Intelligent Transportation System Using IOT

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Abstract – Internet of things plays a key role in the innovative development in certain industries. Internet of things is used in home automation such as smart city, smart parking system, smart farming, smart irrigation and smart grid etc. and so on. Over the past decades intelligent transportation system have developed and deployed in order to improve transportation safety, mobility, reduces environmental impact, promotes sustainable transportation development and enhances the productivity. Intelligent transportation system (ITS) combines high technology and improvement in information systems, communication, sensors, controllers and so on with the conventional world of transportation infrastructure. The ITS uses the toll administration. The prospect of ITS is to focus as new technologies which become available.

Index Terms – Sensors, toll administration, controllers.

1. INTRODUCTION

In this paper we propose an ITS architecture which is based on the requirement technology to sort out the traffic congestion issue that lie behind the intelligent transportation system. The smart toll leverages technology like number plate detection to charge the user account so that the vehicles do not have to wait near the toll gates. Basically, on state or national highways we will find the toll gates and instead of paying money to the toll gate we use a smart card with the RFID tag where we can recharge the smart card. Transport demand in most of the Indian cities has increased substantially due to increase in population as a result of both natural increase and migration from rural areas and small towns. Quantitatively, the available public transport services are overcrowded particularly during peak hours and involve long waiting periods.Importance of this smart system helps in enhancing the process and increases the efficiency of fare collection and congestion management. The system consists of a scanner subsystem to scan the smart cards which can be topped up by the recharge centers. Thus, the amount gets deducted from passenger smart card. This enhances the proper utilization of the resources, reduces the time and serves to be economic for the citizens. The amount of the smart card is just rupees 100. In that smart card we can recharge the maximum amount up to 500 rupees. In this paper we propose an ITS architecture which is based on the requirement technology to sort out the traffic congestion issue that lie behind the intelligent transportation system. The smart toll leverages technology like number plate detection to charge the user account so that the vehicles do not have to wait near the toll gates. Basically, on state or national highways we will find the toll gates and instead of paying money to the toll gate we use a smart card with the RFID tag where we can recharge the smart card. Transport demand in most of the Indian cities has increased substantially due to increase in population as a result of both natural increase and migration from rural areas and small towns. Quantitatively, the available public transport services are overcrowded particularly during peak hours and involve long waiting periods. The system consists of a scanner subsystem to scan the smart cards which can be topped up by the recharge centers. Thus, the amount gets deducted from passenger smart card. This enhances the proper utilization of the resources, reduces the time and serves to be economic for the citizens. The amount of the smart card is just rupees 100. In that smart card we can recharge the maximum amount up to 500 rupees. ITS various users to be better informed, make safer more coordinated and smarter use of transport networks. The benefits of the transportation system are: It reduces time and resources required to integrate the technologies to local needs. Helps identify agencies and jurisdictions & seeks their participation. ITS various users to be better informed, make safer more coordinated and smarter use of transport networks. The benefits of the transportation system are: It reduces time and resources required to integrate the technologies to local needs.

2. PROPOSED SYSTEM

Customers through the associated clouds including a conventional cloud and a temporary cloud (vehicular cloud) [3]. The conventional cloud is composed of virtualized computers and provides SaaS, PaaS, and IaaS to interested customers. The following are used in proposed system for the intelligent transportation system are:

- ➢ Scan the smart card using the scanner system: Before travelling on the highways.
- ➢ Store the data in the database

- Calculate the toll fare for the national or state highway
- Recharge the smart card: To use this card, the user has to regularly recharge the card at the recharge centers.

Nowadays the concept of smart cities became more popular. The evolution of internet of things (IoT) helps the idea of smart city more achievable. A major branch of smart city is smart transportation. The term Intelligent Transportation System(ITS) encompasses the subsets of information and communications technologies that applies to operational transportation, aiming to make transport systems smart, efficient, reliable, safe and environmentally sustainable. Herein, the purpose of intelligent and smart transportation system is to create organized, clean and hassle-free structures for managing transportation. Primarily, the ever-growing traffic congestion, high rate of pollution and higher instances of accidents are the major factors paving the way for countries around the world to adopt intelligent transport systems and consequently trim-down these critical issues. IoT in intelligent transportation system is not only being widely leveraged for traffic management and smart parking solutions but also for fleet management, telematics solutions, passenger entertainment and security solutions. Furthermore, the IoT enabled ITS helps in advancing transportation management systems which include management of networking solutions and electronic toll collection. Intelligent transportation systems are revolutionizing the way people and goods move through busy cities and traffic corridors. With the integration of smart city technologies, including sensors, telematics, connected vehicle technologies and analytics, it is quite easy to optimize traffic patterns and reduce congestion as well as make transportation systems more efficient and reliable. Despite being highly priced, the demand for ITS products is growing at an exponential rate across the world owing to its value-added contribution.

