Intelligent Transportation Systems

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Abstract

To safeguard environment for future generations and to manage urban complexities like economical and social policies; smart and sustainable cities are necessary, means improving urban planning with affordable housing, adequate water supply, creating green public spaces, upgrading slum settlements, investment in public transport and ensuring access to smart usage of ICT's for management. And the key segment in smart sustainable city is to have smart buildings, which are built with intelligent management systems and a vision to reduce environmental challenges by higher usage of renewable sources. It is true that, capital cost for smart buildings will be higher than conventional structures but life cycle cost will be very less and even offers increased safety and more quality to the life by which eventually a person and subsequently the society gets benefited. So, accordingly features of smart building can be designed effectively to meet the requirements which are worthy for smart living.

Keywords: *Conventional, Economy, ICT, Non-renewable, Renewable, Social policy, Sustainability.*

1. Introduction

Intelligent transportation Systems (ITS) defined as, embodying intelligence to transportation. This is an advanced application. ITS can be attained by the usage of cloud where huge amounts of data can be stored and can be accessed from any spot from cloud. Intelligent Transportation systems increases the efficiency of road transport, traffic management and avoidance of accidents.

Intelligent transportation technologies like CCTV surveillance on roads, detection of number plates, determining traffic volume data by sensors, operating of traffic signals at peak timings automatically, parking a vehicle, weather conditions, car navigation. To elucidate this, in an android app called Google maps, it automatically chooses the shortest route to reach the destination and also indicates the traffic delay in the respective routes with different colors (Red, Orange and Blue).

2. Literature Review

2.1. Intelligent traffic signal control system for ambulance using RFID and CLOUD by "B.Janani Saradha, G.Vijayashri, T.Subha"

Ambulance service plays a vital role in saving lives, Sometimes due to traffic lag there is a possibility of delay to reach the nearest hospital. In this paper it was mentioned that nearly 95% of heart attack cases failed, due to delay. To overcome this problem, Intelligent Ambulance transportation systems was developed by using RFID (Radio Frequency Identification) and Cloud computing.

This system mainly comprises of three components (i.e.) RFID, Mobile app and GPS tracker. The IDs can be stored in a microcontroller. A unique tag issued for each ambulance. Antennas provided at regular intervals and a reader provided at an elevation or even mounted on the platform nearer to traffic signals. Antennas

recognize the encroachment of ambulance by means of tag connected to it, Antennas transfers the data to nearest reader which intimates the database to the control signals. This paper also provided a solution for practical problem (i.e.) "If RFID fails", the alternative is that, ambulance driver should have an access to a mobile app in which if data entered as 'blocked' the nearest signal will appear Green keeping the rest in Red. This system is very useful for saving lives in high traffic rate areas (i.e.) Metropolitan cities like New Delhi, Mumbai, Kolkata, Hyderabad, Bangalore, Chennai and Amaravathi.

2.2. Establishing an intelligent transportation system with network security mechanism in an internet of vehicle environment by "Hsin-Te Wu & Gwo-JiunHorng"

Establishing an intelligent transport system with network security mechanism in an internet of vehicle environment. As a part of security process this requires authentication, non-repudiation, conditional anonymity, conditional intractability. This paper mainly aims at providing an ease of access for emergency vehicles even during high congestion periods, peak hours etc., So that the vehicles can reach the destination in time. Network security mechanism can help in solving the accident cases in most of the cases or provide clues in some cases as it gives the information regarding speeds, GPS of vehicle etc. They have taken the Road Side Units(RSU) for the study which ultimately sends the info to CA. To eliminate the storage issues and reduce complexity in encrypting/decrypting codes they have made it simple by creating a similar key mechanism. Studies are being carried out to achieve these results without using Road sideunits.

2.3. A study of enhancing privacy for intelligent transportation systems by "Peipei Sui, Xianxian Li, Yan Bai"

With the introduction of IoT the information of a person is stored and used for the big data analysis during different studies. This sometimes may cause harm for the person due to leakage information. Some works are taken up to put check to this but couldn't do it completely. This paper mainly deals with securing the information of user. For the study, location trajectories are taken help of from past. For hiding the sensitive information of person the parking locations are chosen in location trajectories but there is loss of information in this process. Therefore the parking location are generalized with prior permission from users so that there is no loss. The correlation value describes the relationship between user and parking location. Later privacy-protection model is proposed to avoid problems for the user in that location trajectory.

