Designing A Wristband That Enables Money Transfer Using Bluetooth

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Abstract: The world is marching towards a globally digitalized economy. Cashless technology has made a humongous contribution to transforming from physical payments to digital payments. Without cash, transactions happen electronically which reduces the risks associated while handling money physically. In this contemporary world, mobiles have become an invaluable asset and primary tool of resort for payments. While making payments using Unified Payment Interfaces(UPI's), several problems are encountered such as application under maintenance or server not responding at the moment. In this paper, we have described the design of a wristband that enables money transfer through wireless proximity technology such as Bluetooth. This enables a direct connection establishment with the merchant without requiring the internet.

Keywords: Bluetooth, Wireless Proximity Technology, Unified Payment Interfaces, Digital Payments, Wristband

1.INTRODUCTION

In recent years, development in the field of mobile technology has been growing progressively. E-cash, credit/debit, and mobile payments have become feasible alternatives to physical cash. Mobile payment systems can augment convenience, and enhance payment security. This concept of payments is far superior compared to other modes of payment using this method one can easily pay for goods and services. Wireless Proximity technology provides a new way to implement the mobile payment system. The potential for short-range wireless proximity technology such as Bluetooth is extensive and secure. Here, we are presenting a wristband that facilitates money transfer using Bluetooth. Using Bluetooth, the transaction happens directly from a client to a client without the intervention of a third-party service. The conventional system using the internet involves a transaction between client-server-client but using this Bluetooth technology the architecture reduces to the client-client model thereby eliminating server issues. This type of payment system is used in a dynamic environment to make transactions successful between customer and vendor. To ensure secure transactions, a fingerprint sensor is employed to authenticate the user and verify the identity while making a payment. This is an effective payment mode for point-to-point payments, vendor machines, exhibitions, market places where transactions need to happen within a shorter range.

2.LITERATURE REVIEW

1. Paytooth - A Cashless Mobile Payment System based on Bluetooth Rushabh Patel, Akhil Kunche, Nihar Mishra, Zakwan Bhaiyat, Prof. Rahul Joshi, Symbiosis Institute of Technology (SIT) Affiliated to Symbiosis International University (SIU) Pune. This paper explains the concept of Mobile Payment using bluetooth. Wireless and proximity technology provides a new way for implementation and working of mobile payment systems. In this aspect, the capacity and power of using short-range wireless technologies such as Bluetooth is determined and their efficacy is investigated. Bluetooth is a wireless and widely available protocol for transmitting and receiving data over short distances between two mobile phones. In the proposed system Bluetooth is used as a connection medium between two devices.

2. A MOBILE LOCAL PAYMENT SYSTEM BLUETOOTH BASED -Gianluigi Me, Alex Schuster Dipartimento di Informatica, Sistema e Produzione, University di "Tor Vergata", Roma, 00183, Italy Fakultat Informatic, Technische Universität München, Germany. This paper explains about a secure macro payment system prototype, developed with open source and free tools, hosted by a PDA that obtains a virtual cheque from a bank offline or via GPRS and then pays a good/service by transmitting the cheque to a vendor via Bluetooth, with (user option) various levels of interaction in the shop. With appropriate cost analysis on convenience, this prototype can be easily downsized to micropayments systems.

3.EXISTING SYSTEM

In the existing mobile payment system, the model employed is a client-server-client based architecture. It is normally composed of Customer(the one who wants to buy), Issuer(Bank or Financial supporter) and Merchant(the one who wants to sell). In this model the client makes a request to the payment gateway to deduct money from the Customer's bank account. The Merchant makes a money claim request to transfer money to his bank account. This model involves a third party intervention and without a stable internet the transaction fails.