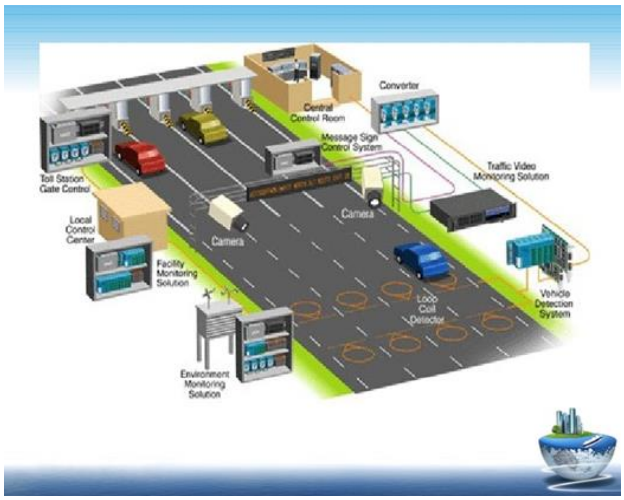

Fig 1.1

People travelling from one place to another for their work have to travel daily and they face this kind of problem. This paper addresses a fare mentioned problem by designing a smart mechanism to handle the fare collection problems. Importance of this smart system helps in enhancing the process and increases the efficiency of fare collection and congestion management.

3. RELATED WORK

Transportation planners in developing countries face a number of problems that require innovative solutions Large increases in urban population and pollution have seriously compromised existing transportation systems and significantly increased the challenge of creating future transportation systems. Despite extensive spending on urban transportation systems, the problems seem to only get worse. India is urbanizing. Its urban population is growing at an average rate of around 3% per year. The average rate of growth of the urban population is not expected to change significantly during the next ten years or so. Assuming decadal increase of around 32%, India's urban population is expected to increase from 377 million in 2011 to 500 million in 2021.

In terms of percentage of total population, the urban population has gone up from 17% in 1951 to 31.8% in 2011 and is expected to increase up to around 35% by the year 2021. However, the number of metropolitan cities – those with a million plus population – has increased sharply over this period. From 35 in 2001, the number of metropolitan cities rose to 50 according to the Census of India, 2011. Out of these 50, eight cities – Mumbai, Delhi, Kolkata, Chennai, Hyderabad, Bangalore, Ahmadabad, and Pune – have population more than 5 million. India's big cities now account for a larger share of total urban population – a trend that has been observed since independence. In 2011, the share of metropolitan cities was 42.3%, up from 37.8% in 2001 and 27.7% in 1991.

The distribution of urban population by city size widely varies and is skewed towards larger cities. One specific feature of India's urbanization is the increasing m, that is, growth in the number and size of cities with a million plus population. The trends indicate the continued urbanization and metropolitaniztion in the years to come. It is now felt that urbanization is necessary for the benefits of sharing modern technology for the growth and development of the entire national economy. In India, urban areas contribute more than sixty percent of the national income. In the coming years, as India becomes more and more urbanized, urban areas will play a critical role in sustaining high rates of economic growth. But, economic growth momentum can be sustained if and only if cities function efficiently - that their resources are used to maximize the cities' contribution to national income. Economic efficiency of cities and well-being of urban inhabitants are directly influenced by mobility or the lack of it.

4. PROBLEM STATEMENT

It is obvious that the introduction of most of the information system functions, mentioned above, are impossible without modern IoT technologies. The latter can enable the intellectual traffic information system to collect, transfer and receive and process the following data from road infrastructure facilities: Information on the level of traffic including the presence of traffic congestion; Information on roadworks location; Information on the road accidents and other. As roads form the circulatory system of the city, there are a lot of stakeholders of the transport infrastructure, who are interested in specific services, provided by it. Among the key stakeholder groups there are: people (citizens and tourists), business (transport operators, taxi, etc.), city government, emergency and security agencies. As roads form the circulatory system of the city, there are a lot of stakeholders of the transport infrastructure, who are interested in specific services, provided by it. Among the key stakeholder groups there are: people (citizens and tourists), business (transport operators, taxi, etc.), city government, emergency and security agencies. Intelligent Transportation System (ITS) is an emerging transportation system which is comprised of an advanced information and telecommunications network for users, roads and vehicles.

