

# Controlling Traffic Congestion in Metro City by Exercising Mobile Accelerometer Sensor

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**Abstract** - With the constant escalation in vehicular traffic, prevailing traffic management solutions have become incompetent. Urbanization has led to an upsurge in traffic jams and accidents in major cities. In order to entertain the growing needs of current transport systems, there is a demand for an Intelligent Transport System. Our system results distributed collaborative traffic congestion detection and dissemination system that uses GPS and Accelerometer. Economy, the environment and the overall quality of life has been adversely affected by Traffic congestion. Now it's peak time to adequately govern the traffic congestion obstacle. Video data analysis, infrared sensors, inductive loop detection, wireless sensor network, etc are some of the pre-existing traffic management mechanisms available across the worldwide. All above mentioned mechanisms are compelling techniques for smart traffic management. The installation time, the cost incurred for the installation and high maintenance of the system are some of the major issues associated with these systems. Hence coupling of newly introduced system comprising of GPS and Accelerometer with the existing signaling system can be a masterstroke to smart traffic management in real time situations. Need of less time for installation and lesser costs in comparison to other methods of traffic congestion management will act as a gamechanger technology. Implementation of this new technology will cause reduction in traffic congestion. Early detection of hindrance will lead to take preventive measures in advance resulting in time saving and cash of the driver.

**Keywords** - *GPS (Global Positioning System), Accelerometer, Message alert system, Map, Emergency Contact.*

## 1. Introduction

**T**raffic congestion can be defined as expanded trip time, lethargic speeds and increased queuing of the vehicles on road networks. Traffic congestion arises when the number of vehicles outstrips the scope of the road. Traffic congestion is an extensive trouble in the metropolitan cities of India. When the insistence outstrips the current feasible capacity of road then the traffic congestion is provoked. Traffic jams are result of rippling effects caused by peculiar circumstances such as accidents or abrupt braking of a car in a continuous flow of bulky traffic. Due to some unethical anti-social events serious security complications in traffic system take place which leads to sluggishness of traffic at one place. Because of vehicles stuck into traffic there is a loss of crores annually

(along with fuel wastage). Moderate speeds of freight vehicles and heightened hanging time at checkpoints and toll plazas are some of the adverse effects of congestion. Count of vehicles on roads have diminished the space capacity for further increment of vehicles on roads. Hence there is an urgency to manage traffic in a smart way as the Management of traffic with the traditional way such as the signalling system is not having a dominant effect in constraining congestion of vehicular traffic. The only elixir to such large traffic issue can be settled by usage of diverting end users towards online connectivity within a common network. This survey paper provides a comprehensive study of the solutions by looking at the different phases of a modern TMS in a smart city environment, from information gathering to service delivery. In particular the paper discusses the ways to tackle city traffic in which traffic department individuals

monitors traffic parameters (such as traffic volume, speed and road segments occupancy, etc.), and periodically report these readings to a management entity. This new system will inspire users to get registered on our website where they will obtain solutions to their daily queries related to city traffic which will guide people to opt for better ways for moving towards their destination. Daily updates related to route modifications in city traffic paths will guide end user to take the best suitable diversion based on their requirements. In case of accident emergency medical facility, message convey to relatives etc. help will be served by the administrator to victim. Users will login to our system which will ask for their personal details like car no., driver contact number, emergency contact number, blood group, username, password etc. and will send daily updates to end user based on his residential area traffic plan amendments and provide best suitable hassle free route. Using search option comprising of source and destination he/she will be forwarded to map for directions. GPS (Global Positioning System) will monitor current position for tracking of vehicle movement and Accelerometer will keep an eye on users speed limit for their safety with continuous monitoring of speed with respect to threshold speed. Alert system will send blocked path related information or any diversion in city traffic system using messages and e-mail services prior to starting of drive. Over speeding situations can be tackled by delivering alert messages to driver on moving vehicle more than threshold and if the message is ignores more than 3 times then owner is charged with fine by notice through fax. Emergency contact services will help out users during any accident so that their relatives get informed and all necessary arrangements can be done in advance prior to reach of local authority.

