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Innovative Pocket Size Smart Card for Public Transportation Using GPS

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Abstract: **Smartcard ticketing provides convenience for commuters and efficiency gains for transport service providers. Automated Fare calculation for public transport is an Economic and Management approach. The public transportation system at present use paper tickets which are printed by a small machine with a key pad. This process needs man power and don't know the details of the passengers using the public transport. In proposed system automatic ticketing uses a digital ticket (smart card). It has details about the passenger and it is swiped while entering the public transport and the destination.selected via key pad. The amount is reduced from the passengers account according to the passenger categories (student, rural people, government officers, and army). All these details are stored in EEPROM (Electrically Erasable Program Read Only Memory). Then using GPS (Global Positioning System) the position is known and a buzzer is triggered when destination is reached.The manual fare collection system has many issues which are overcome by proposed system.This outstanding capacity improves the traditional payment systems used in the public transport context.**

Keywords: **Electrically Erasable Read Only Memory, Global Positioning System, PTN Operator, ARM, Radio Frequency Identification**

I. INTRODUCTION

Asmart card is a contactless13.56MHz credential whose dimension are credit card size. Its embedded integrated circuits can store and sometimes process data and communicate with terminal via radio waves. Contactless smart cards do contain read only RFID called CSN(Card Serial Number).Automated Fare Calculation for Public Transport system an economic and Management Approach for Transit System.This provides a wealth of resourcefulinformation to everyone with interest in mass transit. InAutomated fare collection system, the unit has 2 modes;Admin mode and User mode. Every time the unit isswitched on, it will give a welcome note with modeselection. The modes are selected via keypad interfaced.When the admin mode is selected, it gives two options;Location Fixing and Add User.In Location fixing the GPS is used to find thelocations and will saves the location details like latitudeand longitude values to the EEPROM. When the adduser option is selected, the admin can add new user alongwith his recharge details and saves those in to EEPROM.

When user mode is selected, the user can show his unique digital ticket and can select the destination. Theunit will automatically reduce the fare from his accountand will update the data into the EEPROM. When theuser reaches the destination, the vehicle stops andtriggers a buzzer.

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II. RELATED WORK

1.Intelligent vehicle for public transport is one of the research areas. Here global positioning system plays animportant role to find positions. In certain urban areas there may be some errors to find the location so an alternative approach is visual odometry.Where vision based algorithms are proven to track the position of the vehicle over a long distance using sequence of images without prior knowledge about the environment .But the results have some disadvantages in alternate weather conditions so GPS holds best when compared to others. Control strategies based on expert rules and fuzzy logic are used to control the departure time, interval between two vehicles and delay occurred due to traffic. The parameters of fuzzy controllers were tuned through a particle swarm optimization algorithm.Also discusses possible future extensions of this system in areas such as Internet–of-Things (IoT).The idea of using RFID in PTS was previously put forward by different personalities [1-6].

2.Another alternative approach to GPS is the use ofPTN operator with positioning sensors to give on-trippersonalized navigation information Here unknowndestination location for infrequent users can be foundusing positioning sensors. This proves to be amotivational driving factor for the public to prefer it overother modes of transportation. Mobile ticketing modelcomprises of a registered mobile subscription eitherprepaid or postpaid. But people with normal phone cannot use this technology.

III EXISTING SYSTEM

At present we use paper tickets for public transportwhich is ejected from a handy machine. This machine isinterfaced with a keypad and has tickets rolled inside it.When the destination is selected via keypadcorresponding details are printed on the ticket and thenejected out. This whole process needs manpower. Thereare three main disadvantages in the existing system.Firstthe need of manpower that is every time when a passenger travels a public vehicle a person is needed toissue the ticket, then the passenger details are not knownand for unusual users the destination points are unknown.Knowing the details of the passenger is essential in thecase of any public issues. Infrequent users do not knowthe actual destination where they must reach so they need.a device which intimates there location. These threedisadvantages are overcome in the proposed system. Thehandy machine is shown in the figure 1. The conductorusing the machine is also shown in the figure 2.

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Fig:1Handy Machine

Fig:2 Conductor Issuing the Ticket

IV PROPOSED SYSTEM

In our proposed system automated fare collectionsystem no man power is needed. All the passengersareprovided with a smart card. The smart card carries anumber which is issued on the basis of any proof of thepassenger it may be a driving license or a pan card or aration card. Hence on any public issues the system can bechecked for the passengers list. The smart card has anaccount balance if the balance is reduced the amount istop up again. Then a system is fixed in the publictransport. When a passenger enters the public transport they would swipe the smart card and choose the destinationthrough the keypad. Hence swiping and choosing is doneby the passenger all other work is carried out by thesystem. The system calculates the distance between entryand exit point. Then according to the passenger (local) or according to the distance (tourist) the amountis reduced from the passengers account. Using GPS thelocation is found and a buzzer is triggered at thedestination then the same location is displayed in theLCD. This is very useful for unusual users travelling toan unknown location. The basic block diagram is shownin the figure 3.

