Challenges and Issues in Wireless Sensor Networks Based Intelligent Transportation System

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Abstract – Wireless sensor networks are distributed in Intelligent Transportation Systems (ITS) application made up of tiny sensing devices, low power, low cost equipped with processors, memory, and limited wireless networks communication have transformed outside transportation networks through the advanced communications and computing technologies into the in-vehicle and roadside traffic transportation infrastructure. Wireless sensor network based ITS technologies have improved the safety, reliability, security, traffic, parking management and mobility of the transportation network through advanced applications such as electronic toll collected works, in-vehicle direction-finding systems, accident avoidance systems, and advanced traffic safety and parking management systems, and highly developed traveler information systems. In this paper that focuses on different ITS technologies and challenges, applications, authors from a number of countries include contributed covering different ITS challenges and open issues, applications, and management practices with the expectation that the open exchange of results and ideas presented in this paper will be improved understanding of Intelligent Transportation Systems technologies and their applications.

I. Introduction

Public Transport is one of the important infrastructures of several countries. In developing countries like India bus transport consists of around 70% of public transport. However, lack of systematic mechanism to monitor and manage the bus-network is leading to lack of predictability of the bus network. It gets complex to classify causes after delays, or predict the arrival times. Bus transport system faces the ever increasing problem of traffic and congestion. Not including a well-deployed monitor classification, it becomes very difficult to plan for optimization and growth. In order to offering Intelligent Transportation Systems (ITS) that advance the security, effectiveness, reduce travel period, fuel expenditure and carbon path of traffic and transport systems, different Traffic Techniques offers a seamless integration of information and communications technology into a joint integrated system. Wireless sensor networks (WSN) based Intelligent Transportation Systems (ITS) designed tiny size, wireless network power consuming, low maintenance and very low cost for achieve traffic-related data that can be used for generate automatically security warnings at black spots on the road network has it root in transportation. There represent a view of WSN based ITS issues and challenges recent year. Traffic jam and high number of accidents from in urban areas become maximal stressful and direct to dramatically result on economy, human physical condition, parking and environment. It gets difficult to identify causes after delays, or expect the arrival times. Motor vehicle transport system faces the still rising problem of traffic and congestion. Not including a well-deployed screen structure, it becomes very complex to arrangement for optimization and development. The operations intelligent transportation systems can be considerably improved by monitoring the traffic operations and analyze them to provided that useful information both to the travelers and bus operating authorities. For examples.

- Gathered information can be used to presuppose likely causes behind the experiential bus delays, the bottleneck traffic integration, heavy traffic time slots, and make appropriate scheduling recommendation.

- The highway traffic model, route delays, traffic increase trends can be of great help in suitable planning. The composed Information can also be used to achieve analysis to analyze the effect of various...
likely scenarios such as the effect of adding additional buses, the effect of making changes in a road on traffic and delays.

As opportunity intelligent infrastructure will bring attach individuals, vehicles and transportation from first to last wireless communications, it is serious that strong communication technologies are developed. Mobile wireless sensor networks are self-organizing mobile networks where nodes exchange data without the need for an underlying infrastructure. This may provide in terms of profile of real-time organization, intelligent plan and intelligent transportation system use of this approach for new road charging and possibly carbon trading through with the Cooperative Vehicle and Highway Systems (CVHS) for security and control applications.

WSNs attribute such as bandwidth, reliability, point to point transmission in the wireless communication networks. The sensor node is use tiny size and almost impossible to manually configuration each and every node change or replace node. Self configuration and self organizing capability need to the sensor networks like in ad hoc networks. Not large distance communication in the environment sensor networks solutions for intelligent transportation applications. Intelligent parking grouping function via Wireless Sensor Networks is presented in this paper, a wireless sensor networks development for Intelligent Transportation Systems (ITS) is considered in [1] and authors also propose new routing protocol to make the wireless sensor networks more power consuming, low costly, energy efficient and with less delivery latency, time reduces.

Wireless sensor network based intelligent transportation system adaptive vehicle navigation in multi-hop relay Wi-MAX networks is proposed in [2]. This paper proposes the WiMAX multi-hop riley networks as the mutually-vehicle communications to increase the reliability and performance of mutually-vehicle communications. Real-time traffic information is gathering here from different types of WSN equipped on vehicles and exchanged with neighbor vehicles [3]. The possibility of used WSN in road and rail network communication in real ITS applications.

II. ITS Application: Requirement
Challengers and Issues

In this section, introduction of WSNs are different other sensor networks, survey of different types of ITS techniques. The ITS market is born in India. Till it however, most of the technologies have been successfully applied in developed countries, there are majored challenges in implementing such state-of-the-art technologies in India, as listed below. WSNs providing in , reducing travel time, metropolitan traffic by enhancing safety and fuel consumption at the aim of improving our daily life. ITS has some significant challenges and issues will be discussed.

