Future Development Traffic Monitoring Conditions Using Embedded And IOT

MOHAMMED UZMA AFREEN
Research Scholar
Shri JJT University,Rajasthan
uzmaafreen10@gmail.com

Dr. MAHABOOB SHAIK
Assistant Professor
MJCET Hyderabad
44.maha@gmail.com

ABSTRACT:

Now a day's traffic is getting increased due to some prosperity conditions like increasing in use of vehicles and population. To reduce these circumstances a new system has been implemented in this survey such as traffic monitoring using embedded and IOT systems.Further, an advanced traffic management system is proposed, implemented using Internet of Things (IoT). The system is supported bya circuit embeddedin the vehicle, which operatesusing RFIDwith clustered systems. The functionalities of the system include efficient traffic light control, parking space identification and anti-theft security mechanism. Nowadays safety on road has become an important factor in our life because there is an increasing amount of accidents on the road and there are some places where accident occurs frequently such as crossings, turns. Also there is a big problem of traffic jams on the road. So we are designing a system that is "An Intelligent Highway system with (Weather Accidents Landslides and traffic) W.A.L.T." which is an innovative concept to maintain safety on roads.Detection of traffic volume by using genetic algorithm and Emergence vehicle detection such as ambulance, police etc by using wireless sensor network (IR) embedded at the signal intersection.

Keywords: Accidents,Smart highways, IOT devices, sensors, Internet of Things, Traffic Management, RFID.

INTRODUCTION:

The Internet Of Things(IOT) is the network of physical objects-devices, vehicles, buildings and other items embedded with electronics, software, sensors and network connectivity that enables these objects to collect and exchange data. The IOT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IOT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyberphysical systems, which also encompasses technologies such as smart grids, smart homes and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate between the existing internet infrastructures. This paper proposes a system for smart highways of future cities.

Embedded systems in ITS

Embedded systems are everywhere, built into cars, roads, bridges and tunnels, into medical instruments and surgical robots, into homes, offices and factories, into airplanes and airports, into mobile phones and communication and virtual reality glasses, and even into our clothes. With the constant evolution of electronic devices and software technologies, there will be more and more embedded systems integrated into equipment's.ITS area is a clear example of embedded systems evolution. In the ITS area which involves industrial developments for automotive systems and public infrastructures, embedded systems engage with reduction of fuel consumption, pollution or road fatalities. Interconnection into networks of many devices is crucial, allowing vehicle-to-vehicle or vehicle-to-road infrastructure communication in the background of active safety systems.

OBJECTIVES:

LITERATURE REVIEW:

Ahmed S. Salama et al (2010)provide integrated intelligent traffic light system using photoelectric sensors distributed on long range before and after traffic light on roads. Emergency cases such as , the passing president car and ambulance that require immediate opening of traffic signal. The system has the ability to open a complete path for such emergency cases until reaching the target but this system does not operate wells when more than one emergence Vehicles come on the signal from two sides

ManojKantaMainali et al (2010)proposed a genetic algorithm approach to estimate the traffic volume in road sections without the traffic information of road sections. This method can estimate the unknown traffic volume using only the known traffic volumes. So, proposed ITSC system use the advantage of to design very efficient system that use the combination of AVR-32 and genetic algorithm.

ShilpaS.Chavan et al (2009)design of traffic light controller handles major problem of conventional traffic signal. At certain junction, sometimes even if there is no traffic but people have to wait because the traffic light remains red for the preset time and road users waits until the light turn to green. They try to solve this problem effectively by using GSM but system will leads to complications. The proposed ITSC system solves this problem by using genetic algorithm

PROPOSED SYSTEM: The proposed system consists of a circuit embedded in each vehicle in commutation. The users can interact with the system either through wired or wireless connection of their smartphone with mounted board. This system uses Radio Frequency Identification (RFID) which plays a vital role in the research paradigm of Internet of Things (IoT). Instead of using GPS (Global Positioning system), this system uses a more efficient LPS (Local Positioning System) for locating a vehicle with the help of localized workstations situated at optimal points.

