**Wireless Sensor Network for Vehicle Speed Monitoring and Traffic Routing System**

**I.Abstract**

A smart Vehicle Speed Monitoring and Traffic Routing System (VSMTRS) is proposed using Wireless Sensor Networks to monitor and report about the speeding vehicles and also to regulate the traffic. The system is built up of wireless modules including Crossbow MicaZ mote MPR2400, a 2.4 GHz IEEE 802.15.4, Tiny Wireless Measurement System (TWMS), a data acquisition card MDA320CA and a base station MIB510. The other modules include a microcontroller and a motor. The software used includes Tiny OS-1.11, Crossbow Moteworks (Xsniffer, Moteview, Moteconfig), MATLAB 7.30 for Data Processing PIC 16F877A is used for generating required data. MPLAB Assembler is used for microcontroller programming. This paper explains about the hardware prototype setup for part of VSMTRS, the algorithms used for the purpose, the advantages and the limitations of the entire system. Also the configuration of the setup, the OS and the application software are elaborated.

**II.Introduction**

The advancement in Wireless Sensor Networks (WSN) and embedded systems has led to extensive research in various fields. One of the major applications with a lot of potential impact on social well-being is identified as the implementation of WSN in designing Intelligent Transportation Systems (ITS). The concept is even more significant in developing countries like Bangladesh, as the on road vehicle population is increasing more than ever.

**III. MOTIVATION**

**The purpose of the system is to reduce road** accidents and traffic jam. The road accidents are also touching all time high rates. In a dubious distinction for the country, World Health Organization (WHO) has revealed in its first ever global status report on road safety [3] that more people die in road accidents in I Bangladesh than anywhere else in the world, including the most populous China. WHO, in its report, states that road fatalities will become the biggest killer by 2030. The statistics for Bangladesh are chilling. At least 13 people die every hour to road accidents in the country. Technology can play a very significant role in bringing the chaos under control. A little intuitive yet contextual analysis and large scale adoption of innovative technology to tame this “epidemic” should be one of the first priorities of a responsible scientist.

**IV. RELATED WORK**

There has been a lot of research in designing and implementing ITS (Intelligent Traffic System) but using WSN in ITS is still in its infancy. A few technologies that have been used in earlier attempts include inductive loop detectors, micro-loop probes, and pneumatic road tubes, all of which use underground intrusive sensors. However, these sensors disrupt traffic during installation and repair, which leads to a high installation and maintenance cost. Video and ultrasonic sensors which are fitted

underground are less intrusive and easier to install. But these systems are also very costly and maintenance is complex. Their accuracy depends on environment condition. Tubaishat et al. [5] use sensor nodes that are environmentally robust and has very high life-time and low maintenance costs. The nodes are placed alongside the roads on the pavements. The vehicles are detected using the magnetometer sensor attached to the node which detects the distortions of the Earth’s magnetic field caused by a large ferrous object like a vehicle. This is quite effective but the introduction of ultra light cars like a TATA Nano and other hybrid cars with heavy electronics setup inside them that can interfere with the magnetometer is quite questionable. Wireless Sensor Network for Intelligent Transportation System (WITS) [6] proposed by Chen et al. is another attempt at data gathering and traffic management which is based on very complex intersection signal control algorithm and needs a mote to be installed

in every vehicle and a separate detector node is used to count the number of vehicles at the intersection. The detection mechanism is not explained in detail. Our design description focuses more on practical deployment of the system in Indian conditions by using real motes in a simple scenario simulation. The ITS proposed also looks into other major traffic related problems like Accident Reporting and Over speed

Detection, making full use of the capabilities of a WSN.

**V. PROBLEM DEFINITION**

A wireless sensor network is a sophisticated system which finds its use in applications like ocean and wildlife monitoring, military surveillance etc. The same concept of large scale monitoring and surveillance through wireless sensor network (WSN) can be implemented to ensure enhanced safety measures and innovative traffic controlling techniques. The proposed Vehicle Speed Monitoring and Traffic Routing System (VSMTRS) utilizes WSN wherein a sensor node is installed in all automobiles which can communicate among themselves and with a Central Monitoring Station (CMS), along with the sensor nodes placed at appropriate points on the roads.

**Advantages & Disadvantages:**

This project is made with best of capabilities and dedication. Details were taken care of preparing of it. The problems encountered in various steps were taken into account and eliminated to much extent so that they may not harm the project functioning. Also certain areas were thought of before hand and worked upon, so as to prevent them from becoming a limitation for the project. But as it is that every system is not perfect in all the aspects. They have some associated limitations. Here are presented advantages, in general and comparative of the counterparts, and disadvantages of the project.

**ADVANTAGES:**

1. Device can be controlled from long distance.
2. Wireless (No Cable).
3. It reduces the accident rate.
4. It gives alert to driver.
5. Its maintenance low.
6. This technology gives safety.

**Disadvantages:**

* The system is network dependent. Hence, network congestion can reduce the reliability of the system.
* Every car must have Bluetooth and GPS tracer to communicate with each other.
* Sometimes it may be costly when routing path longer than current path.

