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Fingerprint Based E-Ticket Vending Machine

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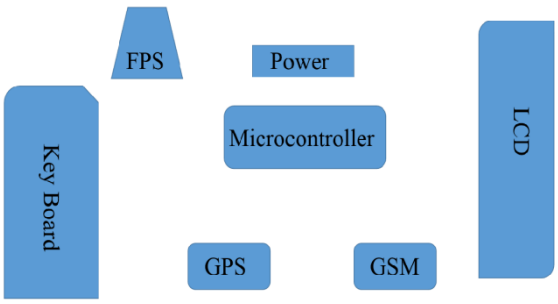
Abstract: This project is intended to build a high performance, durable and eco-friendly Ticket Vending machine. As the name suggests, the system captures and maintains the record of the passenger by sensing its Fingerprint. The system is developed on an Embedded platform based on AVR microcontroller.

Keywords: Environment, fingerprint, embedded system, E-ticket

I. INTRODUCTION

A ticket vending machine produces paper or electronic tickets. A ticket vending machine extensively uses paper to dispense ticket in most developing countries. The use of papers in the ticket vending machine is extensive. The printed receipt is mostly issued for traveling in Bus, Train, and Air. Paper tickets are discarded once the destination has arrived. Small paper receipts are more common in Indian and South-Asian countries as they are widely used in transportation. India has over 1.9 million buses for public transportation across the nation. The tentative paper consumption and cost stack up to the heap of finance and causes more environmental issues. To cut down operating cost and environment issues, Embedded system has been deployed in a mixture of the Fingerprint sensor, GPS, and GSM. Comparatively the investment for an Embedded System to dispense tickets are one time high, the Cap-Ex is initially higher but it does not require operation cost and maintenance as these are regularly needed in conventional ticket vending machines where the printing paper must be changed and ink levels have to be maintained. The implementation of such an embedded system will greatly result in lesser usage of paper and in return provide greater cost saving.

II. BLOCK DIAGRAM



The Generic Block diagram consists of :

A. Microcontroller: The microcontroller is the centralized logic control and processing unit where the firmware has been deployed. The microcontroller is of Atmega 8-bit processor. Active-High logic is utilized for the operation and proper function of the connected devices.

B. GPS(Global Positioning System): is needed to track the movement of the vehicle also inline it is used for the boarding location of the passenger. The accuracy given by this Neo-6m is in 5m radius. The GPS is interfaced via UART (Universal Asynchronous Receiver /Transmitter). The GPS is activated only when the user needs the location to initiate billing process, with this method we have been able to save power utilized by the GPS and it is only utilized when the user needs it.

C. FPS(Finger Print Sensor): reads the biometric pattern of an individual and stores the data in accordance with the boarding location, time, distance, fare, and destination. The fingerprint data is encrypted via 8 bit AES(Advanced Encryption Standard) Encryption to protect travelers privacy. The only authority to read the encrypted data is with the ticket invigilator and law and enforcement department given the condition if they have decryption key present with them.

D. Display: it is of 16x2 LCD with partial graphical display, the purpose of the display is to have an ease of accessing different modes and command to the user. The Keypad is a general-purpose alphanumerical matrix keyboard to provide hardware interrupts by the user onto the system.

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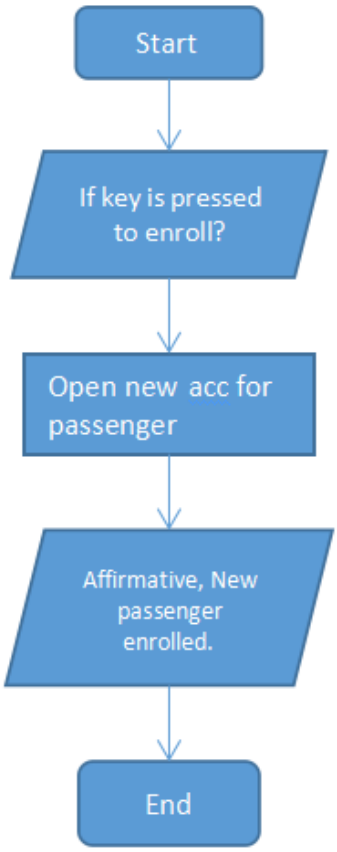
E. Battery: The system is made to be operational for a longer time in a single charge. The system is a standalone device capable of operating up to 100 hours. The battery is high-performance lithium-ion.
F. GSM(Global System for mobile): is used for the e-Ticket on the user side. This feature is optional and may require passengers discretion, it may also depend on the availability of the network. The GSM will effectively minimize the paper consumption and indirect costs incurred on the transport authority. The goal is to have a centralized GSM network from the transport authority to have better documentation and receipts for an individual dispute and verification.

III. CODING

The logic has been developed on Embedded C. The code is well written and tested as a functional program. The system is responsive only when the corresponding arguments in a functional loop satisfy. The motive behind the functional coding overstatements is that the functional algorithm gives out the effective result, the system on which a functional algorithm is deployed turn out to be more responsive on the commands are given by the user rather than sequential results that makes the system, slower and unresponsive. Libraries had been developed for the Fingerprint sensor and GPS. The firmware utilizes such libraries to communicate with the external hardware and sensors. The flow chart is hereby explained as functions



This process flow is for the new account opening for the passenger. This is the first operation that is done by the user towards a passenger to collect fare and fingerprint. The new account will store all the data related to the passenger such as fare, locations, and crucial data such as Fingerprint and Mobile number. The below-shown flow process to scan the finger print and depending upon the location o boarding and destination a fare is calculated. The fare is variable that solely depends on the traveling distance, duration, vehicle type, amenities and time on which the service is being used.

