EFFICIENT TRAVEL USING SMART CARD AND GPS TECHNOLOGY.

R.Aravind Prasanna#, S.Baskar#, M.Hariharan # R.Prasanna Venkatesan#
S.Swaminathan*,
Final Year,Department of Electronic and Communication Engineering, *Asst.prof/Dept of ECE
SRC,SASTRA UNIVERSITY,Kumbakonam s.swami@src.sastra.edu,

ABSTRACT: The aim of our paper is to reduce the man power as well as to have a carefree travel. This project involves the combined usage of smart cards and GPS to make travelling smarter. In our paper, Smart card which has become a common thing now, holds the particulars of the card holders and GPS which is an efficient tool in many fields like surveillance and tracking is used to find the distance travelled by the user. The smart card can be used by the user for entering and leaving the bus. Depending on the distance travelled, the money which has been paid in advance will be deducted from the card. This paper includes implementation of the central processing unit which controls the entire system. Also the need to make this system practical and result that we will obtain is explained in this paper.

Keywords: Electronic bus ticketing, GPS, smart card, etc.

INTRODUCTION:

In the paper "Personal Navigator for a Public Transport System using RFID Ticketing" Ana Aguiar et al explained that a system that uses that same RFID-based location information to give the user navigation indications depending on his current location; provided that the user has indicated beforehand the places he intends to visit. By using smart card instead of RFID with GPS, we can find the location of the passenger enter and exit. Using the location we can find the distance travelled and amount. The amount can be withdrawn from the smart card. A microcontroller can be used to program this system by interfacing GPS and smart card. By implementing this system the usage loose cash can be reduced and efficient ticketing can be implemented.

EXISTING SYSTEM:

In the conventional system, every bus is controlled by a conductor. The conductor will collect from each passenger and issue ticket. Initially, printed papers tokens are used as tickets. Nowadays, handheld machines are used to print tickets.

This system has many disadvantages. The passenger have to carry the ticket till the end of travel, the conductor should ensure that everyone got ticket, the time taken for ticketing is comparatively more and more paper is used. Also to operate the handheld machine the conductors are trained.

For example, if a passenger wish to travel in bus. He has to carry money with him. Then conductor will collect with money and he will give ticket. This has to repeat for all passengers. This will take more time and waste of human resource. Even handheld ticketing machine is comparatively slow and need trained person to operate it.

PROPOSED SYSTEM:

GPS is the latest technology used in varies fields such as navigation, tracking and also in some of surveillance application. Here we going to use this GPS to calculate the distance travelled by the passenger. GPS module can configured to generate the latitude and longitude of the current position of the bus. The position of the bus can be monitored continuously using this GPS module.

Smart cards can provide identification, authentication, data storage and application processing. These smart cards can be used as passenger identifications. Every passenger carries a smart card. The smart card has the information such as user identification number, available balance and a status register. These smart cards should be capable of the recharging, so that the passenger can use it again and again.

Combining GPS technology and smart cards we can design a complete bus ticketing system. A microcontroller is used to control the entire system. GPS and smart card reader are interfaced with the microcontroller. It can be further connected with liquid crystal display and keyboard for user interface.

Every time when the passenger enters the bus he needs to sweep his smart card in the smart card reader. The card has a unique identification number, balance detail and a status register. The frame format in the smart card of the above details is shown in Fig.1.

UNIQUE ID NO.	STATUS REGISTER	BALANCE

Fig.1 Smart card frame format.

These details stored in the smart card are transferred to the microcontroller. Initially the microcontroller will check the validity of the card and balance available. Then microcontroller sends a request for current location to the GPS module. The GPS module sends back the latitude and longitude position to microcontroller.

Microcontroller has a lookup table which consist the information about the bus stop name according to the latitude and longitude data sent by the GPS system. Every time when user sweep his card on entry the microcontroller checks the look table and store the appropriate location with the passenger details in the memory array.

While exiting the bus the passenger should sweep the card again. On sweeping card for second time the microcontroller will retrieve the data about the particular passenger and calculate the distance travelled. The bus fare for the distance travelled is not uniform. It is non-linear i.e., for more distance travelled the amount per kilometer is less. This can be determined using another lookup table.

On calculating the bus fare the equivalent amount is reduced by the user. This smart card can be recharged for further travelling when the balance is low.

ARCHITECTURE:

Fig.2 below shows the block diagram for interfacing of the peripherals with the microcontroller.

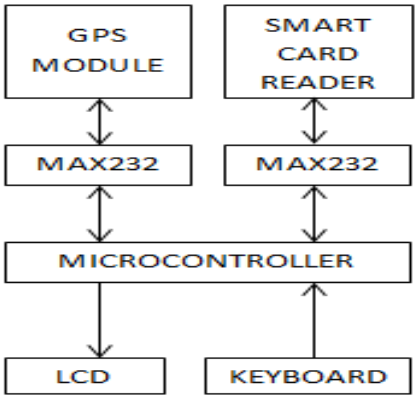

Fig.2 Block diagram.

In the block diagram, the max232 are used to establish serial communications between the GPS module and smart card reader and microcontroller.

