Point of Sale Device for Ticketing using LPC1768

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Abstract : **In today's modern world where everyone is in a rush to reach their destination, a POS ticketing system comes into the picture and is the requirement of day-to-day life. POS system is used for basic ticketing applications for the payment customer makes. It is a handy device which will provide you with a ticket for your travel. The system consists of a user interface that will interact with the user to get his/her source and destination, calculate the fare, and print the ticket for the same. For security purposes, it has an admin and user login, where only the admin has the rights to update the rate of travel. The POS device provides an organized and searchable history of travel without the need for Wi-Fi or cloud services as it contains a memory card to store the data. The device uses a portable thermal printer to print the tickets. Hardware specifications consist of ARM Cortex-M3 core LPC1768. In this proposed system to make the hardware more flexible and understandable, LPC1768 is ARM 32-bit Cortex M3 microcontroller and is the main component that is used to implement this POS ticketing system.**

Keywords - ***Point of Sale (POS), ARM Cortex-M3 core LPC1768, POS ticketing, portable device*****.**

I. INTRODUCTION

Looking at the current scenario of the travel industry the requirement is too high. Be it any day, public transports are always in a rush. Especially considering the busses running across the city you would find that passengers are in a hurry to reach their workplace. The conductor in the bus has a lot of work to do when lots of passengers fill up the bus. And this is where it becomes difficult for the conductor to attend to all passengers in super quick time. This is when the Point of Sales Device for Ticketing comes into the picture. This project has a good scope especially in metropolitan areas where you need to work faster and quicker while ensuring all transactions are perfect.

A point of sale terminal is a combination of software and hardware [2]. It permits retailers to get transactions and to make simple day-to-day business operations. A POS terminal has its specialized microprocessor with application specific programs and I/O devices for the particular operations in which it will serve [2]. The goal of the project is to create a simple Point of Sale Device for ticketing applications, for the customer to make payment. A device that will provide you with a ticket for your travel.

II. RELATED WORK

Table I: Comparative Survey on POS devices

Name of the paper	Year	Description	Hardware	Software
Design of secure SMART card reader and Wi-Fi interface for Point of Sale Terminal	2018, by Sahana from Siddagang Institute of Technology	POS terminal with smart card reader system for convenient and secure transactions using wifi module to transfer data periodically to a global server.	MX6 Processor, Wi-Fi Module WG7831-D0 (have both bluetooth and Wifi option),Smart Card Reader With IC DS8005	Cadence OrCAD Software Suite
Design of battery charger with power path controller and fuel gauge for point of sale (POS) terminal	2018, by Anand K N from Siddagang Institute of Technology	POS terminal and battery charger by several researchers to obtain the better battery charging system and that in the POS was limited to	Fuel Gauge, MX6 Processor, Buck Converter, LVDS Display, MAGIK II Kit.	Cadence OrCad Software Suite

		track record the customer items		
Implementation of Mobile-Based Monitoring sales system in Semi Tani Shop	2017, by Hendrik Setyo Utomo from department of Informatics engineering from Indonesia	The sales information system focuses on monitoring reports that can be accessed from anywhere as long as it is connected to the internet and has a POS cloud system.	Android Mobile, Computer	OSPOS cloud system, Internet
A Secure Wireless Point of Sale System	2011, by Carl J. Debona from University of Malta	A secure payment solution that uses an Infrared link between the mobile device and a dongle connected to a Point of Sale which in turn is connected through a network to the transaction server.	Mobile Phone, Computer, Field Programmable Gate Array System, Infrared Led.	Graphical User Interface, Banking System, Transaction Server.

Various changes have been made in POS systems over the past years by several researchers to achieve the best and secure POS system. Reviewing various research papers based on POS systems we can say that many hardware and software requirements are needed. Hardware requirements such as MX6 microprocessor, Smart card reader, android mobile, computer are observed and Cloud system, Internet are software requirements in their proposed systems.

POS terminals are used instead of isolated cash registers making the retailer work easy with improved performance providing services in merchandise locations with reduced credit losses and employee efficiency [1]. In this proposed system to make the hardware more flexible and understandable, we have used the LPC1768, ARM 32-bit Cortex M3 microcontroller to implement the POS ticketing system. Arm Cortex M3 processors are suitable for high performance, low power consumption and cost constrained applications. Thus, the 32-bit microcontroller LPC1768 turns out to be the perfect choice for implementation of a low cost, simple and high performance Point of Sale Device for ticketing.

