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Handheld Cash Deposit and Withdrawal Mobile Banking Device

[1]B. Darshini and [2]E. Esakki Vigneswaran

[1]PG scholar,Department of Embedded system technologies,
Sri Ramakrishna Engineering College, Coimbatore, India
[2]Assistant professor, Department of Embedded system technologies,
Sri Ramakrishna Engineering College, Coimbatore, India

Abstract: Now-a-days the need for banking system is increased in the rural areas. Facilities in the rural areas are not up to the level. So installation of an ATM in those areas is not easy. In order to avoid the inconvenience of the customers a handheld device for cash deposit and withdrawal has been designed. This device is made using ARM CORTEX M3. The details such as account number, name, fingerprint and pin number are stored during configuration. A touch screen is used for giving the customer details. The handheld device is tracked using GPS since this device is allowed to be used in that particular region for security reasons. Fingerprint of every customer is verified for every transaction using fingerprint scanner. After the transaction, the remaining balance in the account is sent as an SMS to the server using GSM. The receipt is given through the mini thermal printer. If there is no facility of GSM, the transaction details can be stored and can be retrieved later by means of USB. A panic button is placed that can be used in case of emergency situations which gives a sound alert and an alert SMS to the server.

Key words: GPS · GSM · Thermal printer · Fingerprint scanner · Arm cortex M3

INTRODUCTION

Every people in rural areas have started using the banking system [1]. Simple tasks like going to the ATM and withdrawing money make people in villages will miss their working hours and may lose a significant part of their daily wages as well. Hence there is a need to design a system that helps those rural area people who can't leave their business premises for banking transactions [2]. The main idea of this mobile banking system is to provide door step banking in the rural areas. The bank should employ special persons who are licensed as the Business Correspondents (BC) to carry a micro bank machine with them. Each BC will be allocated to a particular area and they are provided a hand held banking device.

The customer who needs this micro bank service must call the customer care of the corresponding bank and have to inform whether he wants to withdraw/deposit money [3]. The bank server will choose the appropriate BC. The server will send OTP to the customer. Once the BC reaches the customer he will cross check with it and after the verification, the transaction will be started. Initially the device will be unlocked by the banker. This device can run in both offline and online mode. In online mode, the details about the customer will be directly retrieved from the server automatically. In the offline mode the customer have to give the details such as customer name, account number. The time limit will be enabled [4]. The transaction should be completed within this limit. The location will be tracked using the GPS. Once this device moves beyond a limit, the alert will be ON.Then the fingerprint of the customer is verified. After this, the money transaction takes place. The balance amount will be updated to the customer by means of SMS and also a receipt through the thermal printer.

The block diagram of the handheld mobile banking device is shown in the Fig 1.1. The LPC1764 is interfaced with a touch screen controller to which the touch screen is connected. A micro SD card is present for storing the transaction details of the customers. The GSM is interfaced to the microcontroller for the sms service to the server. The fingerprint scanner and GPS areinterfaced to the microcontroller separately. A buzzer is also interfaced so that if the device is used beyond the particular area,

Corresponding Author: B. Darshini, PG Scholar, Department of Embedded System Technologies,
Sri Ramakrishna Engineering College, Coimbatore, India.