2.4. Blockchain-Based Dynamic Key Management for Heterogeneous Intelligent Transportation Systems by "Ao Lei, Haitham Cruickshank, Yue Cao, Philip Asuquo, CHibueze P. Anyigor Ogah and Zhili Sun – Members of IEEE."

Security management necessity has been increasing from past few decades. ITS plays a crucial role in security services. Security is nothing but preventing collision of vehicles. 82% of accidents can be avoided by involvement of ITS. This can also be used in militant areas. Methodology of security managements explained in this paper. Components involved in security management are Cyber Physical Systems (CPS), Vehicle Communication Systems (VCS), Road Side Units (RSU).

Blockchain mechanism introduced in this journal. This is defined as the public ledger in the form of blocks. This performs two activities (i.e.) Distribution and Decentralization. Traffic area divided into respective security domains. Each domain has four layers (i.e.) Vehicles, RSUs, SMs and Central Manager from layer4 to layer1 respectively. Data collected from different SMs comprises of heterogeneous traffic details and also militants information for security reasons, the collected data can be transferred to CM (Central Manager) for further investigations. Security domains with all the four layers, collection of information from SMs all this collectively called as blockchain Structure.

Blockchain Mechanism thus useful to reduce the dynamic data collection period because of formation of SM cloud to collect the data from all SMs. This paper also made mathematical (Empherical) approach for calculating different transactions collective periods. The main concept of distribution and decentralization can be satisfied by Blockchain Mechanism.

2.5. A real time signal control strategy for mitigating the impact of bus stops at urban signalized interactions by "Jianwei Hu & Huiping Fang"

Have come with an open up strategy for intelligent transport system. For assessment criteria they have considered section saturation, intersection saturation, gateway connection, gateway channelization and load coefficient of peak hour. With the high usage of roads by population these days congestion have become a big threat for the efficient transportation. Due to accidents and lack of land resources there is huge traffic congestion in major cities. However there are methods like odd-evento` license plate, widening roads to minimize the problem. In order to achieve the ease and efficient traffic in the surrounding the residential communities have taken an open up strategy.

2.6. The assessment system of residential community for ITS by "Celeste Chavis & Eleni Christofa"

They have taken up the task on how to reduce the length and congestion at crossings when there is a bus stop present nearer to intersection. Bus stops if not provided it directly occupies a lane which eventually blocks the way for other vehicles. By increasing the green signal when a bus is departing from the bus bay the length of traffic can be minimized provided it doesn't create any problem for the other three ways. This can be done with proper arrival, dwell and departure times of the buses at that particular bus bays.

3. Objective:

To determine the applications of Intelligent Transportation Systems for the newly forming capital of Andhra Pradesh - "AMARAVATHI"

4. Methodology:

Information regarding traffic volume data can be attained by the usage of various technologies like wireless communication, floating car data or floating cellular data, computational technologies, sensing technologies.

In the early years of ITS, mobile networks used to determine the traffic volume. Each mobile transmits signals to the nearest tower even it is not in use (phone call). So when there are more number of mobiles in the same locality the nearest tower get more signals. By using this data to assume traffic volume. The accuracy of this system increases by the increase of cellular towers. This system fails when there are more number of parallel roads, bus stops and any gathering takes place in that locality without disturbing traffic etc.

