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Cost Effective SMS Fire Approach for Transportation based on Vehicle Speed

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Abstract: *Today most of vehicle navigational system use latest GPS (Global Positioning System) and GSM (Global System for Mobile Communication) technology for sending vehicle navigational information (latitude and longitude) at server side, but they use several existing techniques (based on time, distance and manually) for sending SMS (Short Message Service) at server side. Addressing that problem, an innovative methodology is designed for transportation i.e. vehicle speed based SMS sending technique. It provides the cost effective solution for sending SMS from navigating vehicle to server side by reducing the quantity of SMS in case of traffic congestion or vehicle damage.*

Key words: *GPS, GSM, Navigational, SMS, Speed, Vehicle.*

I. INTRODUCTION

Public transportations [1] (taxis, buses, maxis and trains) are carrying millions of passengers every day form one city to another. Traditional methods of information storage for such navigating vehicles are not efficient (in terms of database complexity) and not cost effective (in term of SMS cost). SMS is way of sending and receiving information with the help of mobile devices. An Integrated circuit GPS+GSM is used for sending SMS from navigating vehicle to server. Traditionally in all GSM based vehicle tracking system, SMS send on the basis of time, distance and manually. Into time based technique SMS fire after a particular time intervals. In case of traffic congestion and bus damage SMS fire continuously and makes system inefficient. Implementation of this technique is very easy but it increases the cost of SMS and complexity of database due to large number of SMS fire. In distance based technique SMS send according to distance. It overcomes the drawbacks of time based technique, but in case of traffic congestion and bus damage it will not send SMS. The logic of sending SMS can vary according to short and long route. In short route vehicle stops are nearer than long route. In manual technique, it is the responsibility of bus conductor to press SMS button for sending SMS. This technique avoids the limitation of previous two techniques but it is not preferable because it increases the burden on bus conductor. So there are several limitations of these exiting vehicles tracking system in terms of SMS cost and database complexity. Suppose on a long route X, which distance is 230 kilometers and travelling time is 4 hours, If SMS will send on the basis of time then approximately 2880 SMS will be send if SMS fire after every 5 seconds. In distance based, approximately 2300 SMS will be send if SMS will be fire after every 100 meters and in manual technique, approximately 2100 SMS will be send. A speed based technique is novel technique for sending SMS on the basis of vehicle speed. If the speed is 0 or low, it takes the advantages of time bases technique and overcomes the drawbacks of distance based technique, at high speed it overcome the drawbacks of time based technique and takes the advantages of distance based technique.

The rest of this paper is organized as follows. The section II describes the literature review and several existing SMS scheduling techniques for SMS fire. The section III presented hardware and software requirements of proposed system. Section IV showed architecture of proposed system. The results and discussion are provided in section V and section VI shows the conclusion and future work of the paper.

II. RELATED WORK

Several authors have been proposed various GPS and GSM based vehicle tracking system for transportation. Most of all tracking system use GSM technique to send vehicle location into the form of latitude and longitude at server side. Kai Jakobs et. al. (2001) has [2] been proposed an open architecture for tracking and tracing in transport and logistics. The main thing of this architecture scale extremely well. There was no problem to install an additional server if needed and no need to modify existing corporate IT infrastructure. GSM-Based Mobile Tele-Monitoring and Management System for Inter-Cities Public Transportations has been implemented by M. AL-Rousan et. al. (2004) for [3] Inter-Cities public transportations. By using wireless technology GPS and GSM system provide powerful management transportation engine, which allows tracking