GPS module has many configurations. For each configuration it will transmit different data such time, date, latitude position, longitude position, velocity etc. Here it is enough to extract latitude and longitude positions. Smart card should have enough memory space for storing the passenger detail.

We LCD and keyboard are user interfacing peripherals. Keyboard is used for entering the number of passengers travelling using same smartcard. LCD is used to acknowledge the passenger about amount detected and one more LCD can be used to display the next bus stop.

FLOW CHART:

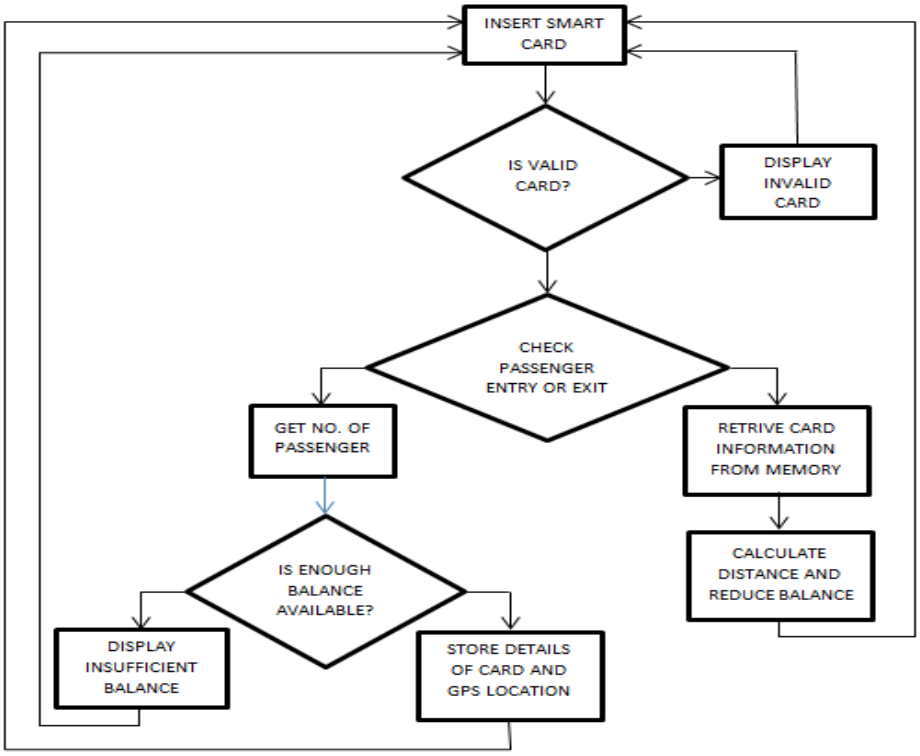

Fig.3 Flowchart

Fig.3 shows the operation of the system. The GPS locations are updated continuously.

LOOKUP TABLES:

The lookup tables are preprogramed tables consists of fixed variables that can be stored in the memory of the controller. It can be used as reference for further programming. Here we used two lookup tables. One for location identification and another for distance calculation.

BUS STOP NUMBER	BUS STOP NAME	LATITUDE	LONGITUDE
1	FIRST	X1	Y1
2	SECOND	X2	Y2
.	.	.	.
.	.	.	.
.	.	.	.
N	NTH	XN	YN

Table.1 Bus stop identification.

Table.1 is an example of bus stops. The latitude and longitude position from the GPS module is compared with the lookup table shown; the bus stop number and location are extracted.X1,X2,…,XN and Y1,Y2,…,YN represent the appropriate bus stop latitude and longitude position. The bus stop number used to calculate the distance travelled and bus stop name is used to for displaying purpose. Bus stop name can be stored in ASCII format.

Table.2 used for distance calculation is shown. The purpose of this table is to fix the bus fare between bus stops as the fare is non-linear. From the retrieved data the location from where the passenger travelling and the destination location from the GPS lookup table are compared with this lookup table and then appropriate amount is reduced from the smart card. The distance travelled and amount reduced can be displayed to acknowledge the passenger in LCD. X12, X13, X(N-1)N and Y12,Y13,..Y(N-1)N are the distance between the bus stops and the equivalent amount for the distance travelled.

BUS STOP		DISTANCE	AMOUNT
FROM	TO		
1	2	X12	Y12
1	3	X13	Y13
.	.	.	.
.	.	.	.
1	N	X1N	Y1N
2	3	X23	Y23
.	.	.	.
.	.	.	.
2	N	X2N	Y2N
.	.	.	.
.	.	.	.
N-1	N	X(N-1)N	Y(N-1)N

Table.2 Distance & amount calculation.

CONCLUSION:

By implementing this paper as a real time project many disadvantages mentioned early can be rectified. The time taken by the microcontroller for computation will be in few microseconds, so time consumption is reduced.

Nowadays almost everyone has ATM card or credit card. This system can be upgraded by changing the program for using ATM card or credit card instead of smart cards. Also GSM module to transmit bus location to the bus terminal can be used. Further GSM can be used to tell information about the accident happened and bus break down.

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