GPS and RFIDs came into existence in the recent years to detect the vehicles by means of satellite communication and providing antennas on the road side respectively. The accuracy of traffic volume data improved. No infrastructure needed like providing towers etc. for detection, RFID (Radio Frequency Identification) will be given to each vehicle, It is a unique code. Similarly GPS (Global Positioning System) given directly by satellite hence it is also unique to every vehicle.
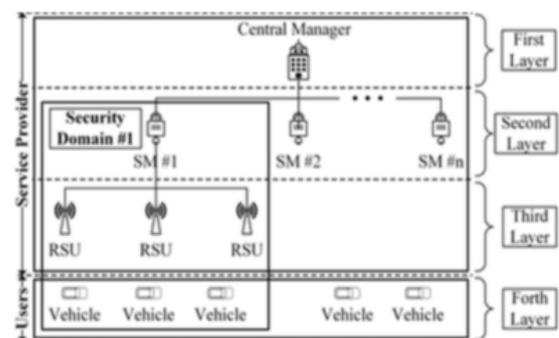

Fig a: Block chain mechanism

In emergency cases ITS plays a vital role, to intimate the nearest hospital about the accident and also to the nearest police station about the collision of two vehicles even in country side location.

Violation of traffic rules by motorists of cars can also be identified by providing sensors or road side (RADARs), which gives complete data about that particular vehicle (i.e.) speed of vehicle, route it has chosen, origin and destination etc. Red light cameras provided to detect the skipping of signals by vehicles and penalty will be registered for that particular vehicle by recording RFID.
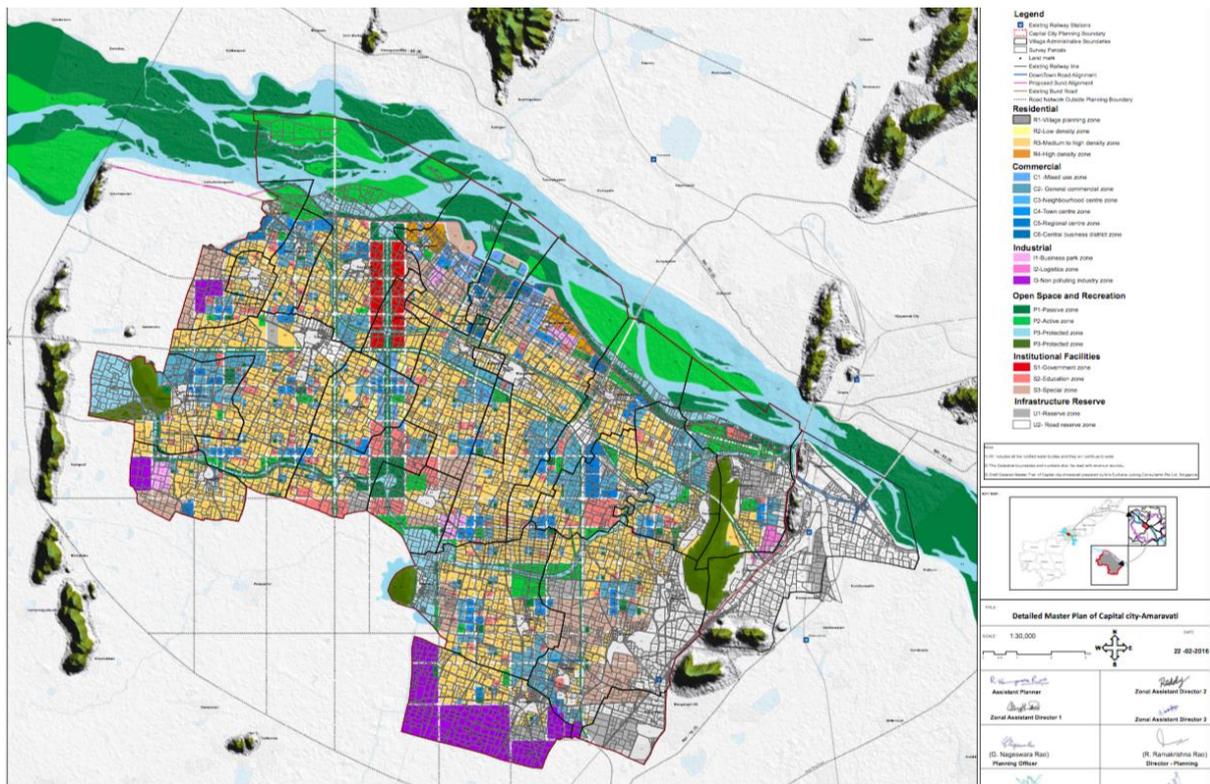
Fig b: Master plan of Amaravati, capital of Andhra Pradesh