vehicle and provides most up-to-date information about ongoing trips. A low costly train tracking system based on radio communication was developed by [4] in 2005, which locate train on high precision in real time both inside and outside tunnel. In 2007 Stephen Teang Soo Thong et. al. designed a system to track objects [5] with higher accuracy at areas where GPS signal are week and unavailable by using the concept of concurrent GSM and GPS positioning system. A hybrid GPS/GSM based positioning system [6] implemented by Hsin-Yuan Chen et. al. (2008) and Tung-Yi Chou et. al. (2008) with the help of fuzzy logic to improve accuracy. The proposed prototype Automatic Vehicle Location System (AVLS) is based on GPS and GSM technology. Into the Iran wireless technologies like GPRS has not been established very well therefore Ali Mousavi et. al. (2009) decide to [7] designed a GSM based Technology. All data are provided to user through GSM technology. The author Zhang Fei (2010) presents [8] the current situation and development situations of the intelligent transportation system (ITS) in china and introduces some ideas to promote development of technology for ITS. The author Zhang Fei (2010) presents the [9] current situation and development situations of the intelligent transportation system (ITS) in china and introduces some ideas to promote development of technology for ITS. By using existing GSM network technology authors Md. Zaved Parvez et. al. (2010) designed a [10] novel vehicle tracking system. The advantage of novel architecture it was very low costly, it neither required any modification in existing system nor it does demand any additional hardware. Cell-ID Based Vehicle Locator and Real-Time Deactivator Using GSM Network (VLRD) use GSM network for tracking vehicle and vehicle thieves. Nilesh Dubey et.al. (2011) designed [11] VLRD system for overcome the drawbacks of GPS and SMS based vehicle tracking systems. It is low costly solution and provides higher degree of reliability for vehicle tracking without using GPS technology. In 2011 a system was proposed, which provides [12] the maximum accessibility for the users at anytime and anywhere. It allows people to track down their vehicle position, speed, stops, movement and monitor the vehicle when another person is driving it. It also prevents the vehicle theft by vehicle alarm and display the location of theft vehicle on Google map. A hybrid GPS-GSM system is proposed by Mohammad A. Al-Khedher (2011) and Montaser N. Ramadan et. al. (2012) to track the [13] [14] vehicle using Google earth, it also increase the accuracy of measured location by using Kalman filter and display current location and status of vehicle on Google earth. Intelligent Anti-theft and Tracking system is very efficient and safe in emergency situation and engine failure. The system of Muhammad Ridhwan Ahmad Fuad et. al. (2013) also used [15] GPS, GSM and Goolge earth for tracked vehicle location. This system used in many applications including vehicle security and fleet management. The secure automotive telematics system (SATS) is very reliable system, which is designed by Imran Jattala et. al. (2013) and [16] used AES-256 encryption algorithm for securing SMS communication between vehicle and server. In 2013 authors Ibrahim Abdallah Hag Eltoum et. al. designed a velocity based tracking system. The developed [17] system by M. Behzad et al. (2014) which allow users to tack speed, water level, engine level and location. Designed system also provides the scalability, integrity, portability, usability and security.

Table1: Benefits and limitations of GSM based SMS scheduling techniques

SMS Technique	Time based technique	Distance based technique	Manually technique
Advantages	Easy to implement Accurate	Few SMS will be sent Low costly in term of message cost. Reduce database complexity.	Few SMS will be sent. Low costly Reduce data base complexity. Efficient technique in case of traffic congestion and vehicle damage.
Disadvantages	More SMS will send Increase data base complexity Not fixed logic for each route. Very costly in term of message cost.	Less efficient in case of short route, where stops are very close. Increase waiting time for passenger in case of traffic congestion. Not a fixed logic for each route.	Not automate system. Increase burden for conductor. Less accurate (because due to crowed into bus it may be possible conductor forgot to press SMS button).

The above literature presents the various exiting GPS and GSM base tracking system but these existing GSM based vehicle tracking system are not cost effective (in terms of SMS cost) and not efficient (in term of database complexity). So a speed based cost effective SMS fire solution is proposed. Table1 shows benefits and limitation of different GSM based SMS scheduling techniques (time, distance and manually).

III. HARDWARE AND SOFTWARE REQUIREMENTS

The system hardware comprises of a GPS module, TTL Bluetooth device, Java enable GSM mobile device, SIM (Subscriber Identity Module) and GSM modem. The GPS module and server are communicating via the wireless GSM public network using SMS. The TTL Bluetooth is connected to GPS receiver and 3 volt cell is used for battery backup. The message format of SMS is vehicle ID, latitude, longitude, current date,

current time, vehicle speed. The software requirements are Arcgis and Arcmap. These two softwares are used to draw the map. Figure 1 shows hardware designed.