Block Diagram

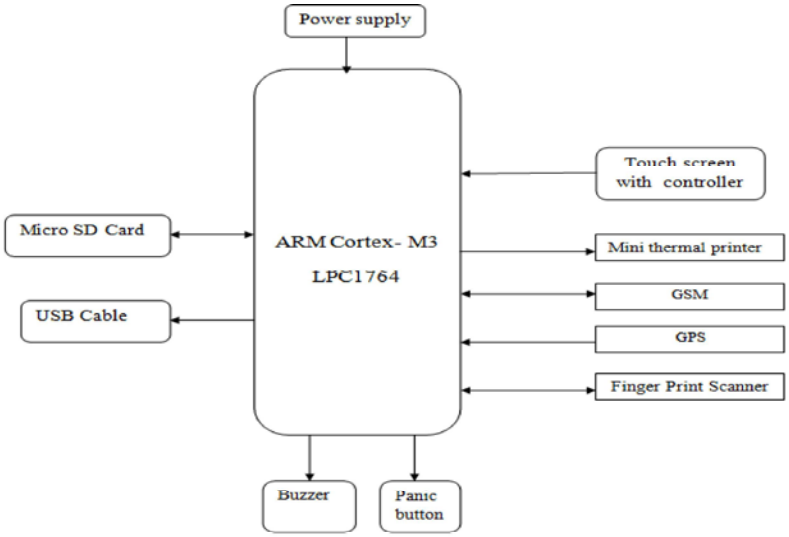

Fig. 1.1: Block diagram handheld mobile banking device

buzzer will be automatically ON. An usb cable is connected for retrieving the information about the transaction once the device is used in offline. A power supply of 3.3v to 5v is given to the LPC1764 microcontroller. A mini thermal printer is interfaced to one of the uart ports of the microcontroller. In the SD card the transaction details are stored that can be retrieved later. A panic button is placed such that if any emergency situation or theft occurs means it will indicate to the server and an alert will be ON.

Hardware Implementation: The ARM Cortex-M3 is a general purpose, 32-bit microprocessor, which offers high performance and very low power consumption. The ARM Cortex-M3 offers many new features, including a Thumb-2 instruction set, low interrupt latency, hardware divide, interruptable/continuable multiple load and store instructions, automatic state save and restore for interrupts, tightly integrated interrupt controller with wakeup interrupt controller and multiple core buses capable of simultaneous accesses [5]. It uses LPC1764 as the microcontroller. This LPC1764 consists of 100 pins and works at an operating frequency of 100 MHz. it comprises of 70 GPIO pins, four UART ports, two SPI ports and two I2C ports. The board is given a power supply of 3.3V.The touch screen used is ILI9325 which is a 262,144-color one-chip SoC driver for a-TFT liquid crystal display with resolution of 240RGBx320 dots. ILI9325 can operate with 1.65V. A touch screen controller, ADS7843 is interfaced.It is a 12-bit sampling Analog-to-Digital Converter (ADC) with a synchronous serial interface and low on resistance switches for driving touch screens. It has a Successive Approximation Register (SAR) ADC. The architecture is based on capacitive redistribution which inherently includes a sample-and-hold function. [6] It operates from a single supply of 2.7V to 5.25V. Low power, high speed and onboard switches make the ADS7843 ideal for battery-operated systems.

This touch screen is connected to the microcontroller through the SPI interface. The data lines of the TFT display is interfaced with the GPIO pins whereas the touch screen controller is interfaced serially using the SPI interface. A fingerprint scanner is interfaced with the microcontroller. It has two parts. Initially the fingerprint enrollment must be done. During enrollment [7], it generate a template of the finger based on processing results and store the template. Next fingerprint matching should be done. During matching, user enters the finger through optical sensor and system will generate a template of the finger and compare it with templates of the finger library. If both of the template matches, the authentication will be given or else the user access will be denied [8]. The fingerprint scanner is interfaced UART interface. The transmitter and the receiver pins of the fingerprint scanner are interfaced to the microcontroller.

The GPS tracking is used during the online mode. Handheld mobile banking device is programmed such that allowed to use in a particular range only. The region is set initially. When the device is operated beyond that region the alert will be ON. This GPS is interfaced with the

microcontroller through UART interface. The transmitter of the GPS is connected to the receiver pin of the microcontroller.

The GSM is used for sending the transaction details to the server as sms. The transmitter and the receiver pins of the GSM are interfaced to the microcontroller through the UART interface.