The GPS takes the location of the passenger and also provides the time in IST format for better management of records. The GPS is always connected to the satellite whenever it is powered on. The only glitch that a GPS has is densely areas and landscape with high alps. Though, high-performance GPS can be used to tackle this problem. The GSM utilizes standard network on passenger's end. If demanded a receipt for the travel, the transport authority will provide it via bulk message service to save cost. The receipt can be delivered to the passenger time and on-demand up to a described date to

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raise Travelling allowance from there companies. The passenger will get the receipt on the Indian telecommunication network for which the standard code is +91

When the destination has arrived, the accounts which had been opened to store the data are closed as the destination I arrived. The System is on a constant lookout for the destination. This is achieved with the GPS which continuously tracking the vehicle.

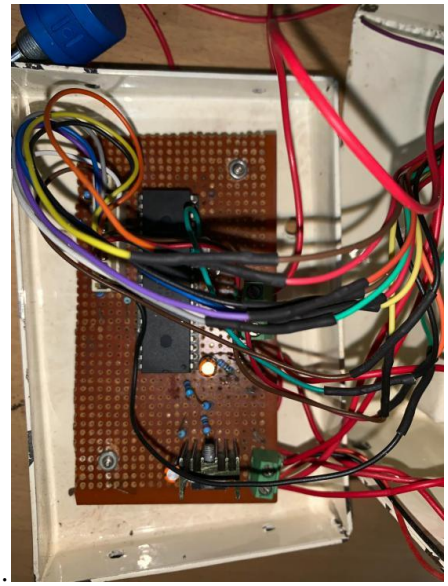
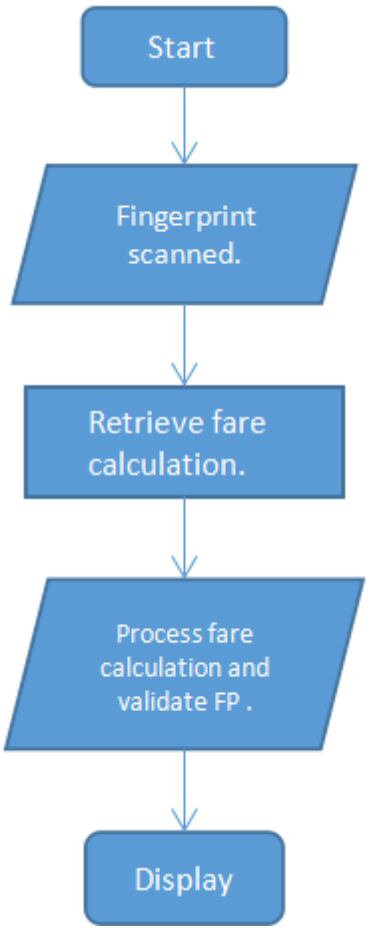


Image of the Embedded System



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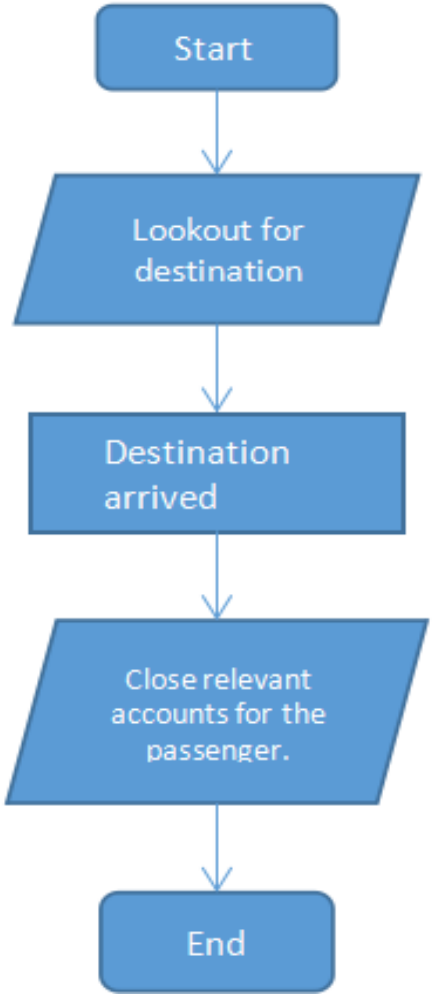

IV. CONCLUSION

After the thorough examination and trials, the system is proposed to be implemented on the busy routes of public transport in developing countries. The implementation of RF-based smart cards and Chip-based smart cards are economically challenging for such a large application where hundreds of thousand people will board public transport vehicles such as buses and trams. With minimized paper cost the transport authority can introduce rewards and bonuses for the passengers and their employees to promote the environment and public transportation.

Pros and Cons

The proposed system has longer backup than conventional systems. The single system is capable of holding the data of 1000 passengers which can be scaled to larger amounts. The system is online with main server located ion the premises of transportation authority that will significantly negate corruption and miscalculation of fare. The only con of this system is that it must have a fingerprint scanned of the customer which will lead to longer attending a time of not more than 10 seconds.

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