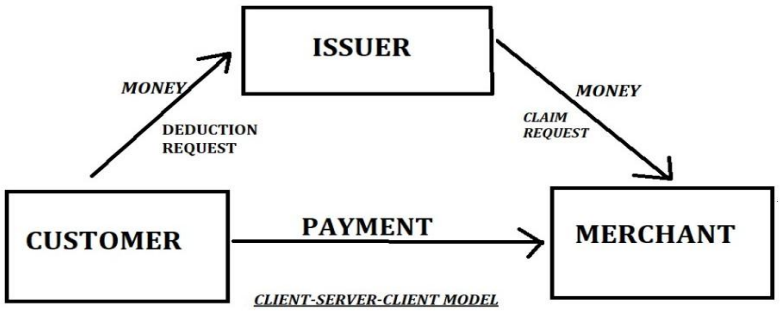

Figure-1 Client-server-client-model

4.PROPOSED MODEL

In the proposed model, the architecture is reduced to client-to-client where the transactions happen directly from the customer to vendor. Here, a prototype of a wristband is designed and propounded for transferring money to the merchant through Bluetooth. The merchant should have a Bluetooth enabled device compatible application in order to receive money. The client initiates a connection request to the merchant i.e. pairing is done. After pairing successfully, the customer can enter the amount using the wristband and then send the amount to the merchant's account in the application. This model eliminates the third party intervention and there is no need of having a stable internet connection. This also serves as an effective model in remote areas or places where internet stability poses a major challenge when the transaction should happen within a shorter range.

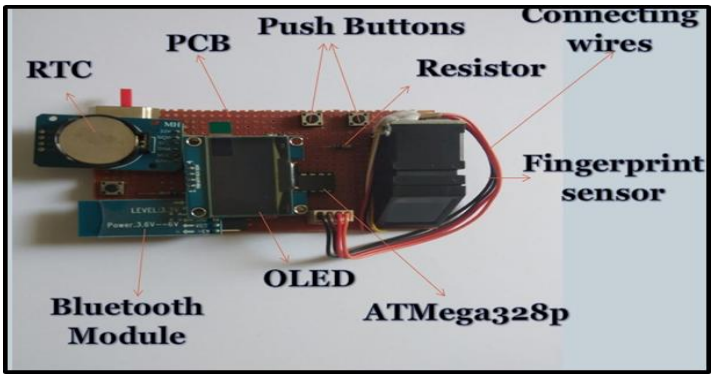

Figure-2 Model Diagram

5.BLOCK DIAGRAM

The wristband has the following hardware components ATMega328P microcontroller, Fingerprint module, Bluetooth HC-05 module, Real Time Clock, push buttons. The Fingerprint module allows the user to authenticate and verify their identity while transferring the money. All the components are soldered on a printed circuit board and connected to a battery which is rechargeable. The Real Time Clock module is used to display the date and time in real time and it operates even when the watch is powered off. The Bluetooth HC-05 module is used to connect by pairing up with the device.

The Bluetooth module can be controlled through Bluetooth HC-05 terminal application. The push buttons are used to select the options and navigate through the list of users.

