Automated Highway Entrance Management System

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Introduction

Automated Highway Entrance Management System is a complete system which helps to manage the complex and time consuming manual tasks of present system in to a very efficient automated manner.

Specialty of toll based highway is traveler have to pay some amount of money for using highway. Main intention of Highway is help to achieve transportation in less time. But it may take time of user for its toll collecting process at entering and leaving gates. This process may causes for traffic at these points.

This system provide automated method for toll collecting and other functions bind with its process and eventually save time of traveler and increase productivity of Highway. The system reduces the manual tasks occur at highway entering and leaving gates.

Materials and methodology

Complete system consisted of two major components which were Desktop application and Web application.

Desktop application was developed using Visual C# as main programming language with following technologies Radio frequency Identification technology (RFID), Microsoft .(dot)Net framework, MySQL database and AT commands.

Vehicles were registered to the system and given unique id and RFID tag. Tag was used to identify the unique id of each vehicle using a RFID reader. Each vehicle was given monetary account to deduct toll charges. To enter highway required predefined minimum balance in account. These registrations were done using desktop application and required data was stored in MySQL database.

Desktop application was installed on computers at entering and leaving gates of highway. RFID reader was fixed at gates and connected to computers which installed desktop application.

Presence of a vehicle at entering gate was identified by sensor based electronic unit at gate and notified to computer through serial port communication. Then computer read RFID tag of vehicle using RFID reader and authorize entering to highway automatically.

At leaving gate vehicle was identified with similar procedure as in entering gate and deduct appropriate toll charges from its account automatically. Vehicle owner is informed about the deducted amount and current balance using sms.

Desktop application was authorized using login system. Accessibility to functions of desktop application was restricted to operator base on operator's authority level. Operators can increase account balance of vehicles when payments received from vehicle owner. Operators can obtain reports on highway usages using application.

Super level user of desktop application was able to create new operator user accounts, increase / decrease authorization level of other accounts or deactivate accounts.Web

application was built using Asp.net with C# as server side language and technologies such as HTML, Ajax, CSS, JavaScript, SMTP server and PayPal API for user payments.

Users were able log in to their dedicated account through web application from anywhere using internet and increase balance of their account using PayPal.

People who visit main page of web application were able to find out number of vehicles on highway at that time.

Registered users were able to obtain reports on their account and highway usages. Web application was provided additional functions such as reset password in case of loss password and change password for account.

Results and Discussion

In manual toll based highway roads vehicle have to stop at entering gate and ask for a ticket by providing vehicle number and other details. When leaving the high way again have to submit it and base on entering gate of the ticket user is informed the amount. Then user had to pay it with money and get balance if there is any. This process is done by all vehicles and a popular highways may used by thousands of vehicle per day. So the process creates traffic at gates and drastically reduces the effectiveness of highways.

Due to this system registered vehicles were not needed to stop and wait at entrance gate to provide details and obtain a ticket. A ticket is not required with this system to identify the entering gate of a vehicle. Because when a vehicle enter the details of vehicle and entering gate is stored in centralized data base. So at this gate vehicles are not wasting time by stopping and so it is not creating traffic as manual system.

At leaving registered vehicles were not needed to stop and wait to give the ticket that they received at entering and pay the amount. Because appropriate amount is automatically deducted from the account and vehicle owner is notified about that transaction via sms. So at leaving gate no need to waste time for payments and getting balance and all, which reduce traffic at leaving gate unlike manual system.

In manual system payments are done using cash and there required obtaining balance. This requires some considerable amount of time. But in this system usage amount is automatically deducted from a special account of user. After amount of this account is get lower than predefined minimum value user can increase its value.

In present people use to do most of the payments using internet, this facility is given to vehicle owners of this highway system. They can increase the amount of money that they can use for highway payments by accessing the web application.

Facility to generate reports of highway usages is added advantage for registered users. In a company or any other place where they required usages and amount of money spent as toll charges is easy to get know using web application.

In other way for the administrators of highway also having proper records on highway usages and they can analyze those data easily through generated reports by system for their purposes.

With the time highway system of a country may get extend and will add more entering and leaving gates. As this system is built to support any extending of the highway it is not required to build or edit the software again to support the change by spending lot of money.

Conclusion

Study showed that using RFID technology with software engineering can develop a useful system to achieve effectiveness in a toll base highway road.

References

Miles S.B. Sharma S.E. Williams J.R., (eds), 2008. RFID technology and applications, Cambridge University press, UK.