**VI. VEHICLE SPEED MONITORING AND TRAFFIC ROUTING SYSTEM (VSMTRS)**

The Fig. 1 below shows the various applications of wireless sensor network that our proposed system intends. The motes installed in vehicles will act as nodes in the network and help in sending/receiving data to/from the Central Monitoring Station. This can be used to control traffic effectively, report cases of over speeding directly to police, immediately inform medical departments in case of accidents and reduce the risks of road accidents. Over speeding of vehicles can be easily detected at the CMS and the driver can be alerted and the same can be reported to the Police Station. By this way the drivers can be aware that they are being watched by police and over speeding can be prevented to a large extent. The motes

can warn the nearby vehicles about the speeding vehicle and the distance of the speeding vehicle from the other vehicle. Again the risk of road accidents is greatly reduced. Even in cases of accidents, alarming system can be implemented and medical facilities can be made available at the earliest by informing Hospital as well as Police Station for necessary actions. At Position A in Fig. 1, there is a chance of traffic jam as there are more number of vehicles at that position. The CMS can identify this situation by knowing the increase in the mote density at that position. Thus the CMS can inform the other vehicles about the situation at Position A with the required details like the street at which thing

situation prevails, so that they can choose a different path and hence reduce chances of traffic jam. Suppose the vehicles are going to petrol pump via Route A, the other vehicles can choose Route B with the information from the CMS.



**VII. INTENDED APPLICATIONS**

We use the WSN for the following purposes related to

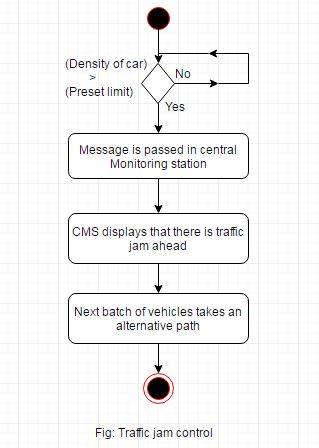
road traffic..

1. ***Traffic Routing***
2. Let A and B are 2 routes to a common destination C, but A is the preferred one as shown in fig. 2. External Check Points (ECP) are planted at critical areas where there is a large probability of a traffic jam. If the traffic at route A surpasses a preset amount (which are monitored

by the check-point and is determined by comparing the mote-density in that area), the central monitoring station is informed by these check-points which in turn can redirect the next batch of traffic through route B, thus solving the traffic jam to a large extend. This might help in avoiding many accidents.



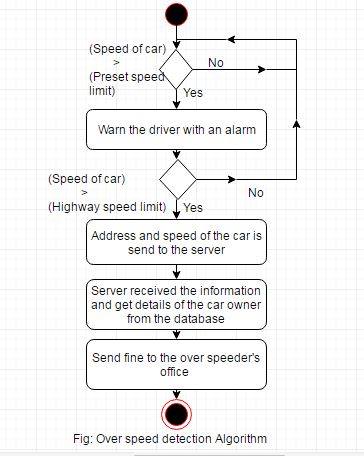
Fig.2 Illustration of traffic routing mechanism



***B. Over speeding***

Over speeding is one of the main causes of accidents in India. VSMTRS tackles this issue in the following way. Special motes called External Check Points (ECP) are installed along the road at critical areas and Internal Check Points (ICP) are installed within the car. The reason why we need check points is because it is not always desirable to check over speeding (e.g. on speedways) and the speed limit varies from place to place. The sensor node in a car can act as ICP, is also connected to the speedometer and

the speed of the car is always transmitted along the block of data to the ECP. If the speed reaches a critical limit which is still below the speed limit, the ICP warns the driver by an alarm. The ECP has a preset speed limit and if the speed of the car exceeds this limit, the ECP reports to the CMS by sending the unique address corresponding to the ICP. The CMS informs to the concerned authorities.



**Solution Of the Problem**

* **The system can create extra network for communicate properly.**
* **Use minimum Bluetooth version 4.0 for faster data transfer.**

**SPEED Control System**

Get SPEED (from gps using Wheel speed sensor)

Get speed\_limit (from gps device ang traffic server)

if (SPEED >speed\_limit) then

do{

Show warnig;

Send sms to traffic Control System;

***10 Sec time to reduce SPEED***

if (SPEED >speed\_limit) then

do{

Send sms to traffic Control System;

***Traffic police will take the action against the vehicle***

}else do{

Show that the vehicle is Okay;

}

}else do{

Show that the vehicle is Okay;

}

**Traffic Information System**

Get SPEED (from gps using Wheel speed sensor)

Get speed\_limit (from gps device ang traffic server)

Get road\_capacity (from traffic server)

Get vehicle\_location (from gps device)

if (total\_vehicle>= road\_capacity&& SPEED = 0) then

do{

Show ("**Black** :Blocked, Heavy traffic delays");

}elseif (total\_vehicle<road\_capacity&& SPEED=<speed\_limit/3) then

do{

Show ("**Red** :Slower traffic delays");

}elseif (total\_vehicle<road\_capacity&& SPEED=<speed\_limit/2) then

do{

Show ("**Orrange** :Medium traffic delays");

}elseif (total\_vehicle<road\_capacity&& SPEED=<speed\_limit/3) then

do{

Show ("**Green** :No traffic delays");

}

**VIII. CONCLUSION**

A comprehensive and thorough analysis of implementing WSN in ITS has been presented. Two practical applications of WSN in this context has been identified and implemented with extensive description of the software and hardware implementation process. The proposed system is highly flexible and adaptive to Bangladeshi conditions. It is comparatively more economical when compared to the conventional advanced techniques involved in modern ITS due to lower deployment and maintenance costs*.* The proposed VSMTRS is capable of routing the traffic on heavily crowded roads with minimal human supervision and higher efficiency. Large scale deployment of the same will ensure better traffic management on Bangladeshi turf.

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