A SD card for storing the transaction details of the customers is used. This details can be retrieved at the bank later for further process using the USB port which is interfaced with the microcontroller. The SD card is connected serially with the microcontroller using the SPI interface. Both the touch screen controller and the SD card are interfaced serially with the same SPI interface in a daisy chain manner.

A mini thermal printer for giving receipt to the customer is used. They are also smaller, lighter and consume less power, making them ideal for portable and retail applications. The receiver pin of the thermal printer is interfaced with the microcontroller through another UART port.

A panic button and a buzzer are interfaced to the GPIO pins of the microcontroller. When the panic button is pressed the alert sms will be sent and the buzzer will ON.

Implemented Software: The software tool which is used for the arm cortex M3 is LPCXpresso. LPCXpresso is a new, low-cost development platform which is available from NXP. This software consists of Eclipse-based IDE, a GNU C compiler, linker, libraries and an enhanced GDB debugger. The hardware consists of the LPCXpresso development board which has an [9] LPC-Link debug interface and an NXP LPC ARM-based microcontroller target. LPCXpresso is an end-to-end solution to develop the applications from initial evaluation to final production. LPCXpresso's IDE is a highly integrated software development environment for NXP's LPC Microcontrollers, which includes all the tools necessary to develop high quality software solutions in a timely and cost effective fashion.

Proposed Work: The handheld device is designed using Arm cortex-M3. It has LPC1764 as microcontroller. The GPS, GSM, mini thermal printer, buzzer, SD card, touch screen controller and TFT LCD Display are connected to the GPIO pins. The bank has to appoint a BC who will have this handheld device. When the customer wants to withdraw or deposit amount he should intimate to the bank immediately. Then the customer will receive OTP. Once the BC reaches the customer he verifies the OTP. The customer will also[10] verify the OTP in BC's micro-bank device for ensuring that BC is from that corresponding bank. This mutual verification will authenticate both parties and now the transaction can be started. Initially, the banker will unlock the device using pattern lock. The home screen will be appeared.

The home screen has two menus: offline and online. The online mode is the one in which the GPS tracking is active and also the details of the customers are retrieved from the server automatically. The offline mode is the one in which the details of the customer should be given manually. After receiving the transaction details, the time limit is set and the transaction should be completed within that certain time limit. In online mode, the distance limit will also begin. This device is allowed to operate in a particular area only. When it moves beyond certain distance, the alert will be ON. Then the details about the customer will be shown. The device has the fingerprint of the BC as well as the entire customer in that particular region in its database. Now the customer will be asked to enter his fingerprint. It is also verified. Once the fingerprint verification is done, BC needs to enter a 4-PIN secret number on the touch screen keypad shown in the TFT display. Then the customer will enter the PIN secret number. After authentication the amount will be given to the customer. The balance amount will be calculated and this remaining amount, transaction time and date details will be given to the customer in the form of a receipt by using a mini thermal printer.

Algorithm for Handheld Banking System:

Step 1: Select config mode or demo mode. In config mode, record the customer details. In demo mode, click proceed.

Step 2: Once home screen displayed, receive the transaction details.

Step 3: The time limit and the distance limit are enabled.

Step 4: The customer details are shown.

Step 5: The fingerprint verification of both the customer and BC are verified.

Step 6: The account number, pin number are given by the customer.

Step 7: Money transaction takes place.

Step 8: The balance amount will be sent to the server as sms through GSM

Step 9: The details such as the customer account number, transaction time, balance amount are printed and the receipt is given to the customer.

RESULTS AND DISCUSSION

The following are the experimental results. Fig 2.1 shows the hardware of handheld mobile banking device.

The handheld mobile banking device consists of the GSM, GPS, Fingerprint scanner, touch screen, SD card and buzzer. All these are connected to the LPC1764 microcontroller using the development board. The board is given a power supply of 6V using a battery. The below fig 2.2 shows withdrawal and deposit options. There are two modes such as the demo and config mode. In the config mode, initially the details such as account number, account name, bank balance about the customer must be recorded by the BC. When the customer wants to withdraw or deposit amount, he should go to the demo mode. In this demo mode, there will be two options such as online mode and offline mode.