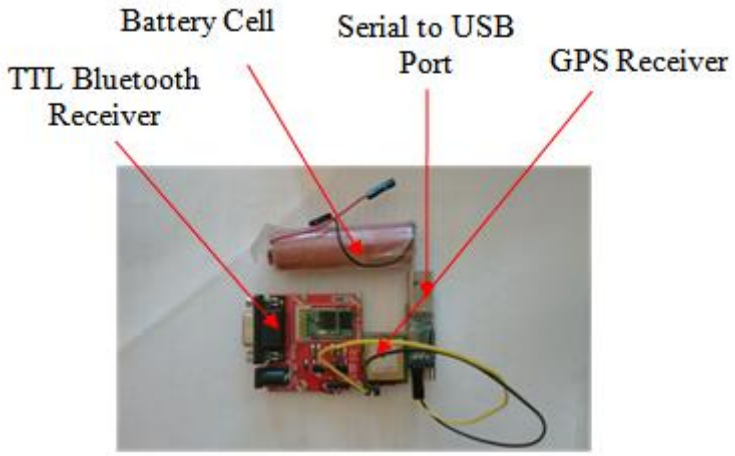

Figure 1: Hardware design

IV. SYSTEM OVERVIEW

The architecture of designed system is given in figure 2. It divided in following modules: GPS module, data storage module and user module. In GPS module GPS receiver received data like (latitude, longitude and speed) continuously from satellites. GSM enable mobile phone is used to send received data at server side with the help of SMS. The management of sending SMS is very useful from database complexity and system cost point of view. Proposed system provides the solution of problems which are discussed in section II. Into this article proposed speed based SMS sending technique is used for SMS fire. By using this technique cost of system (in terms of SMS) and database complexity (in terms of SMS storage) is reduced. At low speed designed system sends more SMS and at high speed it sends few SMS. But in case of traffic congestion and vehicle damage novel approach will not send text messages. Into data storage module java enable GSM mobile phone send data threw SMS at server side, on the basis of proposed algorithm. Server side program filter SMS information and stored into text file. Text file contains current information (latitude, longitude, date, time and speed) of navigating vehicles. There are two types of users for the system, internet users and mobile user. Internet users are those which send queries from internet and mobile users send queries from mobile devices. When server received user request then it sees type of query and process it and return the result back to users.