A broad range of diverse technologies, known collectively as intelligent transportation systems (ITS), holds the answer to many of our transportation www.studymafia.org 6 problems. ITS is comprised of a number of technologies, including information processing, communications, control, sand electronics. Joining these technologies to our transportation system will save lives, save time, and save money. The future of ITS is promising. Yet, ITS itself, is anything but futuristic. Already, real systems, products and services are at work throughout the world. Still, the wide-scale development and deployment of these technologies represents a true revolution in the way we, as a nation, think about transportation.

While many aspects of our lives have been made more pleasant and productive through the use of advanced technologies, we have somehow been content to endure a transportation system whose primary controlling technology is the four-way traffic signal -- a technology that has changed little since it was first invented. It has taken transportation a long time to catch on, but now the industry is sprinting to catch up. Fulfilling the need for a national system that is both economically sound and environmentally efficient requires a new way of looking at -- and solving -- our transportation problems. The decades-old panacea of simply pouring more and more concrete neither solves our transportation problems, nor meets the broad vision of an efficient transportation system. Traffic accidents and congestion take a heavy toll on lives, productivity, and wastes energy. ITS enables people and goods to move more safely and efficiently through a state-of-the-art, intermodal transportation system. Interest in ITS comes from the problems caused by traffic congestion and a synergy of new information technology for simulation, real-time control, and communications networks. Traffic congestion has been increasing worldwide as a result of increased motorization, urbanization, population growth, and changes in population density. Congestion reduces efficiency of transportation infrastructure and increases travel time, air pollution, and fuel consumption.

5. MODULE DESCRIPTION

ARDUINO: Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming.

As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide. The Arduino Uno is a microcontroller board based on the ATmega328. Arduino is an open-source, prototyping platform and its simplicity makes it ideal for hobbyists to use as well as professionals.

The Arduino Uno has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, 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. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or Breadboards (shields) and other circuits. The boards feature serial communications interfaces, including Universal serial bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an Integrated development environment (IDE) based on the processing language project which is as shown in figure 3.1.

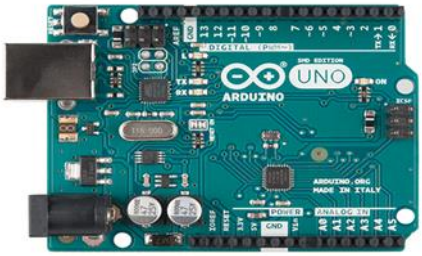

Fig 3.1

Scanner: QR code (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional barcode) first designed in 1994 for the automotive industry in Japan. A barcode is a machine-readable optical label that contains information about the item to which it is attached. A QR code uses four standardized encoding modes (numeric, alphanumeric, byte/binary, and kanji) to store data efficiently; extensions may also be used. The Quick Response (QR code) system became popular outside the automotive industry due to its fast readability and greater storage capacity compared to standard UPC barcodes. Applications include product tracking, item identification, time tracking, document management, and general marketing. A QR code consists of black squares arranged in a square grid on a white background, which can be read by an imaging device such as a camera, and processed using Reed–Solomon error correction until the image can be appropriately interpreted. The required data is then extracted from patterns that are present in both horizontal and vertical components of the image. The QR code system was invented in 1994 by the Japanese company Denso Wave. Its purpose was to track vehicles during manufacturing; it was designed to allow high-speed component scanning. QR codes are now used in a much broader context, including both commercial tracking applications and convenience-oriented applications aimed at mobile-phone users (termed mobile tagging) which is as shown in figure 3.2.

QR codes may be used to display text to the user, to add a vCard contact to the user's device, to open a Uniform Resource Identifier (URI), or to compose an email or text message. There are a great many QR code generators available as software or as online tools. The QR code has become one of the most-used types of two-dimensional code. QR codes have become common in consumer advertising. Typically, a smartphone is used as a QR code scanner, displaying the code and converting it to some useful form (such as a standard URL for a website, thereby obviating the need for a user to type it into a web browser). QR code has become a focus of advertising strategy, since it provides a way to access a brand's website more quickly than by manually entering a URL.

Beyond mere convenience to the consumer, the importance of this capability is that it increases the conversion rate: the chance that contact with the advertisement will convert to a sale. It coaxes interested prospects further down the conversion funnel with little delay or effort, bringing the viewer to the advertiser's website immediately, where a longer and more targeted sales pitch may lose the viewer's interest. Although initially used to track parts in vehicle manufacturing, QR codes are used over a much wider range of applications. These include commercial tracking, entertainment and transport ticketing, product and loyalty marketing and in-store product labelling. Examples of marketing include where a company's discounted and percent discount can be captured using a QR code decoder which is a mobile app, or storing a company's information such as address and related information alongside its alpha-numeric text data as can be seen in Yellow Pages directory. They can also be used in storing personal information for use by organizations.