Base station: Base stations only one sink even through most of the sensor node, there can be requirement application depend on the several sinks node. Intelligent transport system support associated with several sink nodes or base station should be able in WSNs.

Coverage and connectivity in ITS: There are two different categories of wireless sensor network in intelligent transport system requirements in ad hoc wireless sensor networks. Most important role in provided better intelligent transport system (ITS) in sensor deployment, which related to the issue of how well every point in the sensing field is covered. On the other hand, due to source constraints and traffic, parking management and environment condition, It is designed an resourceful development plan that would minimize cost, power consumed and decreased computation reduce node to node or point to point communication, and higher coverage area, WSNs application required function that can be measured in provisions of coverage area. In their application, it is necessary to defined accurate measures of resourceful coverage that will impact overall system performance.

Traffic incident: India Traffic Management sends incident notification to local media who transmit on local public broadcasting. We also propose through announcement to the public through local police department, region urgent situation management offices, metropolitan governments and their agencies. Although the service is free, check with your individual cell/pad service provider regarding any fees. To sign up, just visit Nixle.com & select City of Scottsdale under feature city. Notifications of incident single include locations visible by the TMC and may or may not include clearance notifications.

Traffic congestion: Traffic congestion occurs as use of a street increase. It is characterize by slower speed, longer journey times and increased vehicular queue. Congestion is caused by three major reasons.
The harsh environment condition and the failure of wireless link move up the possibility of lost data packets can lead to undesired system behavior. So, the lost in some data packets can lead to undesired system behavior. The harsh environment condition and the failure nature of wireless link move up the possibility of lost which require reliable communication protocol.

Reliability: sensor based intelligent transportation system many significant decisions must be taken about the received information. So, the lost in some data packets can lead to undesired system behavior. The harsh environment condition and the failure nature of wireless link move up the possibility of lost which require reliable communication protocol.

Security: Wireless sensor network application of ITS and other applications, the security is very important are many Security issue for the wireless sensor networks. Most important applications of the wireless sensor network are out of reach. The sensor node can relative ease be captive by the enemy. The memory of the sensor node can be relative ease read out. And the anti also you can write some of the malicious code into the memory of the sensor. So a wireless sensor network there can be destroyed by one occupied sensor node and other hand the sensor node uses the radio to communication with each other. The messages tipped off by relative ease eavesdropped or the revised by others. In the network layer, there are many attacks [5] [6]. The safety routing protocols should use some cryptography to save the messages and create a self confidence system connecting the nodes for the wireless sensor networks.

Real-time: Integrated and current-time door-to-door information systems are an important tool in developing workable and pertly in the long-distance and Indian passenger intermodality. Well promoted, available real-time information is required to smoothly plan for; and conversation transfers. For the main issue of fusion of heterogeneous databases, more advanced metadata are emerging, which make it easier and cheaper to coalition data sources.

Several efforts to developed transportation ontology have been created around the world. Intelligent transportation system application. In the approach, upon the explore of the advent of a vehicle by a static sensor node, of the latter becomes activates the subsequent static nodes in order to obtain the condition of the following parts of the road.

III. WSN Based ITS applications

In this section, WSN requirement in ITS designed in increase network performance and decrease in network loaded. In this section we will continue study of networks performance, provide a WSN in ITS application needs. It should be start; however, the many of these new ideas are in flux and subject to changed.

Traffic Safety Applications: Traffic safety applications deal with the prevention of accidents. In the order to the purpose they make sensor devices work consistently to alert drivers about potentially hazardous conditions, such as the appearance of obstacles, animals, adverse road conditions (ice or water) and vehicles either locked in (queue-end warning) or driving in the opposite direction (overtaking assistance, wrong-way driving caveat). The connection between these devices enables to inform drivers of events of the line-of-vision, thus increasing the available time reaction [14] [16]. There are different approaches in In this section, introduction of WSNs are different other sensor networks, survey of different types of ITS techniques. The ITS market is born in India. Till it however, most of the technologies have been successfully applied in developed countries, there are majored challenges in implementing such state-of-the-art technologies in India, as listed below. WSNs providing in , reducing travel time, metropolitan traffic by enhancing safety and fuel consumption at the aim of improving our
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Emergency Vehicle Preemption: Emergency Vehicle Preemption System designed for emergency transportation movement for safe passage and travel for lifesavings and view stabilization [7]. Emergency transportation like ambulances and fire fighters are essential in order to reach in time and avoid to overcrowding traffic conditions. An Emergency Vehicle Preemption decreases the accident rate, to foster mutual help strategies, at least response time and maximizing the security. This system works with the help of GPS technologies, infrared systems and audio communication to deliver safe and secure, the efficient results

Vehicle Data Collection: Vehicle Data Collection Systems collected the data of vehicles linked to the performance and good quality of vehicles for organic analysis, processing and remote monitoring. The system bases on vehicle gateway, server software structure, databases and web based interfaces. Application of the system provides assistance to the Engineering, Military and highway, vehicle tracking and analytical the maintenance. For example, this system is Georgia Tech Trip Data Collector (GT-TDC) in drive Atlanta Laboratory (Drive Lab) in Georgia. The system works on the one-by one vehicle record, state and motion through the GPS [8].