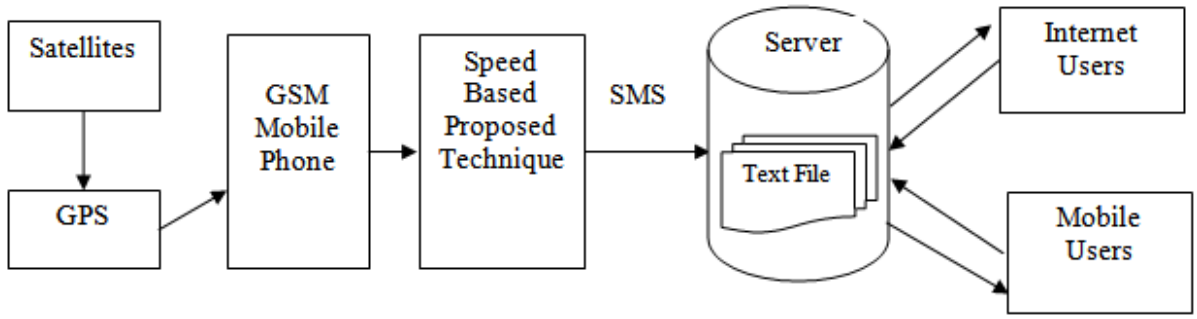

Figure 2: System Architecture

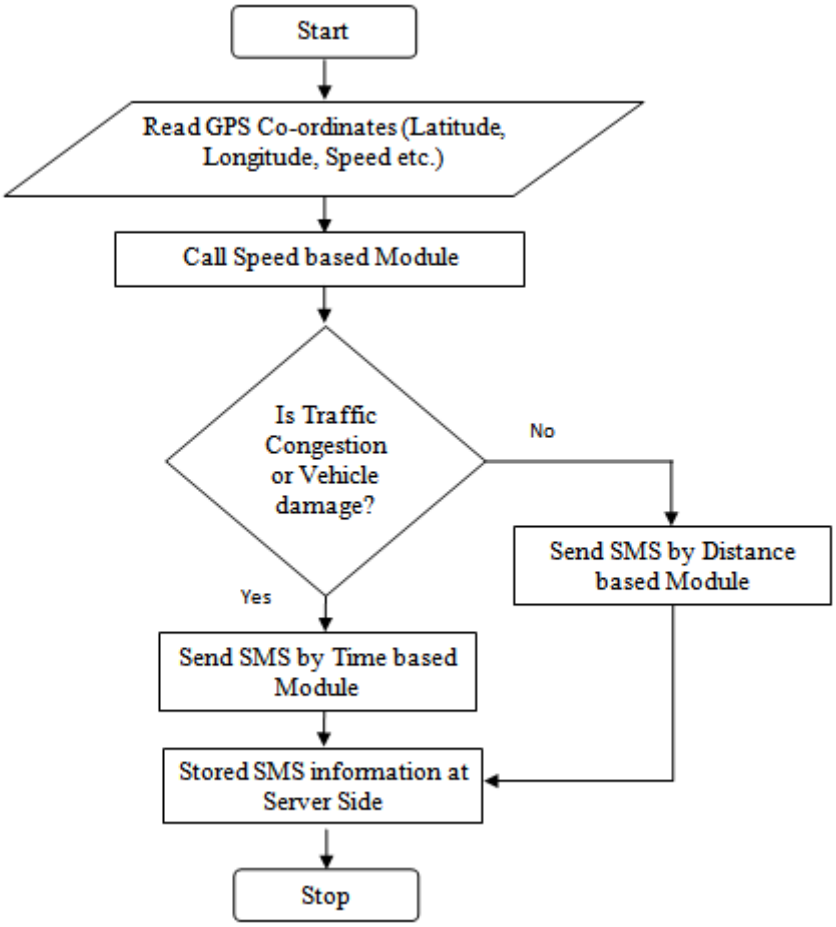

Figure 3: SMS sending based on vehicle speed

V. RESULTS AND DISCUSSION

The proposed approach has been tasted over navigational routes of Haryana Roadways. The table 2 and figure 4 shows total numbers of SMS fire for particular route corresponding to SMS fire techniques. It showed the comparison of proposed technique with existing SMS fire scheduling techniques. For experimental results it has assumed, time based techniques fire SMS after every 5 second, distance based technique fire SMS after every 100 meter and in manual based technique it's a duty of bus conductor to press the SMS button. The results showed time based and manually SMS fire techniques are inefficient because in case of traffic congestion and vehicle damage, it send SMS continuously. Time based, distance based techniques will increase the complexity of database and manually techniques increase the burden on conductor.

Table 2: Total number of SMS fire on the basis of SMS scheduling techniques corresponding to route

RouteId	Source	Destination	Time Based SMS Fire	Distance based SMS Fire	Manually SMS Fire	Proposed (Speed Based) SMS Fire
HR0011	Yamunanagar	Delhi	2880	2500	2000	1800
HR0012	Yamunanagar	Chandigarh	1445	1060	1008	900
HR0013	Kurukshetra	Ambala	660	520	430	402
HR0014	Ambala	Karnal	1092	850	700	720
HR0015	Yamunanagar	Panipat	1440	1200	900	850
HR0016	Karnal	Hisar	1824	1570	1340	1209
HR0017	Yamunanagar	Gurgaon	3960	2809	2300	2250
HR0018	Panipat	Delhi	1460	1190	910	800
HR0019	Panchkula	Panipat	1992	1590	1320	1310
HR0020	Ambala	Zirakpur	432	330	290	240
HR0021	Yamunanagar	Jind	1752	1500	1200	1170
HR0022	Panipat	Rohtak	900	750	680	610
HR0023	Kurukshetra	Kaithal	792	550	420	380
HR0024	Mullan	Jagadhri	5000	360	10	190
HR0025	Yamuannagar	Paonta Sahib	720	620	505	470
HR0026	Yamunanagar	Nainital	4032	3220	2901	2855

