Intelligent Automatic Toll Setup based on Embedded System

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ABSTRACT

*Intelligent automatic toll system which is used for toll collection without traffic jam and without consuming more time. The technology used here is RFID (radio frequency identification). Initially detects for the vehicle arrived or not using Ultrasonic sensor in order to use the voltage power efficiently. The RFID emerges as a converging technology where the time and efficiency are the matter of priority in the recent days. RFID reader reads the user RFID tag and user has to enter the valid password and performs the toll collection automatically from the RFID tag sends a message to the user after deducting the amount from the user account sends the detected amount & balance amount via through 16*2 LCD display using ZigBee protocol and to the mobile. ZigBee technology which is used to transfer the data, transfer via through API (application programming interface) data transferred from one ZigBee to other for serial communication.*

Keyword : - *RFID, ZIGBEE, LCD, Ultrasonic Sensor.*

1. INTRODUCTION

Embedded systems which are used to design for doing some specific task. Rather than to be a general-purpose computer for multiple tasks performing various design. This embedded system provides real time performance constraints that are secured, such as safety and usability; and others may have low or no performance requirements. System hardware which reduces the costs. The software which is written for embedded systems is often called firmware, and is stored in read only memory or flash converter chips rather than a disk drive, it often runs with limited computer resources. Wireless communication has become an important feature for emerging commercial products and a popular research topic within the last fourteen years. These communications are mobile phone subscriptions than wired line subscriptions & commercial interest has been low-cost, low-power, and short distance wireless communication used for personal networks for communication.

Technology advancements are providing smaller less cost and effective devices for wireless communication, integrating computational processing and a host of other functionalities. These embedded communications devices will be integrated into an applications ranging from homeland security to industry automation and monitoring. An automated toll system is used for collection of toll payment using the RFID reader & RFID tags. It saves time by avoiding the long queue and traffic jam. The main advantage of this toll system is ultrasonic sensor which detects the vehicle automatically whenever the vehicle is near the toll system.

Electronic Toll Collection (ETC) is done using the RFID reader and RFID tag. These techniques are more efficient and have many advantages than the Laser technology. At present the laser systems are used in the ETC has the bar coded stickers which affixed on each vehicle. These barcodes are read by laser scanner as vehicle passed by the toll

booths. The scanner has the poor reading reliability and it is sensitive to nature like weather and dirt and has to be located as close as possible to the toll booth.

2. PROPOSED WORK

The following points shows that the proposed work has more advantages than existing system.

- ETC using RFID reader with Zigbee technology is introduced.
- RFID reader has high accuracy and could read even in highway speed.
- This technique is much better than laser technology and has many advantages.
- Ultrasonic sound sensors are used to detect the vehicle & reduce the voltage power supply.
- Ultrasonic sensor which sense the vehicle & if any malpractice sends a message some vehicle has been went.

The main objective of the proposed work is to automatic toll collection & to reduce voltage.

Automatic Toll Collection

Ultrasonic sensor is placed before the toll system which detects the vehicle presence and reduces the voltage power. An RFID tag is given to each user with read/write memory. An RFID reader device reads this data whenever the user vehicle is near the toll system and compares it with the data in the database of the hardware module, as the hardware module memory which is split into two parts one for programming & other for storing the data & comparing the data of the user in hardware kit. Whenever the user after registering in the memory the RFID tag, when the user is near the toll the ultrasonic sensor gets activated sense the vehicle & sends the message to the hardware module as, the vehicle is detected.

When the vehicle is detected it sends a message to the user to place the card. The card compares it with hardware module which is kept separately for storing & comparing in the memory. If the card is valid check the balance from their account & deduce the amount from their account (RFID tag). The will open when the user passes through other ultrasonic sensor which is placed after the gate which is (10-15) centimeter apart. If the card is valid check the balance from their account & if the balance is low sends a message to the user as the balance is low to recharge & to do manual process. If the card is invalid sends a message to the user to do manual process.

3. COMPONENTS USED

3.1 ARDUINO MEGA

The Arduino Mega is a microcontroller board which is based on the Atmega2560 (datasheet). It consists of 54 digital input/output pins 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a reset button, an ICSP header, and a power jack. It contains everything needed to support the microcontroller board. The Mega is compatible with most shields designed for the Arduino Duemilanove.

