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Intelligent Transportation Systems using RFID

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ABSTRACT

The electronic toll collection using RFID & mobile application is a technology that will allow user to make the payment of highway tolls automatically. This terminology will in turn save the time as well as the money by decreasing the waiting time as well as the queues of vehicles at the tollbooth. The RFID tag will be deployed by the toll authority by embedding unique identification number (UIN) and customer's details into the tag. The deployed active RFID tag will be attached to the windshield of the vehicle. Whenever the vehicle passes through the tollbooth, tag data will be read by RFID reader & same will be sent to the server for verification. Server will check tag details & depending upon the type of the vehicle, the toll amount will be deducted from the user's account. The notification about the toll amount deduction will be sent to the cus-tomer via SMS and email as well. The developed android application will be used to recharge the customer's account. The focus of this article is to briefly describe new proposed system "Toll snapping and processing system" and study of different ETC system. The Toll collection system's are always in news for corruptions. The person who collects amount from vehicles at toll booth, leaves vehicles by toll collection from them and don't give them proper receipts. Also sometimes he charges them less amount than actual toll tax. Collection costs can absorb up to one-third of revenues, and revenue theft is considered to be comparatively easy. They require vehicles to stop or slow down, manual toll collection wastes time and raises vehicle operating costs. Thus to eliminate the corruption, and to keep data centralized and to make the toll automated with less human intervention we can develop "Toll snapping and processing system".

Keywords: Electronic toll, RFID, UIN, ETC.

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I. INTRODUCTION

Black The Intelligent Transportation Systems Strategic Deployment Plan for the Sacramento Region is aplanning document that defines how advanced technologies can support the transportation and land use planning initiatives in the region to help planners to achieve the region's planning objectives. Results of the Strategic Deployment Plan will help determine how and when to incorporate advanced technology in transportation projects, and which technologies to use. By integrating the Strategic Deployment Plan with other regional planning initiatives such as the Sacramento Region Blueprint and the Metropolitan Transportation Plan, and by incorporating lessons learned when other agencies deploy similar technologies; the planning partners can realize the benefits from coordination, shared investments, and multimodal integration while working towards common regional goals. The Strategic Deployment Plan suggests some tools and techniques for including advanced technologies in the planning and deployment stages of regional development, and key strategies for building upon the existing regional advanced technology framework. The Intelligent Transportation Systems Strategic Deployment Plan for the Sacramento Region is a planning document that defines how advanced technologies can support the transportation and land use planning initiatives in the region to help planners to achieve the region's planning objectives.

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II. LITERATURE SURVEY

Global Positioning System (GPS): Embedded GPS receivers in vehicles' on-board units, receive signals from several different satellites to calculate the vehicle's position. This requires line of sight to satellites. GPS is the core technology behind many in-vehicle navigation and route guidance systems. Several countries, notably Holland and Germany, are using satellite-based GPS devices to record miles traveled by automobiles. [2]

Dedicated-Short Range Communications (DSRC): DSRC is a short- to medium-range wireless communication channel, operating in the 5.8 or 5.9GHz wireless spectrum, specifically designed for automotive uses. Critically, DSRC enables two-way wireless communications between the vehicle and roadside equipment. DSRC is a key enabling technology for many intelligent transportation systems, including vehicle-to-infrastructure integration, vehicle-to-vehicle communication, adaptive traffic signal timing, electronic toll collection, electronic road pricing, information provision, etc. DSRC is a subset of radio frequency identification (RFID) technology. The technology for ITS applications works on the 5.9GHz band or the5.8GHz band. At present, DSRC systems in Europe, Japan, and the United States are generally not compatible. Wireless Networks: Similar to technology commonly used for wireless Internet access, wireless networks allow rapid communications between vehicles and the roadside, but have a range of only a few hundred meters. However, this range can be extended by each successive vehicle or roadside node passing information onto the next vehicle or node.[2]

Mobile Telephony: ITS applications can transmit information over standard third or fourth generation (3G or 4G) mobile telephone networks. Advantages of mobile networks include wide availability in towns and along major roads. However, additional network capacity may be required if vehicles are fitted with this technology, and network operators might need to cover these costs. Mobile telephony may not be suitable for some safety-critical ITS applications since it may be too slow. Radiowave or Infrared Beacons: Japan's Vehicle Information Communications System (VICS) uses radio wave beacons on expressways and infrared beacons on trunk and arterial roadways to communicate real-time traffic information. VICS uses 5.8GHz DSRC wireless technology.[3] Roadside Camera Recognition: Camera or tag-based schemes can be used for zone-based congestion charging systems or for charging on specific roads. Such systems use cameras placed on roadways where drivers enter and exit congestion zones. The cameras use Automatic License Plate Recognition (ALPR), based on Optical Character Recognition technology, to identify vehicle license plates; this information is passed digitally to backoffice servers, which assess and post charges to drivers for their use of roadways within the congestion zone.[3]

