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Embedded System Based Cashless Campus System using Biometric Authentication

M.Ashok [1*], S.Kumar [2]

[1] Research Scholar, Dept. of Electronics, Sri Vasavi College, Erode, Tamilnadu.
[2] Research Scholar, R & D Centre, Bharathiar University, Coimbatore, Tamilnadu.

ABSTRACT- The project entitled "Embedded System Based Cashless Campus System using Biometric Authentication". The main objective of this system is to make all the transaction in a campus without liquid cash. Here we are trying to implement a cashless campus using biometric authentication that is finger print matching technology which allows transparent transaction. That means students do not need to keep cash to purchase anything inside the campus, they just need to press the finger against the module. The system will have the required database of the students stored in the memory of Arduino micro-controller. If the user is an authorized person, he can perform the transactions. After the transaction, sufficient amount will be deducted from their account and invoice is received to the user in the form of message through GSM module and thus it is paper less transaction. The whole system will be displayed on a TFT LCD Display.

Keywords: Embedded System, Arduino, GSM Module, Biometric Sensors

INTRODUCTION

The Cashless Campus is a standalone application in which users can easily do their daily campus transactions in an accurate and precise manner. Educational zone is fast growing today. The daily transactions in a campus are becoming more and more complex. The management has the head ache of making the system properly. So the concept of Cashless Campus is a good solution. By virtue of today, socioeconomic environment and continuing advancements in information technologies, companies are offering more computer related services and becoming more sophisticated

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computers having high capacity of storage and fast method of retrieving real time information have become boon for corporate. Nowadays, the transactions inside a campus are carried out using liquid cash. Every campus is faced with the problem of theft, and due to a campus's inherent nature of accessibility it is difficult to restrict this access This project cashless campus system are designed and implemented to tackle the drawbacks of the existing systems. The proposed system is interactive, highly user friendly. Here we are going to implement a 'Cashless Campus' using biometric authentication technology. Each user will have their own account which can be accessed by the users fingerprint. The access is granted if the fingerprint matches from the database present. The purchase amount will be debited from their account. The system is used to make all the transactions inside the campus without liquid cash and the invoice is received on the user's mobile phone in the form of a message thus making it a paperless transactions and environment friendly. The finger print module uses the thumb print of humans for verification and gain access. It comes under the category of automatic identification technology. It is one of the most secure and widely used identification technologies. The other major advantage of finger print module is its quick response of verification than other system like barcode and RFID tags .This technology is mainly used to reduce time and labor needed for manual data entry and enhance data accuracy. Some auto-id technologies like bar code system requires a person to manually scan a label or tag to capture data. The finger print module provides much more benefits than scan a bar code. The finger print of user can be easily be stored in the form of a template in the database. It will provide details about students and the faculties that will include their transaction details. The manual system involves a lot of time and manpower but our system has got all the work computerized so that accuracy and transparency is main tained. The connection of fingerprint module and our processor atmega 2560 through Arduino board is very simple we provide the power to fingerprint through Arduino board and connect transreceiver of Arduino with fingerprint module and through the software code we created a database of fingerprint

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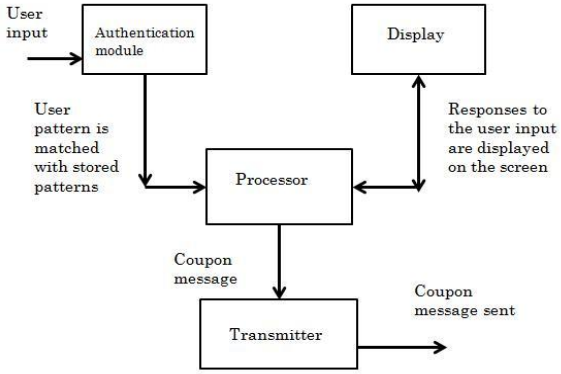
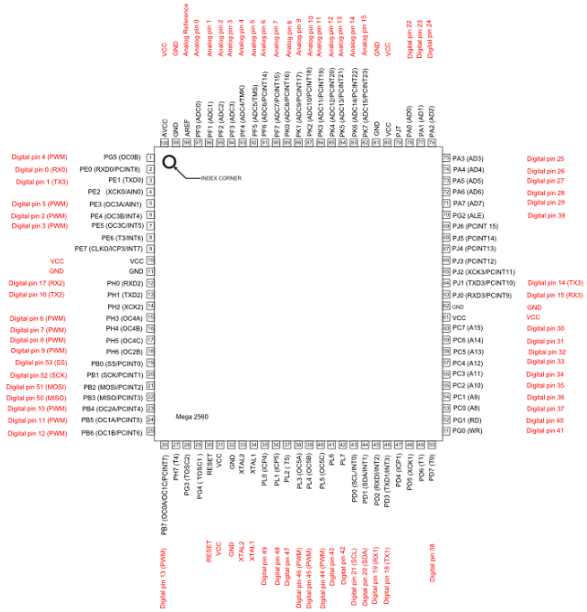
directly in memory of Arduino which has the internal memory of 256kb.