Data analysis involves the implementation of big data analytics with clustered workstations constituting a regional computing unit, which maximizes the throughput. The basic functionalities of the proposed system include:

1. Smart Traffic Light Control System that works dynamically based on the concentration of vehicles in a specific region.
2. Parking Space Identification and Allotment System, with the placement of spatial sensors in parking lots that communicate the availability of spaces with the regional workstations.
3. Anti-theft System that automatically retrieves the location of a stolen vehicle and automatically disrupts the functioning that vehicle.
4. An intelligent Highway is an innovative concept for smart roads of future smart cities.

The main process (traffic-control application) developed for the first version of the prototype is a road-traffic parameter estimation system, providing useful traffic information such as traffic flow, lane average speed and occupancy, or congestion levels. The data collection is based on the so-called detection areas. Each one of these areas or regions is a user-configurable polygon with arbitrary shape or size and an associated functionality. Three functionalities have been programmed: presence, directional and queue regions:

1. Presence-detection functionality to inform about the presence or absence of vehicles according to a configured threshold. They can be considered as virtual loop detectors, quite similar in their behavior to the traditional on-the-road loop detectors buried under the road surface. An automatic vehicle counting mechanism is associated to this functionality.
2. Directional-detection functionality to detect vehicles running in a configured direction. Only vehicles running in a configured direction are detected. Otherwise, they are ignored. This functionality is useful for selective vehicle counting in or near intersections, one-way violation detection, restricted turn infringement detection, etc.
3. Queue-detection functionality to measure vehicle queue length and queuing frequency, typically in front of a traffic light.
4. Detection of traffic volume by using genetic algorithm.
5. Emergence vehicle detection such as ambulance, police etc by using wireless sensor network (IR) embedded at the signal intersection.

Transportation Systems for Sustainable Environment

Based on the recent road traffic statistics, an increased number of vehicle crashes was revealed– following the available data, those occur frequently in the areas around congested roads, since the drivers tend to drive faster before or after encountering a traffic jam, with the aim to compensate for the experienced time delays. Today, the world's largest cities are massively suffering from the traffic congestion despite employing sophisticated mechanisms to reduce it, including the use of TMSs that are advanced congestion control mechanisms.

These statistics provide a clear indication of the devastating effects that road congestion has on people, companies, and society. Unfortunately, the existing TMSs are still unable to provide detailed and accurate information to enable fine-grained and timely monitoring and management of the road traffic. The underlying reasons include the

(i) lack of granular data collection;

(ii) inability to aggregate the needed volume of data (see e.g., the Big Data paradigm); and

(iii) absence of the adequate management systems that report on the actual state of the road network. This leads to an overall inability to effectively monitor and manage the traffic, which negatively affects road safety and fuel consumption, as well as causes increased gas emissions. Presently, the implemented solutions utilized by the existing TMSs to manage the road traffic (e.g., after an accident or during the rush hours) are e.g., adapting traffic lights intervals (cycles) or dynamically closing road lanes and intersections. However, these solutions have rather limited efficiency when increasing numbers of vehicles are using the road infrastructure of a fixed capacity—since efficiency of discrete solutions is limited. Therefore, new implementations and mechanisms are being proposed by the research community to improve the traffic management systems.

Traffic Congestion Detection System

The control decision determines traffic streams that will get a green signal. According to the proposed method, a novel interval microscopic traffic model is used by the agents to predict effects of their control actions in a short time horizon. It allows delays of individual vehicles to be evaluated in terms of intervals.One of the major problems encountered in large cities is that of traffic congestion. Data from the Chartered Institute of Traffic and Logistic in Nigeria revealed that about 75 per cent mobility needs in the country is accounted for by road mode; and that more than seven million vehicles operate on Nigerian roads on a daily base.

