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Smart ATM Card for Multiple Bank Accounts Using Arduino Mega

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ABSTRACT: ATM is an abbreviation of Automated Teller Machine. It is introduced in the year 1959 for encouraging self-service in retail banking. This makes people to deposit, withdraw and transfer amount without the help of banking personnel's and it can be done at anytime and anywhere. At first, the ATM was made to transact for the particular bank customers but later on the ATMs are connected to interbank network, so that it enables people to deposit, withdraw and transfer amount from the ATM machines not belonging to that particular bank (i.e.) any one can access any banks ATM machine to carry out their transactions. ATMs rely on authorization of a financial transaction by the card issuer or other authorizing institution via the communication network. This is often performed through an ISO 8583messaging system. Many bank charges ATM usage fees from the customers for the transactions. At present every customer has an individual ATM card for each and every bank in which he/she maintains account. So handling the cards, their passwords play a major role here. So to overcome these difficulties we embedded more than one bank account of the user in a single ATM smart card, so that the user can swipe the card and can select the bank from which he/she are interested to carry out transaction.

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KEYWORDS : ATM

I. INTRODUCTION

An automated teller machine (ATM) is an electronic banking outlet that allows customers to complete basic transactions without the aid of a branch representative or teller. Anyone with a credit card or debit card can access cash at most ATMs. ATMs are convenient, allowing consumers to perform quick self-service transactions such as deposits, cash withdrawals, bill payments, and transfers between accounts. Fees are commonly charged for cash withdrawals by the bank where the account is located, by the operator of the ATM, or by both. Some or all of these fees can be avoided by using an ATM operated directly by the bank that holds the account. The main aim of the project is to eliminate several ATM cards and to replace it with a single card which can be interfaced with multiple banks. This reduces the cards if multiple accounts are present.

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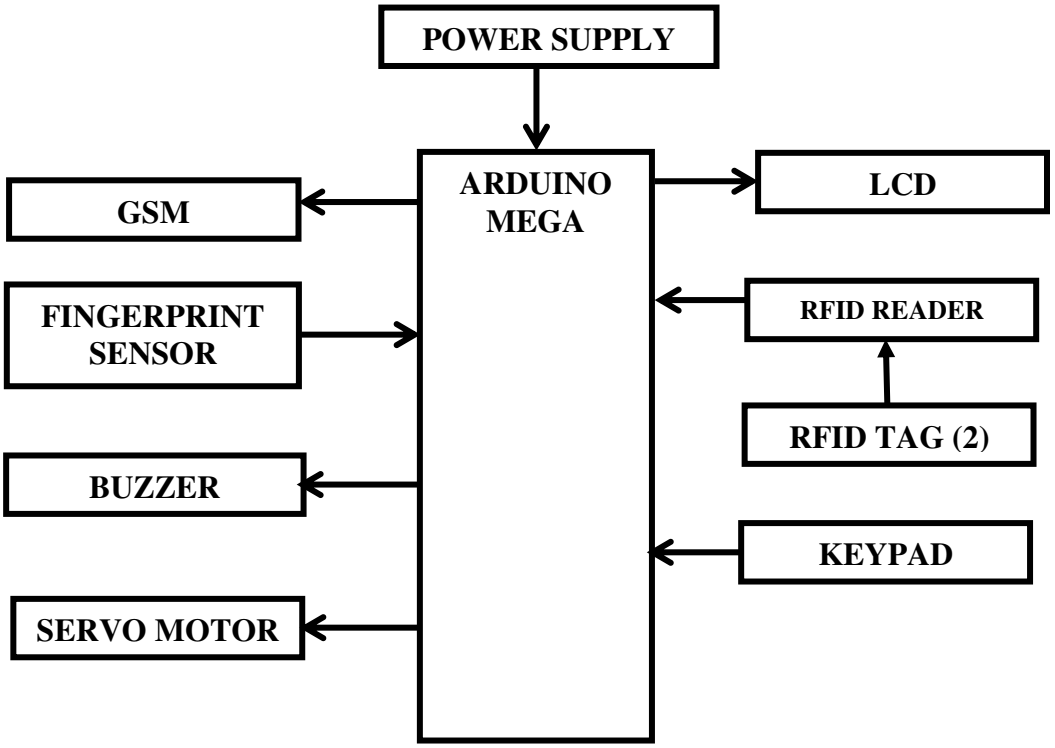
II. SYSTEM ARCHITECTURE

The proposed scheme of MAASC (Multiple Account Access using Single ATM Card) provides the individual, the comfort of accessing users multiple accounts of different banks using a single card. Also, it provides the user one level higher convenience than the existing system. The transactions are approved by biometric authentication of the user which is replaced instead of PIN. As the bank server are different so the linking of single card to multiple server won't be a tough process.