## 2. Literature Survey

1.1 M Smart transportation systems have acquired great importance in recent years due to the in-growing societal concern of living in more ecological, sustainable and livable environments. The initial attempts to manage city traffic were based on external traffic signals and police personal which needed to be maintained and deployed, and so increased the price of the system working process, making it unfeasible in large scale. Recently, the great development of online services is offering new possibilities to substitute the traditional based approaches. Such opportunities rely on analytics of the already deployed GPS systems, reusing existing sensor-networks like accelerometer pre fitted within cell phone leading to reduction in the system infrastructure cost.[1] Exclusive

capabilities of GPS like 24-hour, all weather, worldwide service, Extremely accurate, three-dimensional location information (providing latitude, longitude, and altitude), Extremely accurate velocity information, Precise timing services, Continuous real-time information, and Accessibility to an unlimited number of worldwide etc. is culpable for its reputation among common people[2]. However, GPS on cell phones is a bit drearier. In general, it won't outlay you anything to shift on the GPS in your cell phone, but when you get a location it usually embroils the cell phone company in order to get it expeditiously with little signal, as well as get a location when the satellites aren't detectable. It uses up a few cellular bandwidth. This also means that for phones without a legitimate GPS receiver, you cannot use the GPS at all if you don't have cell phone service.[3] Accelerometers are found in everything from car airbag systems to bridges to smartphones, where they basically measure the g-forces an object is experiencing. This information is communicated to other systems. In a car, for example, acceleration forces might prompt airbags to deploy.[4] Accelerometers encounter translational motion, which makes, for instance recognizing the magnitude of the acceleration vector, trying to deduce information that could be analysed with a pattern. Sensor-enabled smartphones have become a main stream platform for researchers due to their capability to gather and process large quantities of data, hence building new opportunities for innovative applications.[5] Smartphones and alternate mobile technology analyse their orientation through the help of an accelerator, a cramped device contrived up of axis-based motion sensing. An accelerometer is an electromechanical device used to measure acceleration forces which includes tracking vehicle speed.[6] Bringing these two technology together will enhance traffic management capability rapidly and decrement in load over city roads will be recorded. E-mail (electronic mail) is the transfer of computer-hoarded messages by telecommunication. However, you can also deliver non-text files, such as graphic images and sound files, as attachments dispatched in binary streams. E-mail was one of the first benefits of the Internet and is still the utmost prominent use. A gigantic percentage of the entire traffic over the Internet is e-mail. E-mail can also be traded between online service provider users and in networks other than the Internet, both public and private.[7] Telephone Communication, the transportation of speech over a distance either by electric signals insemminated along conductors or by radio signals. Contemporary telephone communication is portrayed by a high degree of automation and by the adaptability of equipment. For direct voice call during information

gathering and urgent help through cell phone will enhance response time. [8] E-mail and voice call services have provided a quick and safe way to communicate with the entire world and marked its importance in day to day life.

### 3. Proposed Work

#### 3.1 Tables and Figures

This section describes the design of smart traffic management system under consideration of our work, the functions performed by the traffic management centre, approaches to measure distance, speed calculation techniques and asystem based on alacrity of emergency vehicles by the calculation of distance. In our system we are using integration of some data processing methodologies, sensing machinery, wireless connection and modern mechanization to diminish congestion on road, time of travelling, and usage of fuel by vehicles and bring preference based signalling. Categorization of vehicles on the basis of high priority and regular city traffic individuals will reduce the blockage time for regular city traffic by minimizing waiting time on traffic signals with the spread of information associated with passage of emergency vehicle in advance to man power and digital signals in advance. We are using geolocation technology which is a part of HTML which will enable to fetch user location and it will guide administrator to track location of user and even user will be able to know his position. Accelerometer attached to our system will empower to measure value of acceleration to know the rate of increase or decrease in the speed of a moving vehicle. Accelerometers can be used to track the efficiency of braking system on road which will help out administrator to track speed limit of vehicles on road so that accidents count can be reduced. Google linked Maps is not just meant for directions instead also works tremendous for spotting businesses. Google map API (Application Programming Interface) will provide path based on three categories i.e. Public transport, personal vehicle or by walk similar to Google map for mapping toward destination in different ways. User Interface will provoke users to approach website where they can get whatever they want to know about city traffic within a fraction of time which will lead to stress free driving experience. Additionally website will work on both personal computer and cell phone on the basis of user's convenience. Direct contact of high priority vehicles with city traffic centre add on a special feature to our system resulting delivery of alternative rush free path for the