Highway Data Collection: Transport Data Collection technology provides achievement of road traffic data in intelligent transportation system. Location and communication system work with the help of sensor on the wireless network provide originally data to the traffic control center for the purpose of calculating analyzing and identification traffic congestion, travel time reduces. other major role of transport data collected works appliance are collection of wind speed data, inclement conditions, complex land, from conditions station for security of vehicles and data reliable[9],[10].

Automatic road enforcement: A traffic apply camera system, consist of a camera and a vehicle-monitoring equipment, is used to detection and identify vehicles niggled a speed limit or any other road constituted is required and automatically ticket criminals based on the license plate number. Traffic tickets are sent by mail. Applications include

- Speed cameras that identification vehicles traveling over the legal speed limit. Several such devices use light detection and ranging to find out a vehicle’s speed or electromagnetic field loops buried in each lane of the road.
- Red light cameras that explore vehicles that on through a stop line or designated stopping place while a traffic red signal light is visible.
- Rotate cameras at the intersections where particular changes are forbidden on red. The different type of camera is the most of the used in towns, cities or heavy occupied areas.

Traffic Control Applications: India uses a fully functional Traffic Management Center (TMC) to supporter-actively move traffic through the Intelligent Transportation System (ITS). ITS similarity four different systems to either prevention and/or repair crowd, improving driver information and actively manage special event and weather related traffic [15]. The four systems are the TransSuite developed Traffic Management System (Traffic Signal ATMS), ICX Camera Camel eon together with a Mitsubitsi Video Wall, horizon Dynamic Message Signs (DMS), and the DRES Media/Public Communication System.

Smart Parking Applications: The lack of parking spaces in cities or country is a concern which leads to illegal parking, congestion due to Lower speed driving and long searching one times the faced by drivers. In order to minimize inconvenience to drivers, numerous smart parking systems have been developed which guide drivers to vacant parking spots Parking Guidance Information System, audio system, camera, display in parking space and alarm space in used in tiny size sensor and enable smart payment and reservation options. WSNs are useful for the deployment of smart parking systems as a option of over in expensive wired sensors. Easy applications using WSNs may involve detecting the distribution of a blank parking slots around several floors by emplacing sensor nodes at the entrance of in every the bottom [11]. Power of sensor networks comes from the reality they provide the state of each parking space. There are a significant number of applications that take advantage from this quality [12][13]. WSN is deploy in a grid present over the parking space, area, individual responsible of the exposure of vehicles and exit other functions such as condition of parking spaces or management to other external subsystems.
IV. Intelligent Traffic Management System

India Government and road agencies are responsible for the provision of infrastructure and infrastructure related in intelligent transportation system enhancing mobility, reliability, security, mobility and road safety. System for highways and other hand roads are different. There are infrastructure related ITS system are following.

- **Lane management:** Dedicated lanes for trucks, buses and High-Occupancy Vehicles (HOV) are commonly used in the developed world to improve the road system
- **Incident management:** Incidents have a negative impact on the traffic flow handling of a road. Improved incident handling measures can limit factor of an incident. In predicting the danger of an incident will also help to clear the incident earlier
- **CCTV cameras:** Closed Circuit Television (CCTV) cameras receive video or photo shots of before identification condition. The universal plan is to ‘smoothen’ traffic flows. Virtual loops are often used to analyze video material automatically
- **Traffic control:** Traffic controllers are used to regulate traffic flows at intersections
- **Parking management:** Parking management systems, based on direction-finding systems, provide drivers with information regarding the availability of parking space and display system
- **Real-time information systems:** real time information system use collected data by traffic management centers or transportation agency to inform road users of incidents, traffic police, emergency phone call and delays
- **Weight in Motion (WIM):** These systems are currently used in India, under which technology assists to Checking up trucks with regards to overloading

V. Conclusions

In this paper, we describes in wireless sensor networks based intelligent transportation system present challenges and issues façade by several feature in ITS. ITS Technology, systems and services that contribute to reliability, fuel consumer, delay, safety, security, on-road side and on-vehicular entertainment, traffic management or efficient passenger transport to fulfill the ITS requirements. In difference of content and services is required to provide ITS services at Indian level. Therefore, information exchange standards should be developed and implemented between public establishment, transport operators and ITS providers.

REFERENCES


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