Fig 3.2

SMART CARD READER :A card reader is a data input device that reads data from a card-shaped storage medium. The first were punched card readers, which read the paper or cardboard punched cards that were used during the first several decades of the computer industry to store information and programs for computer systems. Modern card readers are electronic devices that can read plastic cards embedded with either a barcode, magnetic strip, computer chip or another storage medium. A memory card reader is a device used for communication with a smart card or a memory card. A magnetic card reader is a device used to read magnetic stripe cards, such as credit cards.[1] A business card reader is a device used to scan and electronically save printed business cards. If the card does not use any standard transmission protocol, but uses a custom/proprietary protocol, it has the communication protocol designation T=14.[2] The latest PC/SC CCID specifications define a new smart card framework. This framework works with USB devices with the specific device class 0x0B. Readers with this class do not need device drivers when used with PC/SC-compliant operating systems, because the operating system supplies the driver by default. PKCS#11 is an API designed to be platform-independent, defining a generic interface to cryptographic tokens such as smart cards. This allows applications to work without knowledge of the reader details which is as shown in figure 3.3. A smart card is a device

that includes an embedded integrated circuit chip (ICC) that can be either a secure microcontroller or equivalent intelligence with internal memory or a memory chip alone. The card connects to a reader with direct physical contact or with a remote contactless radio frequency interface. Smart cards can be either contact or contactless smart card. Smart cards can provide personal identification, authentication, data storage, and application processing. Smart cards may provide strong security authentication for single sign-on (SSO) within large organizations. Smart cards have been advertised as suitable for personal identification tasks, because they are engineered to be tamper resistant. The chip usually implements some cryptographic algorithm. There are, however, several methods for recovering some of the algorithm's internal state. Differential power analysis involves measuring the precise time and electric current required for certain encryption or decryption operations. This can deduce the on-chip private key used by public key algorithms such as RSA. Some implementations of symmetric ciphers can be vulnerable to timing or power attacks as well. Smart cards can be physically disassembled by using acid, abrasives, solvents, or some other technique to obtain unrestricted access to the on-board microprocessor. Although such techniques may involve a risk of permanent damage to the chip, they permit much more detailed information (e.g., photomicrographs of encryption hardware) to be extracted.

Fig 3.3

6. SYSTEM ARCHITECTURE

The conventional cloud is composed of virtualized computers and provides SaaS, PaaS, and IaaS to interested customers. For example, cloud management services and many traffic administration applications can be hosted on the conventional cloud. The temporary cloud is typically formed on demand and is composed of under-utilized computing, networking and storage facilities of vehicles and is designed to expand the conventional cloud in order to increase the whole cloud‟s computing, processing and storing capabilities. The temporary cloud supports a compound of SaaS, PaaS, and IaaS and primarily hosts highly dynamic vehicular applications which may have issues running on the conventional clouds [26]. For example, traffic-related applications and smart parking applications are suitable for the temporary cloud. The temporary cloud often needs to communicate with the conventional clouds and there is a frequent exchange of data and services between the two clouds [1]. Based on the layered architecture in Fig. 1, heterogeneous IoT-related devices, network, community technologies and cloud-based services on different layers can be integrated to exchange information, share resources and collaborate on the clouds. By integrating various devices such as sensors, actuators, controllers, GPS devices, mobile phones and other Internet access equipment's and employing networking technologies (wireless sensor network, cellular network, satellite network and others), cloud computing, IOT, and middleware, this platform supports V2V and V2I communication mechanism and is able to collect and exchange data among the drivers, vehicles, and roadside infrastructure such as cameras and street lights. The goal of this platform is to provide real-time, economic, secure and on-demand services to customers through the associated clouds including a conventional cloud and a temporary cloud (vehicular cloud) [3]. The conventional cloud is composed of virtualized computers and provides SaaS, PaaS, and IaaS to interested customers. For example, cloud management services and many traffic administration applications can be hosted on the conventional cloud. The temporary cloud is typically formed on demand and is composed of under-utilized computing, networking and storage facilities of vehicles and is designed to expand the conventional cloud in order to increase the which is as shown in figure 4.1.whole cloud's computing, processing and storing capabilities. The temporary cloud supports a compound of SaaS, PaaS, and IaaS. and primarily hosts highly dynamic vehicular applications which may have issues running on the conventional clouds [2].