MATERIAL AND METHODOLOGY





HARDWARE IMPLEMENTATION

Microcontroller:

To control so many devices using a vast array of communication methods, we needed a micro controller with a lot of pins, and ample RAM and clock speed for powering the resource intensive components, particularly the LCD. The micro controller thus selected was the Atmega256 housed in an Arduino Mega 2560 for easy programming.

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 a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila The Arduino can also provide power to many interfacing devices as we are here using

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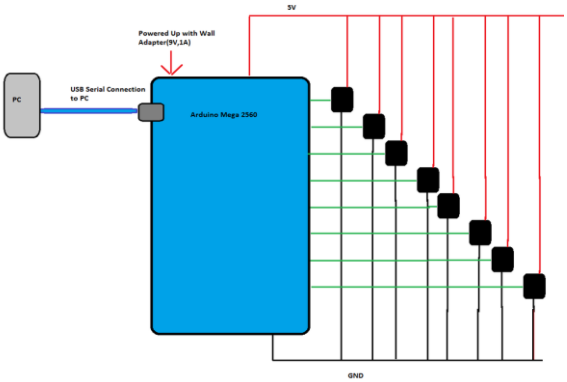
multiple components that are interfaced with Arduino board thus it is useful interfacing multiple devices which is the primary requirement of our project. Hence the Arduino mega 2560 has been preferred over other Arduino boards and systems.



Finger print module:

(i) Authentication:

To make the system more secure and to avoid the use any other card or tags we have biometric authentication. In the biometric authentication we have finger print module as it easy for user to authenticate and it is easily available. Finger print module are quite easy to interface and is quite cheap. The user would only need to press his finger against the scanner and we could identify him. The device uses serial communication via UART to communicate with the micro-controller.

(ii) Enrollment:

The finger print module takes the fingerprint image and stores it into image buffer converting this image from the image buffer into an array of 256 bytes each that is stored onto a character buffer. Using two such arrays and making a template file of 512 bytes. Storing this template file onto the flash of scanner itself and assigning an ID to each of the template stored.

(iii) Matching:

Taking an image of the finger pressed against the scanner and storing it on the image buffer. Converting the image from the buffer into an array and matching it against the templates stored onto the device. On finding a match, the device returns the ID of the fingerprint template that the finger