III. METHODOLOGY

The main objective of the POS system is to print the ticket with all the exact details mentioned. Point-of-sale terminal, not only works as an ordinary isolated cash register, it also functions as a part of a retail data collection system, where customers pay merchants for goods or services [1]. When the user interacts with the device for travel requirements he will enter the basic information such as source, destination, no of passengers, etc. The rate of travel is forementioned and stored in the system. The device is restricted for specific travel routes hence, this is good for local transportation. All the information entered by the user/traveler will be stored in the memory. For calculating the fare of the travel, ALU of LPC1768 will fetch the information from the memory. The fare details and other information will be sent to the thermal printer serially over UART port. To track the history, the admin has access to the information stored in the memory.

IV. FLOW DIAGRAM

Process flow of the POS device is depicted in below fig. 1. When the user will interact with the device to book a ticket he will enter the travel information like source, destination, no. of passengers, no. of children. The rate information already saved in the device. This device is restricted to a specific travel route. Hence, this is more useful for local transportation like rickshaws, taxis,etc. The user needs to decide his travel route and rates before proceeding to book a ticket. All information entered by the user will go into memory. For calculating fare ALU of the LPC1768 will fetch the information from memory to calculate the total fare. The fare details and info will be sent to the thermal printer serially over UART port of the LPC1768 . Information saved in the memory can be accessed by the admin user to track his history.

