ACCIDENTAL MONITORING OF VEHICLES USING MEMS ACCELEROMETER & GPS TRACKING

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I. ABSTRACT

Traffic congestion and tidal flow management were recognized as major problems in modern urban areas, which have caused much uncomfortable for the ambulance. Moreover road accidents in the city have been nonstop and to bar the loss of life due to the accidents is even more crucial. The main theme behind this scheme is to provide a smooth flow for the ambulance to reach the hospitals in time and thus minifying the expiration. The idea behind this scheme is to implement a ITS which would control mechanically the traffic lights in the path of the ambulance. The ambulance is controlled by the central unit which furnishes the most scant route to the ambulance and also controls the traffic light according to the ambulance location and thus reaching the hospital safely. The server also determines the location of the accident spot through the sensor systems in the vehicle which encountered the accident and thus the server walks through the ambulance to the spot. This scheme is fully automated, thus it finds the accident spot, controls the traffic lights, helping to reach the hospital in time.

Index Terms- GSM, GPS, PC, TRAFFIC SIGNAL

II. INTRODUCTION

There is loss of life due to the delay in the arrival of ambulance to the hospital in the golden hour. The ambulance in the traffic signals. It would be of great use to the ambulance if the traffic signals in the path of the hospital are ON. Post Accident Detection Systems Lack of Intelligence in the detection systems. Fails to track the collision and pre-damage status Way of monitoring people to be manually & time delay. Thus we propose a new design for automatically controlling the traffic signals and achieving the above mentioned task so that the ambulance would be able to cross all the traffic junctions without waiting. Every traffic junction will have a controller controlling the traffic flow. The traffic junctions are referred to as nodes and each node will have a GSM modem connected to the controller. The nodes are controlled by a main server by sending the control messages to their GSM modems. When a node is controlled and its traffic signal is made to be green for the ambulance to pass through without waiting, it is said to be in ON STATE. For easy access the server maintains a database for each node, and hence each node will have a unique id for addressing it and its GPS coordinates are also stored in the database. Thus using these data the ambulance is guided to the hospital by the server through the shortest route.

Our system consists of four main units, which coordinates with each other and makes sure that ambulance reaches the hospital without any time lag. Thus our system is divided into following four units,

- The Ambulance Unit
- The Vehicle Unit
- The Main Server & Hospital section

1. The ambulance unit

The ambulance unit has a GPS SYSTEM and a GSM MODEM for transmitting GPS data to the Main Server. The server receives the GPS data sent by the ambulance at regular intervals of time.

The server sends the coordinates of all the nodes' in the path to the ambulance. The last two coordinates (Xn-1, Yn-1) and (Xn, Yn) will indicate the accident location and the hospital location respectively. The ambulance unit on receiving the co-ordinates plots them on to a map with the last two coordinates as the accident spot and the hospital location to get the shortest path to the hospital.

2. The vehicle unit

A programmed timer is also triggered. In case of a minor accident, the passenger probably would not need the service of the ambulance, and can therefore switch off the siren before the timer counts to zero, by resetting the entire vehicle unit through the user interface, which is connected to the controller. Or else, if he is unconscious or fatally wounded and needs an ambulance, then the siren is left ON and when the timer counts to zero, it would trigger both the GSM MODULE and the GPS SYSTEM inside the vehicle. The GPS SYSTEM finds out the current position of the vehicle (latitude and the longitude) which is the location of the accident spot and gives that data to the GSM MODULE. The GSM MODULE sends this data to the MAIN SERVER whose GSM number is already there in the module as an emergency number.

3. Server unit

Therefore for performing the above functions, the server must have the following databases:

- An Ambulance database - contains list of free and busy ambulances at that time.
- A NODE database – The Main Server allocates a unique ID for each node and has a database to containing all the nodes' IDs, GSM numbers and their GPS co ordinates.
- A Hospital database - containing their locations (GPS coordinates) with their GSM numbers.

As the nodes in the given region are fixed points and the distance between the nodes are predetermined, the shortest path between the nodes can be selected using the DIJKSTRA algorithm.

Consider a case when the ambulance travels from accident spot to the hospital. The database in the server as said earlier contains the node and the distance between the adjacent nodes to which it is connected. The accident spot is taken as the source and the hospital is taken as the destination. The node next to the accident spot and the node in the path to hospital must be traced. So that accident node is taken as source and the hospital node is taken as destination and the DIJKSTRA algorithm is applied for these nodes. There may be several paths between these nodes and the algorithm finds the shortest path. There may be one way roads along this path, therefore this must be a vector quantity. The server finds nearest node from source and marks it as visited. Then that node is considered as source and the procedure is continued till the destination. Initially, the source doesn't know the distance to destination, so it will be infinite and after complete computation the shortest path along with the distance will be known.