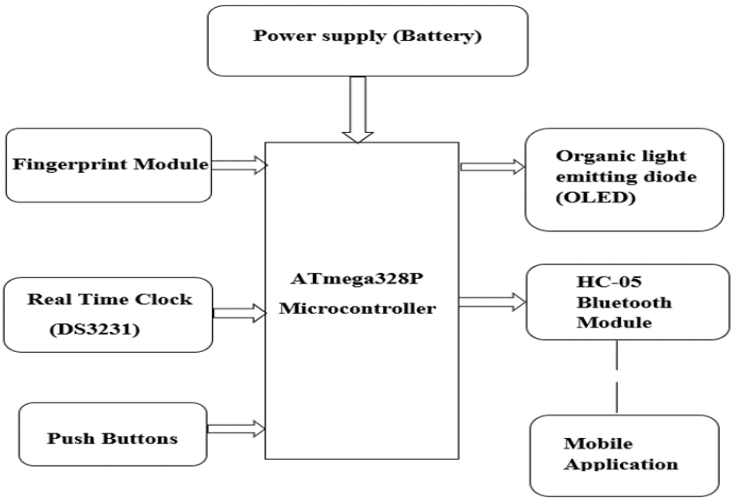

Figure-3 Block diagram of wristband

6.METHODOLOGY

The design comprises two major parts- the hardware and the software part. The hardware is designed according to the schematic diagram and the software module is developed using Arduino IDE, to display messages on the OLED.The fingerprint module,HC-05 Bluetooth module and the OLED works together in tandem with the ATmega328P microcontroller. On turning the regulated power supply, the circuit gets a 5 volt connection. The wristband is powered "ON" and it indicates a message saying the same.The real time clock displays the date and time on the OLED and it keeps track of time even when the power if turned off.The fingerprint module triggers a response request to the OLED to scan the fingerprint for verifying the identity of the user. The user's fingerprint is stored and compared against the fingerprint used while making a transaction. This ensures a completely secure transaction. The messages are serially transmitted to the OLED through the microcontroller connection. The amount to be transferred to the vendor is displayed on the OLED. The Bluetooth module pairs up with the application and wirelessly transmits data. It detects the users within the range and displays them on the OLED.The push buttons are used to enter the amount and navigate between the options. The value of the pull-up resistor of the push button controls the voltage on the input pin i.e. when the button is pressed, the input button is pulled high while entering the amount and selecting the users. The customer selects from the list of users to which money is to be transferred. Whenever there is no sufficient money to transfer the customer can add money to the wristband through the mobile application. The balance amount can be viewed after adding money.

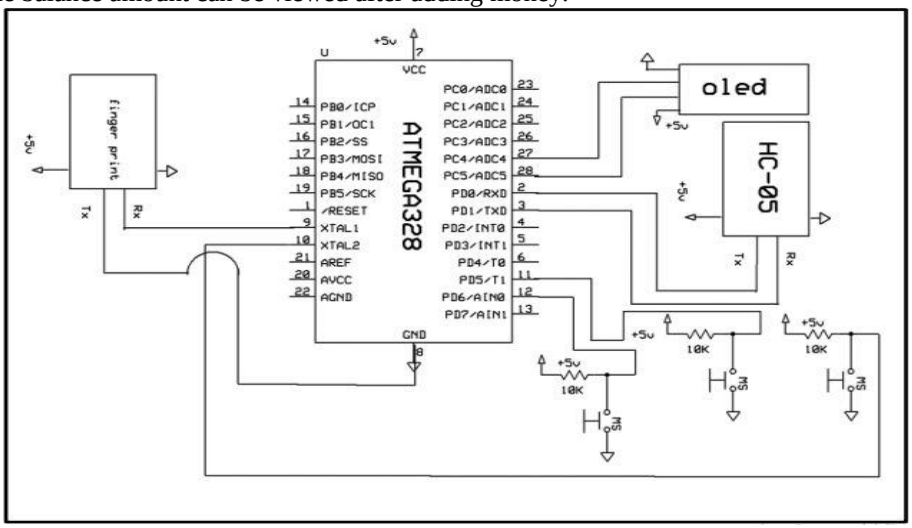

Figure-4 Design of wristband

The ATMEGA328P microcontroller has 28 pins. Receiver pin i.e, 2nd pin of the controller is connected to the transmitter pin of the bluetooth module. Transmitter pin i.e, 3rd pin of controller is connected to receiver pin of bluetooth module. GND pins of the controller and bluetooth module are connected. The 9th and 10th pins of the controller are given to the crystal oscillator. The 22nd pin of the controller, that is the ground pin of the controller, is given to the ground pin of the real time clock. PC1 and PC0 pins of the controller are given to Vcc and EDA pins of the real time clock. Vcc and EDA pins of the real time clock are given to a push button through a 1KΩ resistor. SCL and SDA pins of the microcontroller i.e two – way serial bus data input / output are given to SCL and SDA pins of the OLED through a 16KΩ and 10KΩ resistor. The Vcc pin of the OLED is given to 5V. The GND pin of the OLED is given to the GND pin of the controller. The Vcc pin of the Bluetooth module is given to supply 5V. Transmitter pin of the fingerprint sensor module is given to the receiver pin of the controller. Receiver pin of the fingerprint sensor module is given to the transmitter pin of the controller. GND pin of sensor is given to GND of controller

7.RESULTS

1.After powering the watch, a welcome message is displayed on the screen.

2. The fingerprint module then triggers a request to enroll the fingerprint for initial registration. The fingerprint is stored in the database to compare with the fingerprint at the time of transaction as shown in Figure-5.