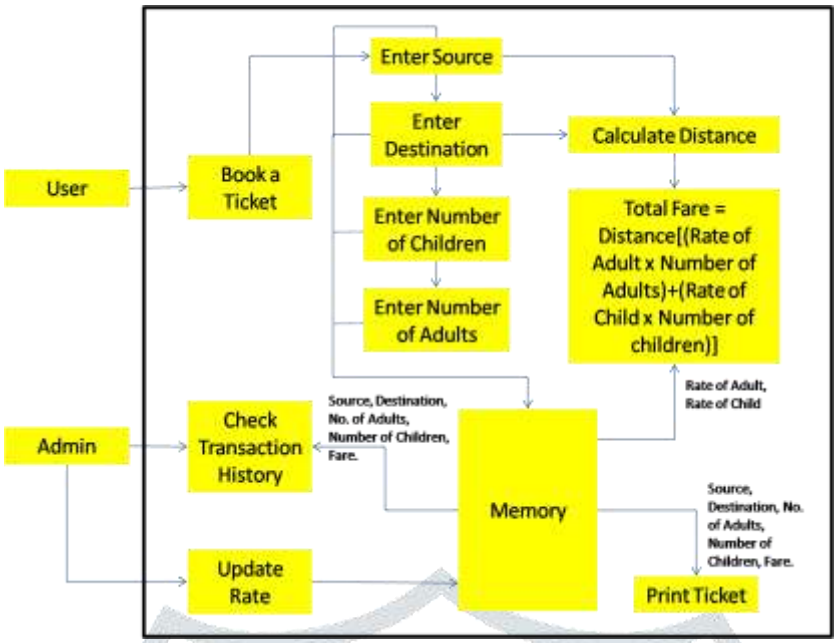

Fig. 1. Logical Flow Diagram

V. BLOCK DIAGRAM

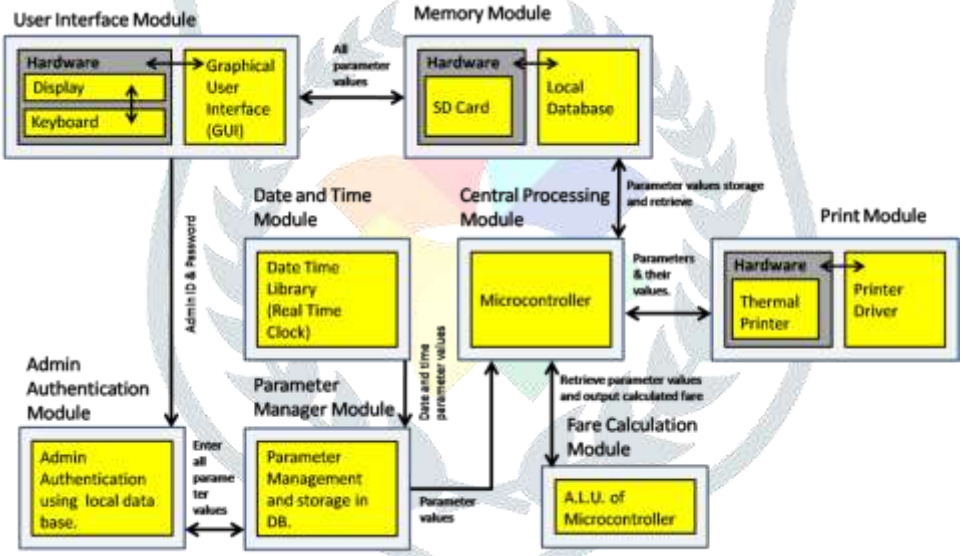

Fig. 2. Detailed Block Diagram

With the advancements in technology, more powerful processors are being implemented in smaller mobile devices [4]. Here, we have divided the block diagram into 8 different modules. The user interface is the point where the user can interact with the device. It is very simple and understandable for non-technical people. Admin authentication protects the internal system settings through a password and ID, so only the admin can make changes to the system eg. The admin only can change the rate of travel. Parameter manager is used to arranging the ticket details like source, destination, etc. in a proper manner. It is also used to update the rate. Date and time module provides the values of the current date and timing displays on UI. Also, it stores the date and time during the printing of tickets for history purposes. The central processor is the part that runs the entire system. It performs tasks like calculations, sending data to a printer, and storing values in memory. It also interacts with other modules. Memory is used for storage purposes. All the ticket details will be stored in the memory. The fare calculation module provides the total fare value by calculating input values given by the user. Its output will be further utilized by microcontrollers for storing and printing purposes. The responsibility of the printer module is to print tickets while ensuring all parameters and their values are arranged in the required manner.

VI. CIRCUIT DIAGRAM

Point Of Sale terminal, Smart card technology and Wi-Fi is carried out by several researchers in order to achieve the secure transactions method [1]. The circuit diagram includes various components. The LPC1768 is a 32-bit ARM Cortex M3 microcontroller used for embedded applications. It is the main component of our project and handles all the major operations in functioning of the device. Thin Film Transistor (TFT) LCD Module is 3.2 inch touch screen display used to display the user-entered data. ADS7843 is a 12 bit Analog To Digital Converter (ADC) with low on-resistance switches and synchronous serial interface and is used for

driving touch screens. Secure Digital (SD) Card is used to store the user entered data and transaction history. F232RL is a USB to Serial converter which will be required to flash program to the microcontroller. The thermal printer will be connected at the UART port of the microcontroller.

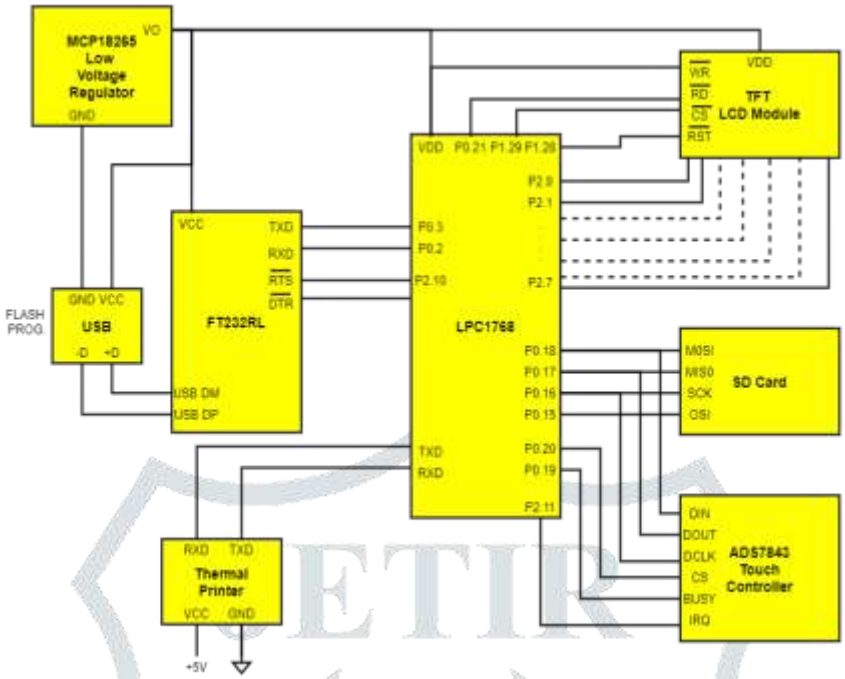

Fig. 3. Circuit Diagram

VII. RESULTS AND DISCUSSION

The major objective behind building the point of sale device is to simplify the ticketing process and make it more transparent and user-friendly. The end goal of this entire transaction and ticketing process is to generate a ticket consisting of your journey details. The journey details can include date and time of travel, source, destination, number of adults traveling, number of children traveling, total distance, and total fare. The ticket generated should be unique and should include a logo or a watermark so that it cannot be copied.