III. METHODOLOGY

In this phase we collect the actual data regarding our transportation system. Which is very valuable for the system design? Here we attach the architecture-

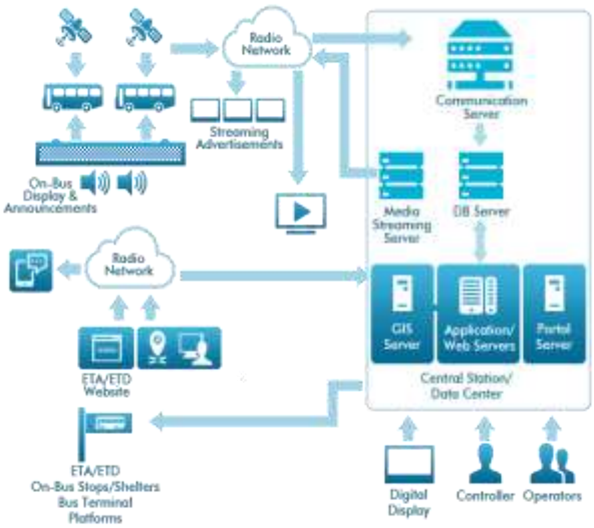

Figure 1: Actual Design

Step 1 :

It occurs when the ITS project is added to the Transportation Improvement Program (TIP). The lead agency makes a preliminary classification of the project as High-Risk, Low-Risk, or Exempt. If the project is Exempt, then the remainder of the process is exactly the same as for a traditional road building project.

Step 2 :

It occurs when initial funding is requested. As part of the E-76 application package, the Project Manager must fill out a Systems Engineering Review Form (SERF), which consists of seven questions. Based on the answers, the project is classified as Low-Risk or High-Risk, then proceeds accordingly.

Step 3 :
Risk projects, the remainder of the process are exactly the same as for a traditional road building project. Step 3b – For High-Risk projects, the traditional road building process is not appropriate. Instead, the best approach is usually a Systems Engineering process. There are two funding cycles in this process – one at the beginning and the second after most of the design is complete (before implementation begins). A Systems Engineering Management Plan (SEMP) must be completed during the first funding cycle to help manage the implementation and testing.

Step 5-Testing
Transportation testing is an investigation conducted to provide stakeholders with information about the quality of the product or service under test. Transportation testing can also provide an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation.

Step 6- Implementation and Maintenance
In this phase we actually implement the system. How to use sensors to prevent accidents in vehicular environment is an interesting issue. Vehicles are equipped with OBU (On-Board Unit) and use the OBU to query information if the coordinator or RSU (Road-Side Unit) is located in its communication range. This system also distributed events into different priority due to the different damages. For your example, RSU collects and analyzes the roadside information for the driver's safety and which provides to an OBU and a management system according to the service priority. In the higher rank terminal, the developed IP-based set-top box application provides information such as the traffic information, road environmental information, environmental sensor station error, and etc. The system has a high potential to improve traffic in two ways. First, it collects local environmental data and passes it to a central facility to further process it and pass it to vehicles. Second, it takes care that urgent local information is passed directly and thus quickly to local vehicles which increases traffic safety. The paper presents architecture to connect a USN (Ubiquitous Sensor Network) with the IT'S (Intelligent Transport System) consisting of connected OBU and RSU. The goal of the system is to provide the ITS with local environmental data gathered by the USN nodes.

IV. RESULT

Comparison Between Manually Operating Toll Plaza And Electronic Toll Plaza At Mumbai Ahmedabad Highway, Worali

Characteristics	Manual Operating Toll Plaza	Electronic Toll Plaza
Time per vehicle passing	3-4 Min.	3 Sec.
Cost	Less	More
Maintenance	More	Less
Economic	Less	More
Manpower	More	Less
Life	Less	More
Payment Type	Manual	Automatic
No. of vehicles pass per day	More	Less
Corruption	More	Less

Table No. 1

V. CONCLUSION

From whole study of our project it is clear that most of the ETC studies have been based in the developed counties. In developing countries still much work is needed in this field to solve the emerging traffic related problems. Most of the ETC system has been developed on the sensors. While sensor platform provides very powerful spatial analysis techniques.

Hence we concluded that -
1. ETC provides very good customers service and it is safe for all human beings.
2. ETC reduce stops, delay at intersections, road accidents and fatalities.
3. ETC making innovative use of available technology.
4. ETC requires less time, fuel consumption and emission and noise pollution.
5. ETC provides credible, reliable and timely traffic information and vulnerable road users and movement of freight.
6. ETC promoting sustainable modes of transport and modal shift to public transport.
7. ETC improves travel time, condition of environment and reliability of journey time.

8. ETC requires less possibility for any type of work delay and frustration.
9. ETC mitigating the effects of traffic congestion.
10.ETC improve speed and control it.also it manage the incident occurrence.

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