3.On successful registration, the time is displayed or else if the finger is incorrectly placed, the fingerprint scanner keeps blinking as in Figure-6.

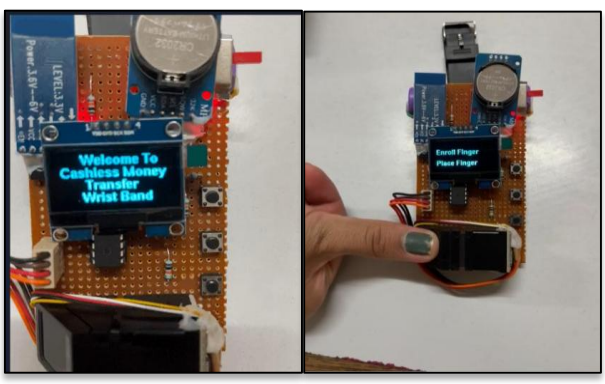

Figure-5 user is asked to enroll fingerprint for registration

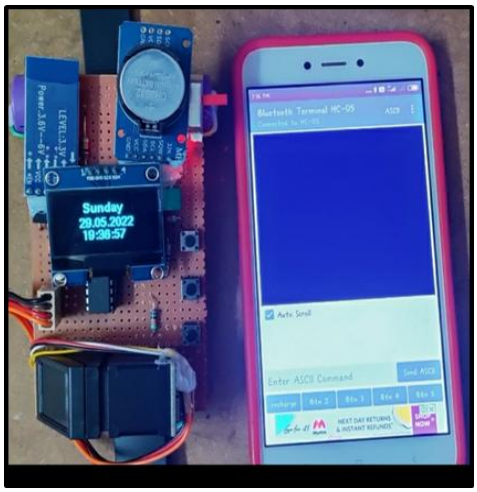

Figure-6 Time is displayed on oled

4.The user should select the transaction mode in order to send the money. After selecting the transaction mode the user can enter the amount to be sent.

5.In order to send the money, a list of users to whom money can be sent is displayed on the OLED. The user can navigate to one of the users to send the amount as shown in Figure-7.

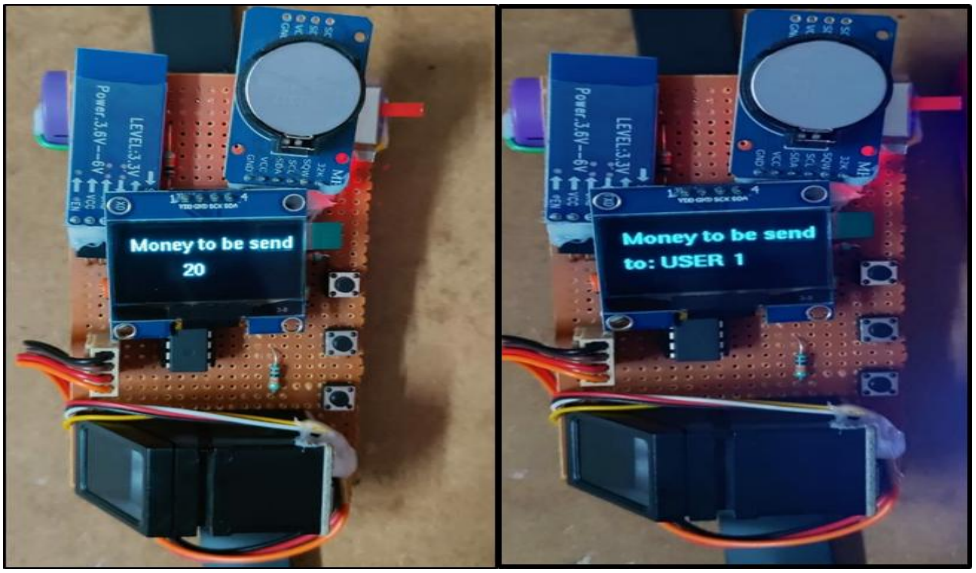

Figure-7 user need to select money and whom the money to be transferred

6.To make the transaction, the user has to verify their identity by placing the same fingerprint that was initially registered for authentication. If the fingerprint matches then the transaction is facilitated, else it gets terminated after waiting for a while.

