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An Internet of Things Approach for RFID Smart Toll Gate Automation

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***Abstract*: In this project we proposed a very fast and efficient way of toll gate billing system. This project also deals with the traffic problems faced by the ambulances within the specified radius of the tollgate. Energy Harvesting is also proposed in this toll gate.**

***Keywords*: Ambulance, GPS, RFID, Piezoelectric effect, Toll gate, Traffic.**

1. Introduction

In, toady's world traffic has become a very large problem. According, to statistics ambulances which are stuck in traffic are not reaching the specifies destination in the exact time. So, this motivated and inspired me to improve the current toll gate system, which causes a huge traffic jam in the peak hours. In our proposed system we would like to implement the idea of blocking a lane in the toll gate until the ambulance passes the toll gate, which may considerably reduce the life loss and causalities involved in the delay of ambulances. Additionally, energy harvesting through piezo electric materials is also being done. As, the piezo electric materials are put in the speed breakers or the road as approaching the toll gate

2. Guidelines

A. Smart toll gate

In the proposed system, The Internet server maintains all the data of user accounts and their balance. All vehicle owners would possess, and RFID based card that stores their account number. Our system at toll booths will monitor the cards scanned when a car arrives at the toll booth. The system now connects to the online server to check if the card is valid and if valid what is the balance.

If user balance is enough, the user balance is deducted online, and web system sends signal back to the card scanner system that the user has been billed. On receiving this signal, the system operates a motor to open the toll gate for that car. If the user has insufficient balance, he/she can pass through the toll gate three times, after which he would be blocked from passing through. Also, system allows to store data of all the vehicles passed at time intervals for later reference and surveillance. This system thus automates the entire toll booth collection and monitoring process with ease using RFID plus IOT based system. An IR sensor will also be used to detect if the vehicle is entering the toll gate.

B. Ambulance unit

Whenever an ambulance is recognized within 3 kms radius of the toll gate then a separate lane for the ambulance would be blocked for the free passage of the ambulance without any hassle. This is done by installing a GPS unit in the ambulance which is connected to an IOT board which would indicate the presence of ambulance in the radius of the toll gate. The GPS locations of the ambulances are stored in a cloud server, where all the entries are recorded, and the locations of the ambulances are seen through Google Maps. After passing of the ambulance the lane which is blocked will be functioning as usual. This module in the proposed project will be solving the issues facing by the ambulances in heavy traffic.

C. Energy harvesting

Whenever an oncoming vehicle passes over a speed breaker, the speed bump is made is such a way that it deflects vertically. This regression is released as thermal energy. Using a synthetic speed breaker with embedded piezoelectric generators, part of this energy the vehicle expands on speed breakers deformation is transformed into electric energy through direct piezoelectric effect instead of being wasted as thermal energy. The mechanical energy is derived from the compression stress created during the vehicles' movement on speed breaker. The vertical regression of speed breaker is proportional to the vehicle weight. Energy is harvested in this part of speed breaker vertical deformation, which is a percentage from the total energy of the vehicle. The piezoelectric material is sandwiched between upper and lower components of synthetic speed breakers In India, there is a lack of speed breakers in critical zones of roads and accident-prone areas, hence by implementing the synthetic speed breakers at the critical zones of roads, the streets and roads are more secure, and the number of accidents caused can be minimized. By doing this, the amount of energy generated is also more.

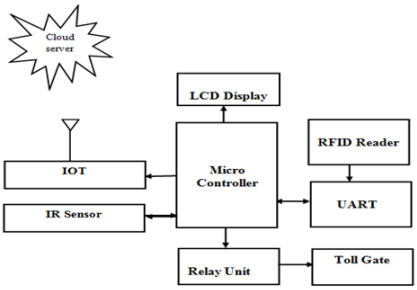

Fig. 1. Block diagram of small toll gate

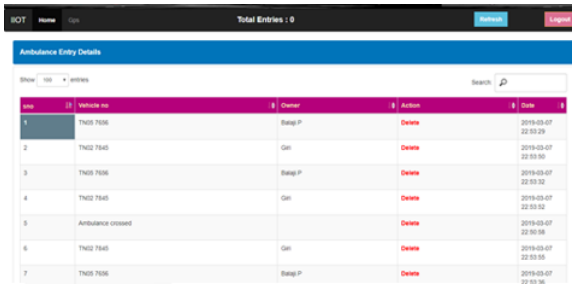

Fig. 2. Data Entries of Vehicles and Ambulances

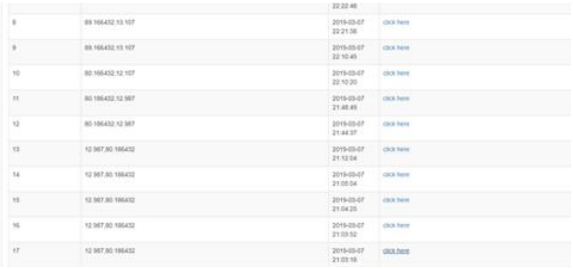

Fig. 3. GPS Location Details of Ambulances

3. Conclusion

This paper presented the implementation of internet of things approach for RFID smart toll gate automation.

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