5. Applications of ITS for Amaravati:

Since Amaravati is a developing capital several factors in transportation should be taken into consideration like emergency, security, sophistication and communication etc. During the construction of any civil structure for transportation like Metro project or any flyover project there is a need to divert the traffic from construction limits. When there is an increase in traffic, proper system to be initialized to reduce traffic delay (i.e.) 'U – Turn' system, construction of Rotary-intersections and removing Traffic signals. To satisfy all these ITS needed.

5.1. Emergency

Due to the increase in population usage of vehicles also increased proportionally occurrence of accidents also increased. Emergency condition does not arise alone because of accidents, some incidents like heart attacks are also comes under emergency. In literature review [2.1] it was mentioned that 95% of heart attack cases failed due to traffic delay.

As we have seen the plan of Amaravati, antennas should be provided for street light poles at regular intervals, RFIDs should be given to every ambulance and receivers to be provided at traffic signals. Prior information should be delivered to the nearest hospital about the emergency situation automatically.

As a part of digitalization in our country, Government issued unique digital door numbers. This is helpful in locating any place through GPS. Similarly RFID-Tag system works to locate an ambulance. This system is useless when a separate lane is provided for emergency services.

Tags should be provided for every vehicle, so that if any collision of vehicles takes place in remote area, it automatically alerts the nearest hospital for ambulance service and also to the nearest police department for recovery of vehicles.

5.2. Security

In any place providing security is a big challenge. As Amaravathi is a capital, existence of public buildings like Assembly, High court, Collectorate, Police control room and high rise buildings like Multi speciality hospitals, Star hotels, Community halls and Shopping malls etc.

For example when there is a visit of any minister the maximum police department in that duty. The involvement ITS reduces the efforts of force for providing security. No need to check each and every vehicle at check post by two or three police men, it is waste of time, by providing LASER system (Two lasers on both sides of the road) which scans heterogeneous vehicles and alerts when there is any plastic explosive or weapons present in the vehicle.

Security is not only to public representatives but also to public. It is easy to catch thief after robbery by providing CCTV on roads and also by means of RFIDs and GPS it is easy to track the culprit. ITS plays a key role in police investigations.

5.3. Sophistication

Every individual habituated for luxury and sophisti-   cated life, hence to make transportation also sophisticated, involvement of ITS needed. Recently metro project approval announced by the Government in Vijayawada, nearest city to Amaravathi with high density of population. Traffic delay will be reduced to large extent after the completion of metro project in two corridors PNBS – Penamaluru and PNBS – Nidamanuru via Railway station 26Km to 48Km stretch.

Sophistication in transportation is nothing but to reach destination quickly with good transportation facilities.

A flyover being constructed at Benz circle to divert the heterogeneous traffic from NH5 directly towards Visakhapatnam without entering into the city traffic of Vijayawada. Traffic signals usage will be reduced because of decrease in traffic delay at rotary intersection.

5.4. Communication

 Now-a-days communication plays a crucial role in transportation. Mostly for security purpose communication needed. Already in capital region (MG Road) Wi-Fi modems were fixed at regular intervals. Car-Navigation, sharing location of any particular place by using GPS. These can be done only when internet provided.

In some advanced mobile apps sharing of live location is also possible, hence it is easy to track the person if any mishap taken place.

Communication also helps in preventing collisions, intimating the driver of the car about the upcoming situation of collision by means of sensors. This is called car to car communication. Communication also gives information about the traffic delay. Hence a better route can be chosen with less traffic delay to reach destination.

6. Conclusion:

Intelligence transportation system plays crucial role in various sectors in day to day life. The applications of ITS in the newly formed capital of Andhra Pradesh AMARAVATI explained with reference to case studies like upcoming Metro projects, digital door numbers. ITS can be attained by various technologies like RFID-Tag system, GPS and Block chain mechanism to increase the efficiency of transportation of public and goods were explained.

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