III. MEMS ACCELEROMETER

An accelerometer is a device that measures proper acceleration. The proper acceleration measured by an accelerometer is not necessarily the coordinate acceleration (rate of change of velocity). Instead, the accelerometer sees the acceleration associated with the phenomenon of weight experienced by any test mass at rest in the frame of reference of the accelerometer device. For example, an accelerometer at rest on the surface of the earth will measure an acceleration g= 9.81 m/s^2 straight upwards, due to its weight. By contrast, accelerometers in free fall or at rest in outer space will measure zero. Another term for the type of acceleration that accelerometers can measure is gforce acceleration. Accelerometers have multiple applications in industry and science. Highly sensitive accelerometers are components of inertial navigation systems for aircraft and missiles. Accelerometers are used to detect and monitor vibration in rotating machinery. Accelerometers are used in tablet computers and digital cameras so that images on screens are always displayed upright. Single- and multi-axis models of accelerometer are available to detect magnitude and direction of the proper acceleration (or g-force), as a vector quantity, and can be used to sense orientation (because direction of weight changes), coordinate acceleration (so long as it produces g-force or a change in g-force), vibration, shock, and falling in a resistive medium (a case where the proper acceleration changes, since it starts at zero, then increases). Micromachined accelerometers are increasingly present in portable electronic devices and video game controllers, to detect the position of the device or provide for game input. Pairs of accelerometers extended over a region of space can be used to detect differences (gradients) in the proper accelerations of frames of references associated with those points. These devices are called gravity gradiometers, as they measure gradients in the gravitational field. Such pairs of accelerometers in theory may also be able to detect gravitational waves. Piezoelectric, piezoresistive and capacitive components are commonly used to convert the mechanical motion into an electrical signal. Piezoelectric accelerometers rely on piezoceramics (e.g. lead zirconate titanate) or single crystals (e.g. quartz, tourmaline). They are unmatched in terms of their upper frequency range, low packaged weight and high temperature range. Piezoresistive accelerometers are preferred in high shock applications. Capacitive accelerometers typically use a silicon micro-machined sensing element. Their performance is superior in the low frequency range and they can be operated in servo mode to achieve high stability and linearity. Modern accelerometers are often small *micro electro-mechanical systems* (MEMS), and are indeed the simplest MEMS devices possible, consisting of little more than a cantilever beam with a proof mass (also known as seismic mass). Damping results from the residual gas sealed in the device. As long as the Q-factor is not too low, damping does not result in a lower sensitivity. Under the influence of external accelerations the proof mass deflects from its neutral position. This deflection is measured in an analog or digital manner. Most commonly, the capacitance between a set of fixed beams and a set of beams attached to the proof mass is measured. This method is simple, reliable, and inexpensive. Integrating piezoresistors in the springs to detect spring deformation, and thus deflection, is a good alternative, although a few more process steps are needed during the fabrication sequence. For very high sensitivities quantum tunneling is also used; this requires a dedicated process making it very expensive. Optical measurement has been demonstrated on laboratory scale. Another, far less common, type of MEMS-based accelerometer contains a small heater at the bottom of a very small dome, which heats the air inside the dome to cause it to rise. A thermocouple on the dome determines where the heated air reaches the dome and the deflection off the center is a measure of the acceleration applied to the sensor. Most micromechanical accelerometers operate in-plane, that is, they are designed to be sensitive only to a direction in the plane of the die. By integrating two devices perpendicularly on a single die a two-axis accelerometer can be made. By adding an additional out-of-plane device three axes can be measured. Such a combination may have much lower misalignment error than three discrete models combined after packaging. Micromechanical accelerometers are available in a wide variety of measuring ranges, reaching up to thousands of *g*'s. The designer must make a compromise between sensitivity and the maximum acceleration that can be measured

IV. CONCLUSION

In this project, a novel idea is proposed for controlling the traffic signals in favor of ambulances during the accidents. With this system the ambulance can be maneuvered from the accident spot to the hospital without time lag. The system can be proved to be effectual to control not only ambulance but also authoritative vehicles. Thus this system if implemented in countries with large population like INDIA can produce better results. This system is more accurate with no loss of time. But there may be a delay caused because of GSM messages since it is a queue based technique, which can be reduced by giving more priority to the messages communicated through the server.

V. REFERENCES

[1]. Wang Wei, Fan Hanbo, Traffic Accident Automatic Detection and Remote Alarm Device

[2]. Zhaosheng Yang. Study on the schemes of traffic signal timing for Priority Vehicles Based on Navigation System, 2000.

[3]. Xiaolin Lu, Develop Web GIS Based Intelligent [4]. Katsunori Tawara, Naoto Mukai, Traffic Signal Control by Transportation Application Systems with Web Service using Traffic Congestion Prediction based on Pheromone Model, Technology, Proceedings of International Conference on ITS Proceedings of 22nd International Conference on Tools with Telecommunications, 2006. Artificial Intelligence, 2010.