convenience of driver stuck into traffic. On the basis of accessibility system will provide directions based on the means of transportation and according to that travelling duration and path gets modified. Notifications will be displayed as a bulletin to show major changes in city traffic arrangements within a small span of time. Searching option will lead to give alternates between source and destination based on preferable route user want to take, so that he/she can get his job done during heading towards destination. Emergency help can be delivered to accident victim by the administrator by monitoring the location of driver and making necessary arrangements for the treatment and legal procedure. Notification to users of our website through E-mail and SMS will give them an advantage over others because of the content comprising of any modification in city traffic routes on that day in advance. Accelerometer will monitor and compare vehicle speed with threshold value and if that value crosses it more than three times continuously then a legal notice will be sent to user because of ignorance by people who defy traffic rules. User's details i.e blood group, sugar patient or not etc is shared by the administrator with users relatives and Emergency service providers for helping the accident victim. For the passage of VIP vehicles traffic signals will modify its working just before the arrival to eliminate unnecessary waiting of common people over traffic signals and after that everything will resume its working on regular way. Due to direct contact between user and administrator a record will be maintained for every individual to minimize illegal money extortion by traffic police individuals and it will help in raising funds for resolving other traffic related flaws.

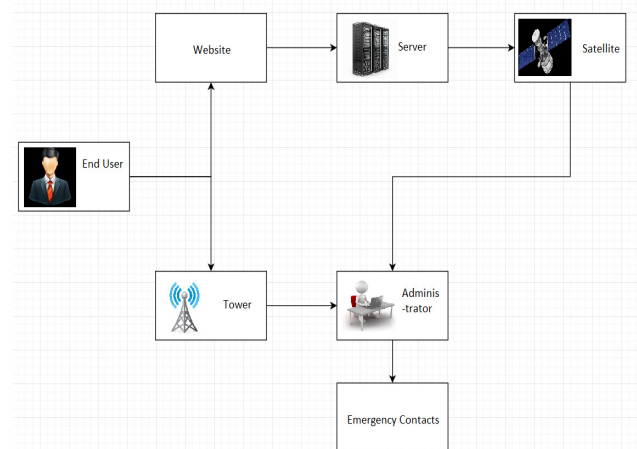


Fig.1 Proposed Block Diagram

### 3.2 Algorithm

**T Step1:** Initialize  $d[s]=0$  for all  $v \in V$   
 $\{s\}$ , where  $s$  as source,  $V$  as set of all  
 vertices.

Do  $d[v] = \infty$ . //set all node's distances to  $\infty$   
 except  $s$ .

**Step2:** Get the current position  $(x1, y1)$  of  
 source node from GPS.

Source\_x=x1;  
 Source\_y=y1;  
 Dist.=0;

**Step3:**  $S$  is the set of visited vertices.

Set  $S = \phi$  //S is initially empty.  
 $Q = V$  //Queue

initially contain all the  
 vertices.

While  $Q \neq \phi$  //while  $Q$  is  
 not initially empty.

Do  $u = \text{mindistance}(Q,d)$  //select element of  $Q$  with  
 min. distance.

$S = S \cup \{u\}$  //add  $u$  to the list of visited  
 vertices.

**Step4:** Get the position  $(x2, y2)$  of the  
 visited nodes from GPS

Current\_x = x2;  
 Current\_y = y2;  
 $\text{distance} = \sqrt{(x2-\text{source}_x)^2 + (y2-\text{source}_y)^2}$   
 $\text{dist} = \text{distance} + \text{dist}$   
 Previous\_x = x2; Previous\_y = y2;

**Step5:** Get the velocity 'vel' by integrating dist  
 And acceleration as  $A = \frac{dv}{dt}$

**Step6:** If Acceleration > Threshold Value

Then get user current temp. node ( $V$ ) and  
 display alert message.