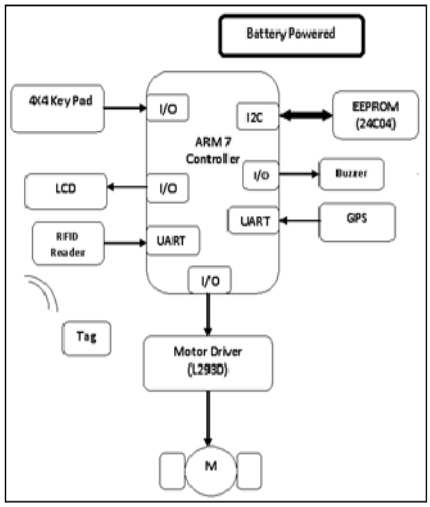

Fig:3 Block Diagram

V TECHINICAL DESIGN

1.Webpage Creation and Fare Media
2.Device to Read/Write Media
3.Depot Station for Data Collection
4.Back Office System for Data Processing
5.Central Cleaning Housing

Webpage Creation and Fare Media:Webpage creation is the process of create a website by the use of HTML,PHP for user who have knowledge to register the details via the online and downloaded the card. Fare media in the sense distributed the card via the manually such as the people collect the details manually and to provide

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the cards at public sector such as school, ration shop and so on.

Device to Read and Write Media: It is the process of interface between the user and the device. The user enter the details via the machine the validate machine. The device read and write media diagram is shown figure 4.

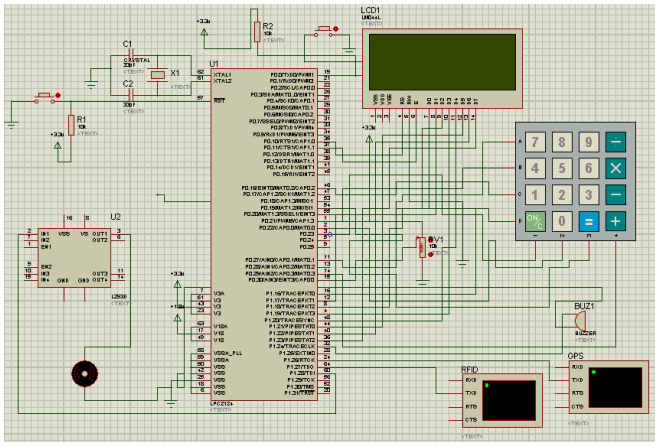

Fig:4 Device Read and Write Media

Depot Station for Data Collection:Used to concentrate data communications with devices in a station or bus depot. Common in older AFC systems where communication lines to upper tiers were slow or unreliable.The depot station for data collection diagram shown in figure 5.

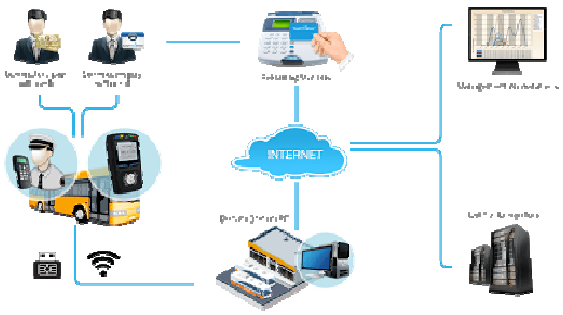

Fig:5 Depot station for data collection

Back Office System for Data Processing:Servers and software to provide management and oversight of the AFC system. Usually includes:
Fare management - changing of fares and fare products
Media management - support for blacklisting of lost/stolen media
Reporting - periodic reports on performance of the AFC system, financial details and passengermovements

Central Cleaning Housing:In environments where multiple system operators share common, interoperable media, a central system,called CCHS – Central Clearing House Solution, is used to provide financial management and other servicesto the operators.A core function of the CCHS is the apportionment and clearing of amounts among the clearing participantsregistered in the CCHS, such as the transport operators and retailers selling tickets, to realize theircommercialagreements for interoperable products.The apportionment and clearing function can deal with interoperable product sale and usage in the systemas well as fees claimed by products retailers. Clearing revenue are settled in the bank periodically.

VI PROTOTYPE RESULT

The block is implemented in hardware where ARM7 LPC 2129/LPC 2119 is used as the main processor.When compared to other processors this type uses lowpower. RFID tag is used as the smart card or the digitalticket. A RFID

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reader is present in the vehicle unit sothat the digital number is accepted by the unit. Parallel interface is done between LCD's eight data pins andARM port 1 pins. Two control pins of LCD areseparately connected to the ARM. AC supply is given tothe system where a bridge rectifier is used to convert ACto DC and then given to Voltage regulator.The output of bridge rectifier is 9v hence; a voltageregulator is used to convert the voltage according to theneeded voltage for processor, motor and all otherdevices.ARM supports UART and I2C. Here interintegrated circuit is used to interface with EEPROM. Amotor is used to move the model so that it reaches thedestination then using GPS the location is detected and abuzzer is triggered. The same destination is displayed inthe LCD A driver circuit is used to drive the motor. Thelatitude and longitude value is known through GPS 634R. The ARM processor with LCD display, GPS,RFID reader and tag is shown in the hardwareimplementation in the figure 6.The smart card design are shown in figure 7.

Fig:6 Hardware Implementation

Fig:07 Transportation Smart Card

VI CONCLUSION

The manual fare collection system has many issueswhich are overcome by our proposed system. Automatedfare collection system for public transport using GPS isan innovative idea which reduces man power. In Proteussoftware the circuit is designed and coding is written inKeilµVision using C language. The amount isautomatically reduced according to the distance travelledby the passenger. All the account details and cardnumber is stored in EEPROM. The card number is issuedbased any proof of the passenger. Implementation isdone using ARM 7 LPC2129, L293D, EEPROM, GPS,LCD, Helical gear motor, 4X4 Keypad. In futureenhancement instead of EEPROM a server can bemaintained to store all the card number and balancedetails. This smart Embedded System can be implemented in the transport system, which willperformthe fare collection automatically.

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