for cash withdrawal.

Fig. 4: Hardware implementation consisting of RFID reader, ARM7 LPC 2148 with 12x4 LCD display and 4x4 matrix keypad.