**Step7:** Exit

Initially the distance travelled will be zero and System  
 will start with source vertex as 's' having  $(x1,y1)$  co-  
 ordinates where  $x1=0$  &  $y1=0$  and a bunch of temporary  
 nodes 'v' belonging to set 'V' till infinity except value of  
 $v=0$ . GPS will take  $x=x1$  and  $y=y1$  for source node having  
 $\text{distance}=0$ . 'S' is defined set of visited vertices having  $S = \phi$   
 t initial stage. Initially  $Q$  comprises of entire vertices of

'V' where  $Q$  is not null. 'u' is defined as minimum  
 distance of  $Q$  elements and  $u$  will get added to set of  
 visited nodes. Now the GPS will get the current value of  $x$   
 &  $y$  as  $x2$  &  $y2$ . Distance will be calculated using formula  
 $\sqrt{(x2-\text{source}_x)^2 + (y2-\text{source}_y)^2}$  and  $\text{dist} = \text{distance} +$   
 $\text{dist}$  will update the new distance every time. On  
 subsequent steps velocity and acceleration will be  
 evaluated by first integrating distance first and then  
 velocity. After that Threshold value will be compared  
 with acceleration and if the acceleration value exceeds the  
 maximum limit then current position will be traced and  
 sent to administrator and alert will be sent to end user. If  
 the visited node 'S' reaches to zero then the user will end  
 up with system and simply exits.

### 4. Advantage

Even though today's world has numerous amounts of  
 solutions pertinent to urban traffic congestion amongst  
 them a few are equipped with astute signals, VANET  
 system, GPS technology etc. But merger of GPS and  
 Accelerometer for monitoring location and detection of  
 speed will be a step ahead towards automation of city  
 traffic. This will be also user friendly and effective  
 because of fewer requirement and maximum yield. The  
 website will be in scope of common people having basic  
 HTML supported cellphone with internet support. End  
 users will be having flexibility for operating our website  
 resources irrespective of location. Accelerometer will  
 control the speed limit of vehicles to reduce chances of  
 accidents. Administrator will make a quick  
 communication with emergency services, so that users  
 medical details can be sent to them as soon as possible to  
 make pre arrangements for victims treatment. Because of  
 automated system people involved in traffic infringe will  
 not be left out and tax collection will be higher resulting  
 decrement in corruption.

### 5. Disadvantage

Irrespective of large advancement in technology there is  
 some limit to every system and in our case System needs  
 continuous net connection for executing real time tracking  
 of position but he can even download offline map where  
 user can get directions and lacking time to time update of  
 vehicle movement. Somehow automation of system is  
 huge achievement in traffic related solution but we cannot  
 neglect the importance of manpower because at last we  
 need their assistance for gathering of database and  
 execution of system working. In case users cellphone gets  
 out of power then administrator will not be able to track

his movement and will left out only with his last location. During accident situation there is a need for assistance by an external person who can communicate with the administrator on behalf of user. At a time single incident will be handled by administrator but to overcome this hurdle count of device and manpower can be raised.

## 6. Conclusions

The proposed system focuses on efficient administration of traffic congestion. The proposed system consisting of GPS and Accelerometer will eradicate the deficiency of the previously discovered systems such as high implementation cost, dependency on the environmental conditions, etc. Investment for the working of this system will be cheaper than the existing system. Thus the overall system will enhance the guiding and monitoring process to simplify things for end user. There is an urgent need to consider these modern ways to cope up with needs of modern urban living.

## 7. Future Work

In future multiple tracking of users at a time can be achieved instead of tracking a single user at an instance. Artificial Intelligence will work as a game changer which involves a joint effort of transportation experts and computer engineers which will allow system to take its own decision based on decision taking capabilities resulting in minimal intervention by human brain. cell phone GPS can be replaced by vehicles GPS to have a higher accuracy of location so that user need not to always carry a registered cell phone with him all the time. Automated Traffic Recorder (ATR) can be included further to guide automated signals.

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