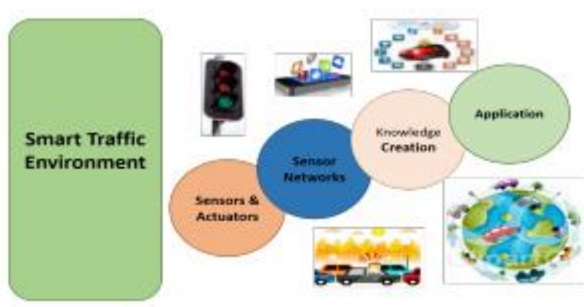


Figure: IoT and Smart Traffic Management

Data Enhancement:

1. Intelligent Driver Management Subsystem: drivers can acquire real-time traffic information with minimum delay
2. Vehicle Guidance and Road Information Management Subsystem: monitoring number of vehicle on one road, tracking vehicle's violation, sending warning massages, guide drivers to avoid possible crowded sections based on the prediction of the traffic network, real-time traffic navigation, etc
3. Intelligent Traffic Management Subsystem: the traffic system database contains data from vehicle sensors, weather information from environmental sensors, and information on traffic flows. The subsystem processes received information and shares it through the interface with other subsystems. It allows tracing the location of a vehicle fast and accurate and optimizing traffic scheduling.
4. Information Collection And Monitoring Subsystem: real-time distribution the information of road conditions, weather information, accident monitoring, etc. The subsystem merges data from different subsystems and provides it to end users in a suitable format.
5. Information Service Subsystem: performs online vehicle information query and dynamic statistic analysis of real-time traffic flow, tracks a specific vehicle and generates reports for traffic management department

Development of an Agent-Based Intelligent Traffic Information System

There are a large number of heterogonous devices within the traffic monitoring system using IoT. Among challenges of full deployment IoT is making complete interoperability of these heterogeneous interconnected devices which require adaptation and autonomous behavior.

An agent is embedded within each device and each device supports all agent functions such as migration, execution. Whole system can be controlled by the specific application written for each device's mobile agent defining how it should behave and act intelligently. Mobile agents within the network migrate from one node to another allowing the devices to pass information to others, retrieve information and discover available resources.

Main IoT Traffic agents are:

Traffic Mobile Agent: Transmits/receives different types of information to/from other objects the Internet; interprets the data coming from other objects (RFID, sensors, users), and provides a unified view of the context; communicates with other agents in the network to accomplish a specific task. All messages sent from this agent will be transferred to the traffic management system and communicate directly with a static agent of the intended application of the traffic management system mentioned above

User Agent: provides users with real-time information of entities residing in the system. The user agent is a static agent that interacts with the user. It is expected to coordinate with mobile agents.

Traffic Light Agent: detects irregular traffic conditions and changes the traffic control instructions right away.

RFID Agent: responsible for reading or writing RFID tags. When reading a tag, according to the data retrieved from it, this agent performs appropriate operations in handling a single task on behalf of a smart object of the associated RFID and to migrate to different platforms at run time.

Sensor Agent: receives, processes data that have been read from the associated sensor and saves (or send it somewhere)

Parking Identification and Reservation System: Spatial sensors are set in the parking lots of the city. These sensors detect empty parking spaces and send information to the regional workstation in closest proximity. These workstations transmit the available parking spaces to embedded system in the vehicle. The drivers can parallely determine the parking areas during their travel. They could allot and book parking spaces using their docked or paired smartphones.