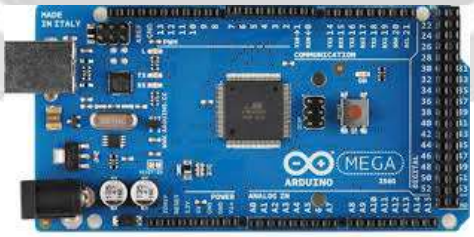

Fig -1 : Arduino Mega

3.2 RFID READER

Radio Frequency Identification Reader is a device used to gather information from an RFID tag. Transfer data from tag to reader. Ranges from 3-300 feet. RFID tags contain integrated circuit; transmit data to the RFID reader**.**

Fig -2 :RFID Reader

4. IMPLEMENTATION

4.1 PROPOSED BLOCK DIAGRAM

In this proposed architecture we use microcontroller Arduino At mega 2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports),a power jack, a 16 MHz crystal oscillator, an ICSP header, a USB connection and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. It has 128 KB of which 4 KB used by boot loader. Divided this memory in to two parts one for programming & other for storing the data.

Initially we register our RFID tag in this microcontroller by providing unique RFID tag for each user. We have used two Ultrasonic sensor initially which is placed before toll system in order to detect the vehicle. This is done because to reduce the voltage & to avoid vehicle nonpayment. ZigBee which is used to transfer the data to the user as well as the system in order to send a message through wireless.

16*2 display module is used to display the sequence of message in this LCD. Bluetooth module is also used to send a message to the user. Through this we can send a alert message whenever the user register for RFID tag. If the balance is less than 20 it sends a message to the user to recharge. RFID reader which reads the RFID tag this is done when ever electromagnetic field touches to the RFID tag. The serial monitor which display's the all the data process which takes place in the system like user unique RFID tag number, balance query. Power supply is given in 5v. DC motor which is used for opening and closing the gate. To drive this motor L293 motor drive is used.

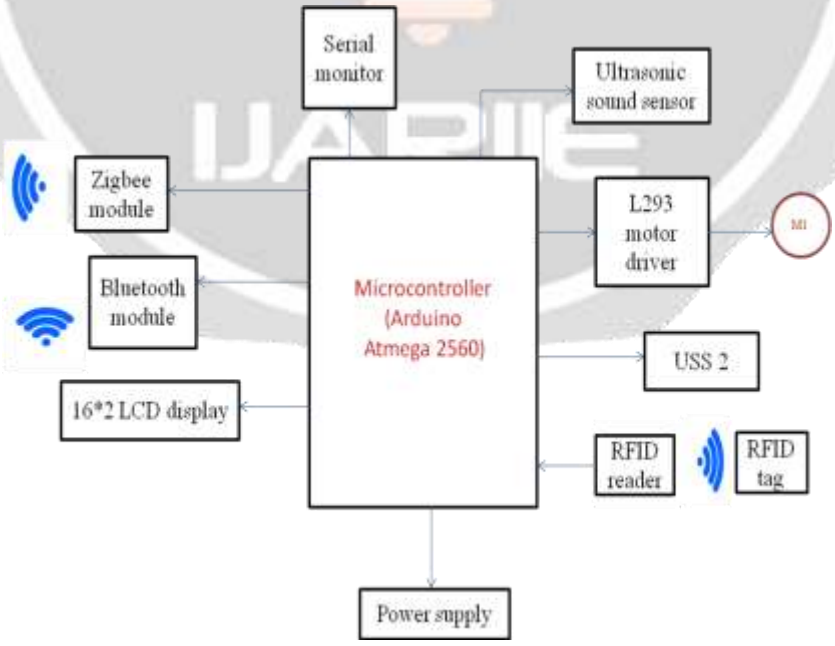

Fig -3 : Architecture of proposed system

4.2 Flow chart of the proposed system

In this flow chart which specifies about the user process and toll system. After user is registered the RFID tag gets a new unique tag number. It sends a message to the user if balance is less than 20 through Bluetooth module. This will be Stored in our hardware module. Whenever the user is near the toll ultrasonic sensor detects the vehicle & whenever the user place the card& if that card is valid & has minimum balance detect the amount. Sends a message to the user the detected amount & the remaining balance & the gate opens. If the user is not registered & uses the toll facility by using unregistered RFID tag. RFID tag number is checked in our hardware module compares and if it is not matched sends a message to the user as invalid card so please register and use it. Whenever the user place the card & if the card is valid & has no minimum balance, sends a message to the user the balance is low & to get recharge.