In the online mode the details of the customer are retreived from the server automatically. In the offline mode the details should be given manually by the customer. This offline mode is used in the rurual areas where the signal for GSM and GPS are not available.

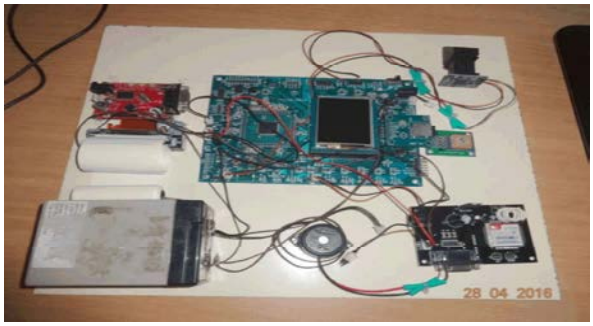

Fig. 2.1: Hardware of handheld mobile banking device

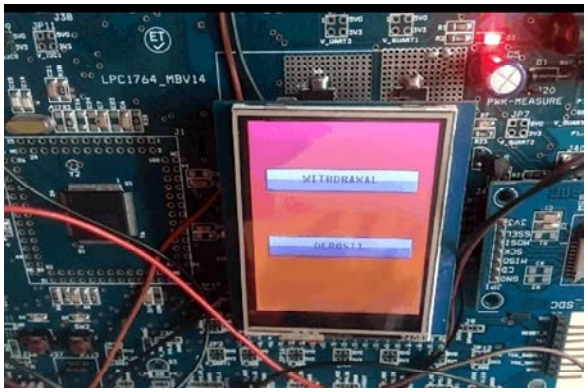

Fig. 2.2: Withdrawal and deposit amount

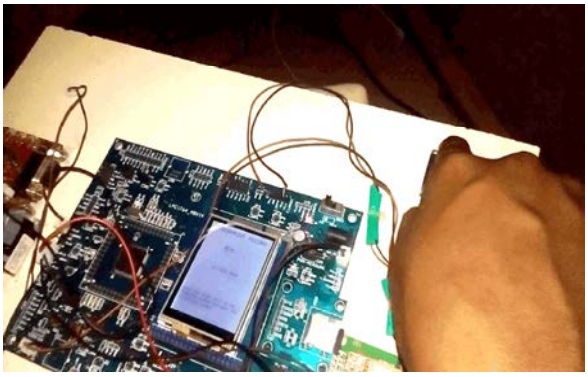

Fig. 2.3: Fingerprint verification

Thus this device can be used in very rural or hill areas also. In the offline mode, the transaction details are stored in the SD card that can be retrieved later. The Fig 2.3 shows the fingerprint verification. In this stage, initially the fingerprint of the customers are stored in the config mode itself. These are processed and stored as a template already. During the transaction process the fingerprint of the customer is got and if it matched with the saved template further access is allowed or else the transaction will be cancelled.

In the above figure, the fingerprint will be verified and then the money transaction will takes place. In this process the option whether to deposit money or withdrawal must be selected. Then, the amount of money to be deposited or withdraw must be entered. Then the security pin must be entered by the BC and the customer. After money transaction the balance amount will be printed as a receipt in the mini thermal printer and will be provided to the customer.

The Fig 2.4 shows the GPS output in online mode. When the device is inside the particular area, the transaction takes place. If the device is moved beyond the limit it will display OUT region and the alert will be ON. This alert is for the safety purpose and to avoid theft.