2.1 BLOCK DIAGRAM :



In the proposed method, the magnetic strip based ATM card is replaced with RFID based card which have a unique number. The Arduino MEGA microcontroller is used to process the data from the sensor. The fingerprint module is used to authenticate the user and the user needs to enter the One Time Password (OTP) which is generated by the controller and it is sent to the registered user mobile phone. The user can register the bank details and also withdraw the amount from the registered bank details. Hence this system provides more secure and multiple bank account using single ATM card.

III. HARDWARE AND SOFTWARE DESCRIPTION

3.1 HARDWARE DESCRIPTION:

3.1.1.ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has

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gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.
Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IOT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

The **Arduino Mega 2560** is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

3.1.2 POWER SUPPLY

This section describes how to generate +5V DC power supply
The power supply section is the important one. It should deliver constant output regulated power supply for successful working of the project. A 0-12V/1 mA transformer is used for this purpose. The primary of this transformer is connected in to main supply through on/off switch& fuse for protecting from overload and short circuit protection. The secondary is connected to the diodes to convert 12V AC to 12V DC voltage. And filtered by the capacitors, which is further regulated to +5v, by using IC 7805.

3.1.3 LCD

LCD screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.
A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.We come across LCD displays everywhere around us. Computers, calculators, television sets, mobile phones, digital watches use some kind of display to display the time. An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in projects. The 16×2 translates to a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

3.1.4 BUZZER:

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

3.1.5 RFID READER AND TAG

An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data.An RFID tag is a microchip combined with an antenna in a compact package; the packaging is structured to allow the RFID tag to be attached to an object to be tracked. "RFID" stands for Radio Frequency Identification. The tag's antenna picks up signals from an RFID reader or scanner and then returns the signal, usually with some additional data (like a unique serial number or other customized information).A passive tag is an RFID tag that does not contain a battery; the power is supplied by the reader. When radio waves from the reader are encountered by a passive rfid tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory.The RX and TX pins of RFID reader connected to Tx and Rx pins of 8051 Microcontroller respectively. Then the reader senses the data from the Tag and transmits the sensed data to microcontroller via serial port.The EM-18 RFID Reader module

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operating at 125kHz is an inexpensive solution for your RFID based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply. Power-up the module and connect the transmit pin of the module to recieve pin of your microcontroller. Show your card within the reading distance and the card number is thrown at the output. Optionally the module can be configured for also a weigand output.

3.1.6 FINGERPRINT SENSOR

R305 Fingerprint Module consists of optical fingerprint sensor, high-speed DSP processor, high-performance fingerprint alignment algorithm, high-capacity FLASH chips and other hardware and software composition, stable performance, simple structure, with fingerprint entry, image processing, fingerprint matching, search and template storage and other functions.

3.1.7 GSM

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. The working of GSM modem is based on commands, the commands always start with AT (which means ATtention) and finish with a <CR> character. For example, the dialing command is ATD<number>; ATD3314629080; here the dialing command ends with semicolon. The AT commands are given to the GSM modem with the help of PC or controller. The GSM modem is serially interfaced with the controller with the help of MAX 232. Here max 232 acts as driver which converts TTL levels to the RS 232 levels. For serial interface GSM modem requires the signal based on RS 232 levels. The T1_OUT and R1_IN pin of MAX 232 is connected to the TX and RX pin of GSM modem.

3.1.8. KEYPAD

At the lowest level, keyboards are organized in a matrix of rows and columns. The CPU accesses both rows and column through ports; therefore, with two 8-bit ports, an 8*8 matrix of keys can be connected to a microprocessor. When a key pressed, a row and column make a connect otherwise, there is no connection between row and column. In IBM PC keyboards, a single microcontroller (consisting of microprocessor, RAM and EPROM, and several ports all on a single chip) takes care of software and hardware interfacing of keyboard. In such systems it is the function of programs stored in the EPROM of microcontroller to scan the keys continuously, identify which one has been activated, and present it to the motherboard.

3.1.9. SERVO MOTOR

A **servo motor** is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a **servo mechanism**. If motor is powered by a DC power supply then it is called DC servo motor, and if it is AC-powered motor then it is called AC servo motor. For this tutorial, we will be discussing only about the **DC servo motor working**.

3.2 SOFTWARE REQUIREMENTS:

3.2.1. EMBEDDED C

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software.Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C. Embedded System is a system composed of hardware, application software and real time operating system. It can be small independent system or large combinational system. Our Embedded System tutorial includes all topics of Embedded System such as characteristics, designing, processors, microcontrollers, tools, addressing modes, assembly language, interrupts, embedded c programming, led blinking, serial communication, lcd programming, keyboard programming, project implementation etc.