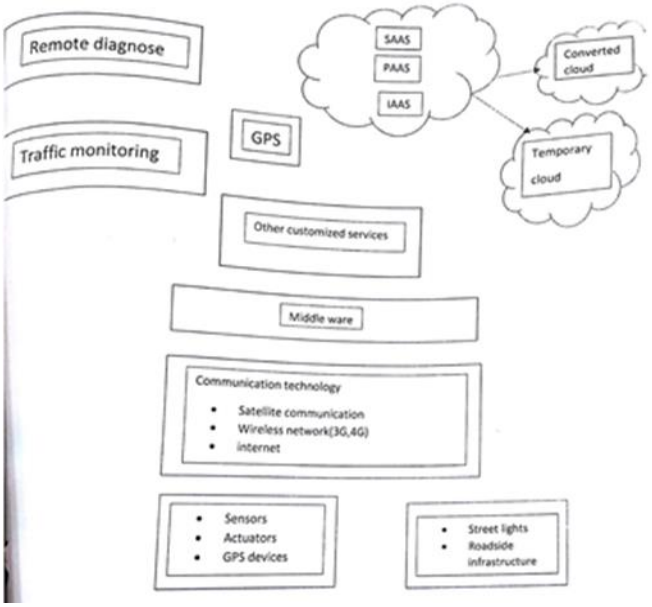

Fig 4.1

7. RESULT

In this paper the proposed architecture describes that about the intelligent transportation system we use the smart card which tries implement the intelligent transportation system for the toll administration where we can recharge the card the smart card in any of the recharge centers. In future this proposed system is going be implemented by using the internet of things technology.

8. CONCLUSION

The proposed system solves all the problems existing on bus ticket change problems. The modules used in the systems are easily available and are cost efficient. Less maintenance required and is portable. Model can be easily implemented anywhere. It saves time and sources. And is user friendly can be used easily. This proposed plan stands in support for Digital India concept and it helps in Demonetization reform that is going on in nowadays. Hence as a part of future scope, we can extend this project and implement in every smart city hence supporting Smart City concept also. Thus, a new vehicular cloud architecture called ITS-Cloud was proposed to improve vehicle-to-vehicle communication and road safety.

A cloud-based urban traffic control system was proposed to optimize traffic control. In this security, which concerns every networked environment is a major issue for cloud IoT. Indeed, both its IoT side and cloud side are vulnerable to number of attacks. In IoT context, encryption can ensure data confidentiality and integrity. Full Implementation of Vehicular cloud will provide the better vehicular network. Currently there is ongoing research in the field of VANET, for several scenarios such as traffic scenarios, mobile phone systems, sensor network and future combat system. Based on the layered architecture, heterogeneous IoT-related devices, network, community technologies and cloud-based services on different layers can be integrated to exchange information, share resources and collaborate on the clouds.

In this proposed layered architecture, different layers have different purposes. In general, the layers on the bottom provide a foundational support for the layers on the top. SOA will be applied to integrate different information and communication services and connect in-vehicle and out-vehicle applications seamlessly through the vehicular data clouds. SOA allows vehicular application developers to organize, aggregate, and package applications into new business applications services.

9. FUTURE WORK

In the internet of things technologies the future work of this paper is that we have to decrease the traffic congestion on the roads and whenever there is a rush near the toll administration so we have to implement the intelligent transportation system using internet of tings technologies .This intelligent transportation system uses an radio frequency identification (RFID) reader where it is used to reader the smart card and we can recharge the smart card in any of the recharge centers. The original idea is that the road side infrastructure and the radio equipped vehicles using cloud. By integrating the various devices such as sensors, GPS devices and mobile phones and RFID tag and a smart card. The temporary cloud supports a compound of SaaS, PaaS, and IaaS. and primarily hosts highly dynamic vehicular applications which may have issues running on the conventional clouds [26]. For example, traffic-related applications and smart parking applications are suitable for the temporary cloud. The temporary cloud often needs to communicate with the conventional clouds and there is a frequent exchange of data and services between the two clouds [13]. Based on the layered architecture in Fig. 1, heterogeneous IoT-related devices, network, community technologies and cloud-based services on different layers can be integrated to exchange information, share resources and collaborate on the clouds. „The proposed IoT-based vehicular data cloud platform supports three new cloud services as indicated in TABLE 1. In this proposed layered architecture, different layers have different purposes. In general, the layers on the bottom provide a foundational support for the layers on the top. SOA will be applied to integrate different information and communication services and connect invehicle and out-vehicle applications seamlessly through the vehicular data clouds. SOA allows vehicular application developers to organize, aggregate, and package applications into new business applications services.

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