7.1 Programming LPC1768 Microcontroller

In order to reach the end goal of printing a ticket successfully, it was very important to set up and develop an application that will interact with the user and provide him/her multiple options to enter the journey details. This final application was designed and then developed ensuring ease of use and simplicity. The device was programmed in accordance with the logical blocks as discussed in the block diagram. The main screen consists of options to enter the journey details and a print button to print the ticket as per the details entered by the user. The screen also includes a new button in order to refresh the screen and reset the data, so that the user can start entering details of a new ticket.

Fig. 4. Programmed POS Device using LPC1768 controller

7.2 Process of printing a ticket

The ticket can be printed using a mini TTL/UART port thermal printer. These printers are also known as receipt printers and are commonly found in ATMs or grocery stores. The printer requires about 57mm paper and the best thing about this printer is that it doesn't require ink for printing. This makes it more economical and handy.

The thermal printer shown in fig. 5. is connected to LPC1768 using the UART Serial Communication interface. The print data is transmitted serially to the printer and in response the printer prints the ticket. In order to ensure communication between the printer and the microcontroller it becomes necessary to write a printer driver. The printer driver code consists of various operations that need to be performed in order to get correct operation of the thermal printer when connected with the microcontroller. The code consists of driver functions like:

- Initialize printer
- Check printer if connected.
- Check if the printer is loaded with paper.
- Check if the printer is free for printing.
- Create a print template.
- Print ticket.

These driver functions in printer driver code ensure efficient handling and interfacing of the printer with the microcontroller.

Fig. 5. Thermal Printer

7.3 Printing a sample ticket on serial console

To check and test the working of the device, a sample ticket was printed on a serial console.This was achieved by monitoring the serial data sent by the microcontroller. To monitor the print data sent by the microcontroller serially, we made use of a third-party serial monitoring software called X-CTU. The print data sent by the system was displayed on the serial console of the software as shown in the figure below.

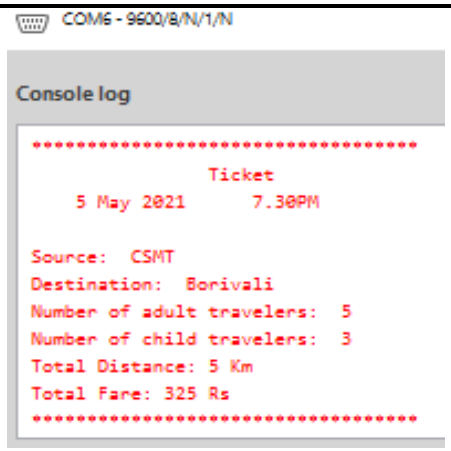

Fig. 6. Final printed Ticket

As shown in fig. 6. the ultimate result or goal was to print a simple ticket consisting of the journey details and it was thus achieved by interfacing a thermal printer with the microcontroller and also by checking a sample ticket on a serial monitoring software.

VIII. ADVANTAGES, LIMITATIONS AND FUTURE SCOPE

8.1 Advantages

1. The device is designed while understanding the user requirements and is very simple to operate and generate a ticket.
2. The device does not require internet connection and can be used even in the remote areas where connectivity is an issue.
3. The user can track ticket sales and understand the total revenue generated.
4. The rate of the ticket per person can be updated when required by the system admin.
5. Compatible with any TTL/UART interface thermal printer.
6. Does not require ink for printing tickets and the development cost is low making it more economical.

8.2 Limitations

1. The device does not generate e-ticket.
2. Does not support e-payment methods like credit/debit card or UPI payment.

8.3 Future Scope

The development of information and communication technologies have changed so quickly with no geographical boundary restrictions [3]. The system can be further improved to enhance the user experience by implementing e-transaction methods like UPI, credit/debit cards. The device can also be developed further such that it can generate a shareable e-ticket thus saving the use of paper.

The application field of the POS system can also be extended by giving rights to the admin to customize the final application, input fields, and data according to the business requirements, thus generating the ticket depending on the business type. So the device can also be used by restaurants, shops, and other small businesses

IX. CONCLUSION

This paper presents the implementation and idea of developing a simple and economic device that can generate tickets for travel. The point of sale device for ticketing developed using LPC1768 32-bit ARM Cortex M3 microcontroller, makes the process of travel transaction more simplistic and user-friendly. POS for ticketing is a tool for a faster ticketing experience, designed and developed ensuring low cost and less maintenance. The device can be used in day-to-day bus ticketing transactions, railway stations, auto-rickshaws, cabs for generating a ticket for the journey.

X. ACKNOWLEDGEMENT

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XI. REFERENCES

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