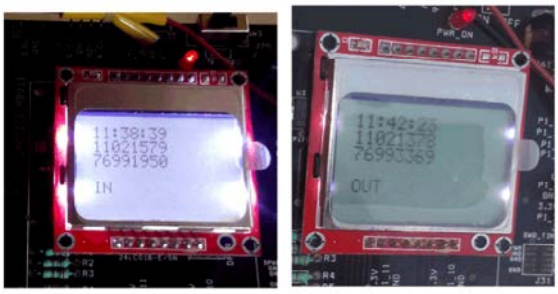

Fig. 2.4: GPS output (Region IN ad region OUT)

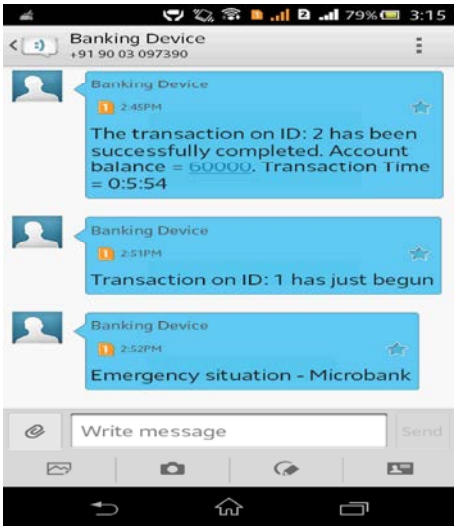

Fig. 2.5: Screenshot of sms to the server

The Fig 2.5 shows the screenshot of beginning of the transaction and also the emergency message. When the BC faces a difficult situation the panic button will be pressed. This will indicate to the bank server through a sms stating that 'Emergency Situation'. This helps to avoid theft. After the transaction over the balance amount is sent to the customer.

CONCLUSION

Thus the handheld device is easy and reliable to use and can be used anywhere not only in rural areas but also in cities. Since this device has a fingerprint scanner and pin security, the unauthorized persons cannot misuse the device. Moreover, a panic button present is too useful in emergency situations. Thus this device will help the rural area people to withdraw or deposit amount easily so that their precious time won't be wasted.

REFERENCES

1. "Location-Aware and Safer Cards: Enhancing RFID Security and Privacy via Location Sensing" by Di Ma, Member, IEEE, Tuo Xiang and Yan Zhu in International Conference on Automation, Control and Embedded Systems.
2. "Electronic Micro Banking System for Remote and Rural Areas Using Arm Processor" by Deepa and Sathish kumar in) National Conference on Information Processing and Remote Computing, NCIPRC 2015.
3. " Mun-Kyu Lee, 2014. "Security Notions and Advanced Method for Human Shoulder-Surfing Resistant PIN-Entry", IEEE Transactions On Information Forensics And Security, Vol. 9, No. 4, April 2014.
4. https://www.circuitsathome.com/mcu/interfacing-lcd-via-spi
5. http://exploreembedded.com/wiki/LPC1768:_UART_Programming
6. Vinayagamoorthy, A. and C. Sankar, 2012. Mobile Banking-An Overview. Advances In Management, 5(10): 24-29.
7. Dhiraj Vasant Kapare, Sadashiv Lokhande and Sayaji Kale, 0000. "Automatic Cash Deposite Machine With Currency Detection Using Fluorescent And UV Light" International Journal Of Computational Engineering Research (ijceronline.com) 3(3).
8. Shouvik Biswas, Anamitra Bardhan Roy, Kishore Ghosh and Nilanjan Dey, 2012. "A Biometric Authentication Based Secured ATM Banking System", International Journal of Advanced Research in Computer Science and Software Engineering, ISSN: 2277 128X, 2(4), April 2012.
9. Pooja Mali, Shruti Salunke, Rajashri Mane and Pooja Khatavkar, 2012. "Multilevel ATM Security Based On Two Factor Biometrics", International Journal of Engineering Research and Technology (IJERT), Vol. 1 Issue 8, October-2012 ISSN: 2278-0181.
10. Essien Eyo, E., 2011. "Proposed algorithm for automated teller machine", Elixir Adoc Network, 36: 3164-3167.