7.The transaction happens and the remaining amount is displayed onto the screen as displayed in Figure-8.

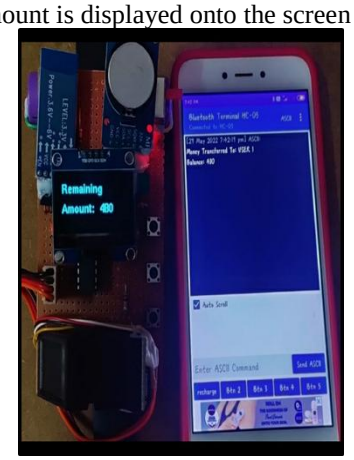

Figure- 8 Money transferred and balance amount is displayed on oled

Adding money to the wristband

1.At any point if there is a shortage of money or if the user simply wants to add money to the wristband, the user can do it with the Bluetooth Terminal HC-05 application.

2.The user can add the money using the "recharge" button that we have defined

3.The user should enter the amount to recharge and then the total balance is updated and displayed on the screen as shown in Figure-9.

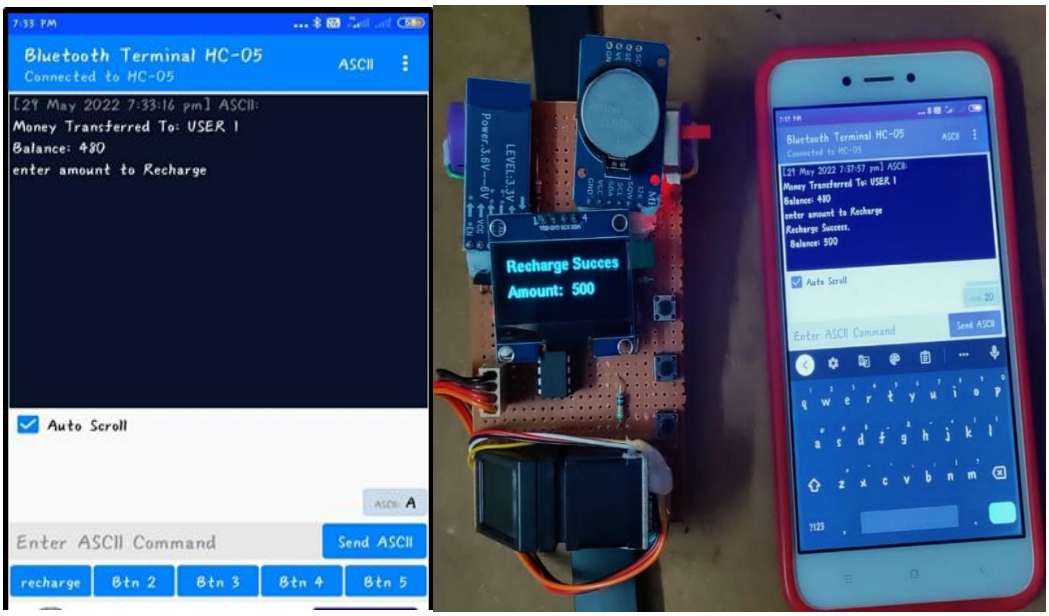

Figure-9 Successfully recharged the wristband and balance is displayed on oled and mobile application

8.CONCLUSION

Government sectors and banking enterprises experience a huge overhead due a lot of cash flowing around. With the flourishing of electronic commerce and widespread use of mobile devices, a new type of service is emerging that extends e-business using wireless technology by e-commerce services using mobile systems. There are eclectic options available to perform money payments due to the availability of network technologies. Here, we have designed a wristband that transfers money via Bluetooth. Though it is used to transfer money within a shorter range, it is a very effective tool in our day-to-day lives. The approach eliminates the client-server-client model. Cardinal problem while using the internet is that, when the servers are down, payment requests cannot be initiated.This poses a problem which eventually increases waiting time. In this way, the wristband can meet our day-to-day errands making our lives easy going. When implemented full-fledgedly, the wristband serves many applications in different aspects and domains. Therefore, the wristband enables faster transaction time, and provides secure money handling.

9.REFERENCES

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