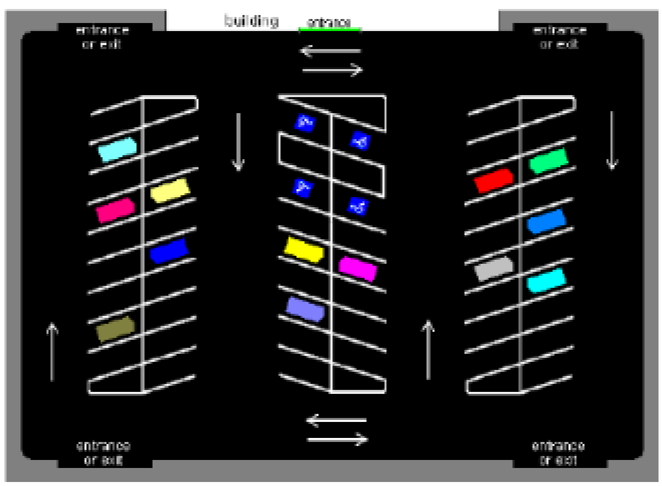
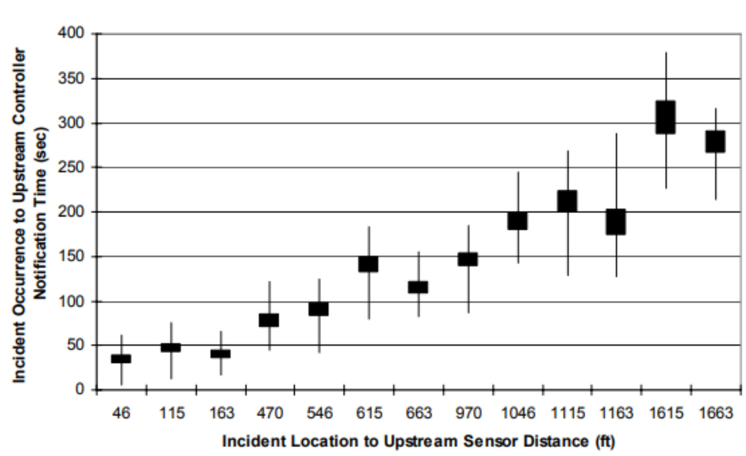


Figure 1: Parking Space Identification and Reservation System

Anti-theft Security System: Based on authentic reports of a missing vehicle, the computing unit is directed to determine the location of the stolen vehicle and disrupt the functioning of the vehicle. A particular range of frequency is set to direct the inbuilt system to turn off the electrical energy supply from the battery relay to the engine, and hence prevent the vehicle from functioning. One outstanding feature is that the inbuilt rechargeable battery in the board enables the vehicle to be tracked even when it is turned off.

Robustness analysis in IP-based applications: A real-time traffic parameter estimation system, working with an acceptable number of regions, has been implemented using the installed prototype. Specialized fixed-point libraries and many source-code and compiler optimizations were required for exploiting all the CPU performance. Five detection areas have been defined (Figure 7): two queue regions in front of a traffic light (R1 and R2), one directional detection region configured to count vehicles coming from the right side of the intersection (R3), and two presence-detection regions (R4 and R5). Notice that each detection area allows the estimation of instantaneous and time-averaged traffic data. Instantaneous traffic data can be overlaid on the image, like the display box in the upper-left corner of Figure, which shows real-time traffic data for each region.

Figure. Detection areas in the installed prototype: details of the queue and the directional regions behavior



Graph 1: Time between incident occurrence and notification to upstream controller versus incident location to upstream sensor distance

For each experiment, a warm up period of 10 minutes was used to assure the simulated vehicle flow approach stationary condition before any incidents were generated. Another 10 minutes were simulated to study the false alarm rate before incidents were generated with random start times and random locations along the freeway section after this warm up time. The detection rate was 100 percent. The false alarm rate was measured as the ratio of the number of verified detections to

1) The total number of detection attempts or

2) The total observation time, given that there is not an actual incident.

CONCLUSION:

Road traffic congestion is a central problem in most developing countries. Road traffic is becoming an important problem in all countries through the world, especially in industrialized countries. Most urban areas have poorly managed traffic networks with several traffic hot-spots or potential congestion areas.The development of technology and embedded systems with enhanced communication and video processing capabilities is providing a revolution in the way we perceive the ITS area. Internet joins this revolution offering a successful communication link for novel electronic equipment's with application in the ITS world.WSNs technology helps a lot in designing flexible and cheaper ITS systems because of its easy installation, extension and maintenance.The future work lies towards generating electricity by developing smart speed breakers in roads. We can also implement charging system for electric vehicles in traffic signals by deploying induction coil. The paper discussed a means to detect and curb congestion in a localized setting. Although, the solution is feasible to affect local congestion, it is still not able to curb the congestion extending for miles due to the localized focus of the approach.

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