System is a way of working, organizing or performing one or many tasks according to a fixed set of rules, program or plan.It is an arrangement in which all the unit combined to perform a work together by following certain set of rules in real time computation. It can also be defined as a way of working, organizing or doing one or many tasks according to a fixed plan. An Embedded System is a system that has software embedded into computer-hardware, which makes a system dedicated for a variety of application or specific part of an application or product or part of a larger system. An

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embedded system can be a small independent system or a large combinational system. It is a microcontroller-based control system used to perform a specific task of operation

3.2.2. ARDUINO SOFTWARE IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension **.ino**. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

The Arduino Software (IDE) uses the concept of a sketchbook: a standard place to store your programs (or sketches). The sketches in your sketchbook can be opened from the **File > Sketchbook** menu or from the **Open** button on the toolbar. The first time you run the Arduino software, it will automatically create a directory for your sketchbook. You can view or change the location of the sketchbook location from with the **Preferences** dialog.

OUTPUT:

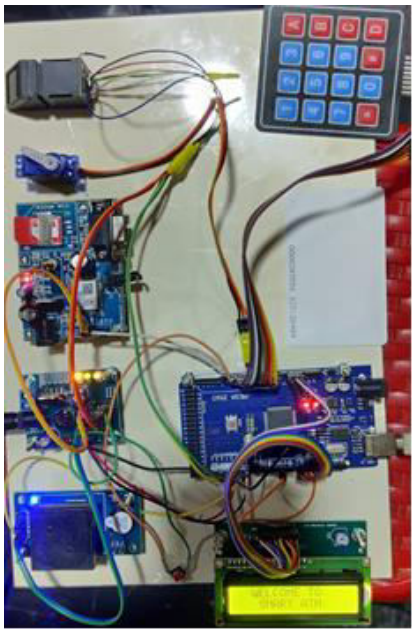

Figure1: Welcome screen

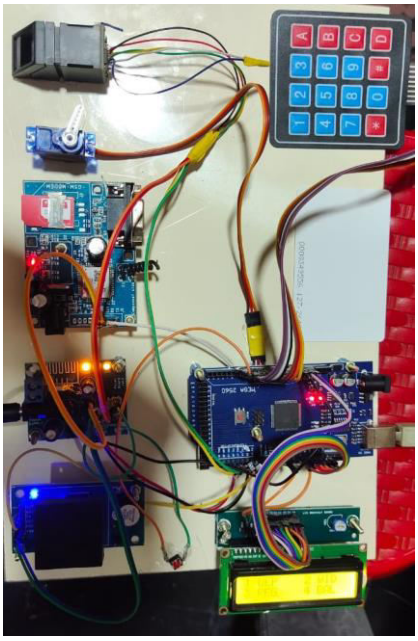

Figure2: Navigation page

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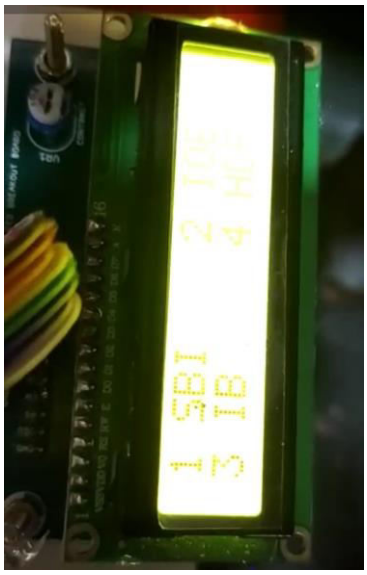

Figure3: Bank selection page

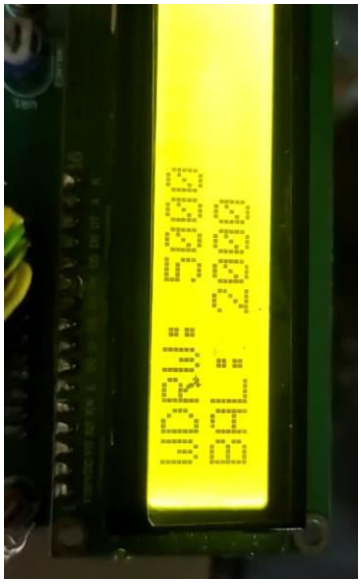

Figure4: Amount withdrawn and balance screen

IV.CONCLUSIONS

Several cards with different PINS to them is a difficult process to remember it and sometimes the user can mistyped the pin with can lead to blockage of ATM card. So this system is proposed to eliminate such issues and this system can make the user convenient with one card. And instead of PIN the user use their biometric which make it more secure. The transactions are same as the logic of a normal ATM. There will be an alert system so the user can identify their misuse of cards. This reduces the card blockage and other issues like mismatch of PINs.

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