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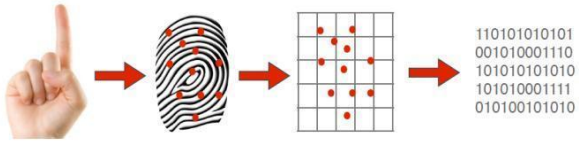
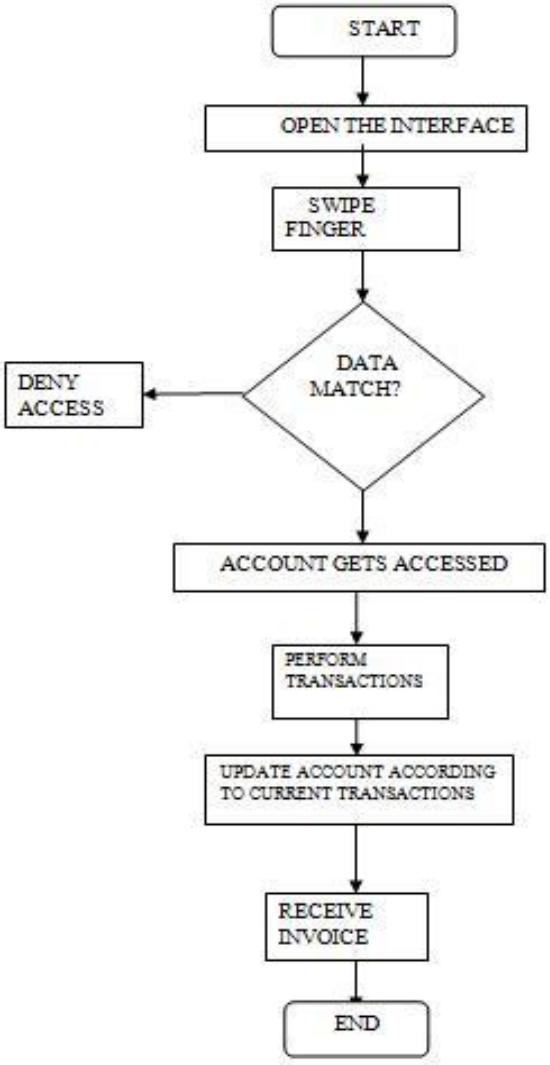
matches against. Otherwise it returns an acknowledgment package indicating that no match was found.



TFT LCD Display:

In order to make the user interface as intuitive as possible, decided to go with one of the most popular technology available in this area that is the LCD touch screen. The touch screen here used is resistive touch screen. The device uses a Color LCD to display information to the user and a touch screen on top of it for taking in the input from the user, for further processing. The touch and display device used here is an Arduino. It is 3.2inches (diagonally) long and has a resolution of 320x240.



GSM Module:

According to the input received from user through touch screen the invoice of purchased item is

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received to the user in the form of message to the users cell phone the input through the screen and gsm are interfaced through the software. Thus we don't need manually to send the message as this. Processors automatically will send the message after the purchase through touch screen is over.

To send the message to user we require a gsm module. The gsm module is interfaced with Arduino mega 2560 processor. The gsm module is connected to processor through connecting wires. The transreceivers of gsm connected to the processors. The touch screen and gsm are interfaced through the software code. The gsm will send the message to the user with the help of AT commands. The sim 900 gsm module will work same as cell phone to send the message to user.

SOFTWARE IMPLEMENTATION:

Code for microcontroller mega 2560 is developed on programmers notepad which is an open source text editor targeted at user who work with source code. This environment is written in embedded c language. The processor at mega 2560 is brain of entire system. It is used to network all components and centrally process all the information. We use the Arduino programming to create a database and store the fingerprint image inside the internal memory of Arduino. The user interface through which the user gives information about the item which he want to choose and purchase the item accordingly is interfaced using along with fingerprint module which allows it open the database of particular user. The invoice is received through software interfacing between input and invoice which is to be received to the user.

CONCLUSION

This application we can be developed implemented in college or institution mainly for transactions in campus where each and every student would have a database in the system. This will reduce certainly reduce time and labor which is involved in the manual process. This project allows easier management of transactions inside the campus. Many system like securities; access control system and attendance system have been automated by the use finger print scanning system. The number of users can be increased by the use of external memory thus accommodating more number of

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users. This increases the feasibility for users thus making it available to more sections of the user. The use biometric authentication will certainly make it a very much more a secured project and misuse money or credit cannot be used by other person. As every person has a unique thumb print and thus there is hardly any chance of misusing other person account for purchase which makes it one of safest authentication in biometric authentication. The use of cashless campus helps the students and faculty to buy any item inside the campus without use of physical money and hence they don't need to carry any physical money with themselves . it also allows the proper management of resources of inside the campus and college or institution will have a proper idea about all transactions thus reducing chances of any sort of cheating.

FUTURE SCOPE

The use of cashless campus system can not only be useful for buying the products it can also be extended to other application like attendance system and access control at various places inside the campus by changing the user interface. .As the use of mobiles phones has increased especially among the students we can develop an application through which the person can buy any products using his or her phone. Thus the authentication process becomes much easy. This system can be further used for payment of fines and keep a record of books the student has borrowed from the library. Hence by use of single account multiple information about the student can be stored which makes it easy for college administration to keep are cord on each and every student. On a broader perspective this system can be made to use in various transport system in our country making few changes in current system.

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