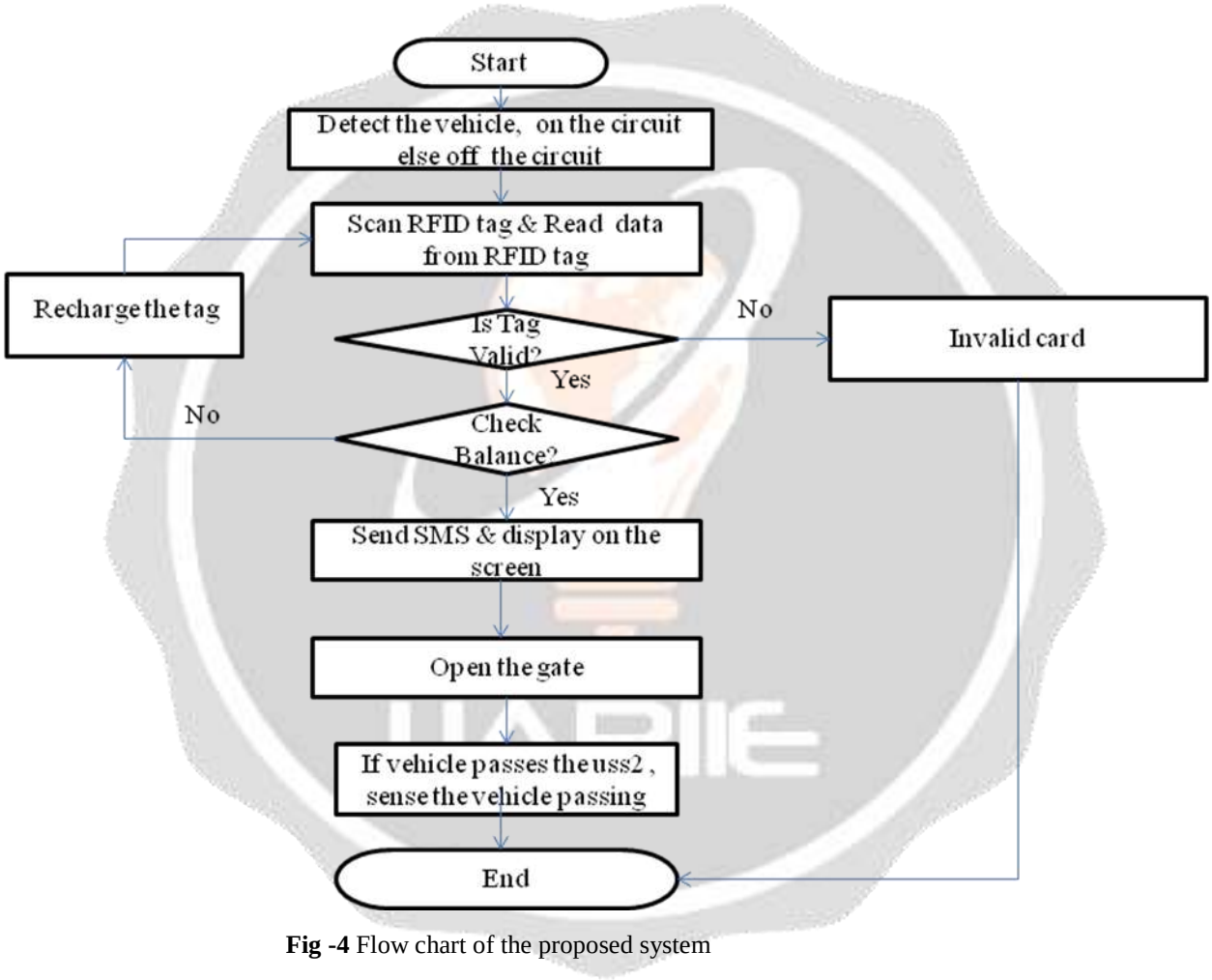

Fig -4 Flow chart of the proposed system

5. RESULT

We have tested the results which are mentioned below

Table-5*:* Toll system properties

Sl no.	*Name*	*RFID tag no.*	*Balance amount*	*Detected amount*	*Towards*
1	*Ramesh*	*55827*	*50*	*10*	*North*
2	*Suresh*	*55324*	*30*	*10*	*South*
3	*Rajesh*	*65432*	*50*	*10*	*East*
4	*Vittal*	*33234*	*40*	*10*	*West*

When the user is registered gets a RFID tag which has unique number .So that if in case if any robbery happens then the user card will be blocked immediately. Could achieve efficient voltage consumption as well time & traffic by doing the process automatically by using RFID technology with ZigBee& sensors collaborated. RFID tag can be used as a pay tm no needs to maintain a separate account for this. Reduces the man power for the collection of money and also to reduce the traffic indirectly resulting in reduction of time in the toll-setup.

Fig- 5 proposed module of the toll system

6. CONCLUSION

Automatic process can be done without manual process by sending alert message to the user whenever the balance is less than 20 or after the registration process. This process of using toll system which can be done in efficient & reliable manner. Reduce traffic jam near toll system.

7. FUTURE SCOPE

Whole data can be stored in cloud based server in order to store & retrieve the data of the user as well can develop a web HTML page for registration process in real time scenario. As focused on doing some contribution to upcoming digitized India we have proposed an idea towards doing the things automatic without manual process. In future can make work as real time without doing manual process everything can be done automatically in the toll system.

8. REFERENCES

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