HR0027	Karnal	Kaithal	828	660	501	430
HR0028	Ambala	Panipat	1524	1200	1008	970
HR0029	Karnal	Roorkee	1452	1300	1112	1034
HR0030	Kurukshetra	Haridwar	1716	1450	1120	980
HR0031	Ladwa	Kurukshetra	252	170	90	60
HR0032	Israna	Panipat	312	240	180	120
HR0033	Jagadhri	Indri	588	450	340	270
HR0034	Jind	Hissar	852	710	550	580
HR0035	Ambala	Barar	588	400	410	320
HR0036	Krurukshetra	Haridwar	1716	1450	1210	1008
HR0037	Panchkula	Painpat	1992	1590	1201	1004
HR0038	Karnal	Faridabad	2304	1570	1300	1030
HR0039	Gurgaon	panipat	1872	1200	1029	930
HR0039	Gurgaon	Ambala	1092	850	700	720
HR0040	Karnal	Sharanpur	1001	904	710	620
HR0041	Panipat	Ambala	1524	1200	1008	970

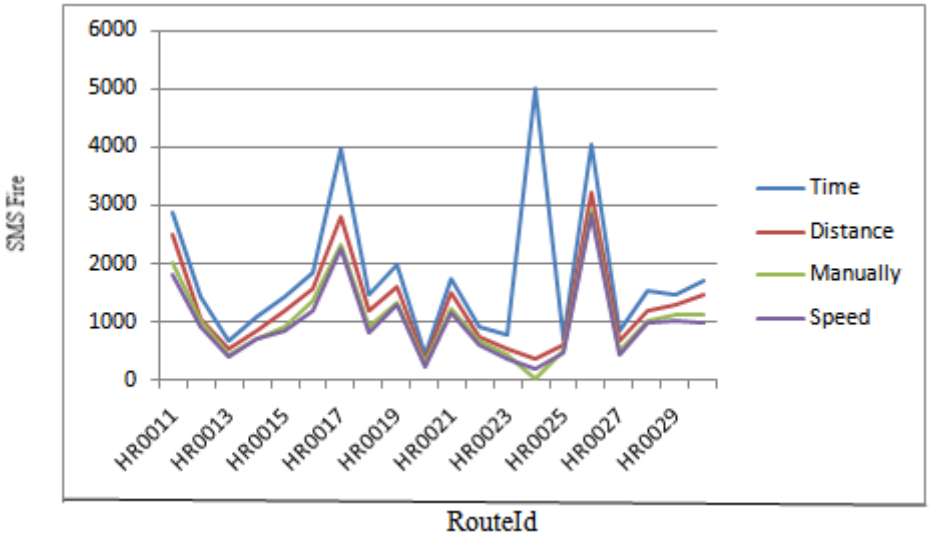

Figure 4: SMS fire based on SMS fire techniques

Corresponding to RouteId HR0024 where the distance between source and destination is 30 kilometer on this distance time based technique sends 5000 SMS due to bus damage. It also increase the SMS cost of system. On the same route the result showed manually SMS technique sends only 10 SMS because conductor forgot to press SMS buttons. So it makes the system less reliable. The distance based techniques is more efficient for SMS fired as compare to time based and manually techniques, but this techniques is not well for short distance route in case of traffic congestion. Proposed techniques overcome the drawbacks of exiting SMS fire techniques. At low vehicle speed it sends more SMS and at high speed it sends few SMS. The novel technique makes the system very efficient in term of system cost and database complexity.

VI. CONCLUSION AND FUTURE WORK

The proposed technique is cost effective and efficient technique for sending vehicle navigational information at server side. In case of any obstacles (traffic congestion, road blockage, vehicle damage etc.) it will not send SMS at server side. Due to few SMS fire it will reduce the server overhead and database complexity in terms of text messages storage. In future the quantity of SMS can be decreased more by using the fuzzy concept. The quantitative navigational route information can be transformed into qualitative route information to reduce the quantity of SMS.

References:

[1]. M. AL-Rousan, A. R. AI-Ali and K. Darwish," GSM-Based Mobile Tele-Monitoring and Management System for Inter-Cities Public Transportations", 2004 IEEE International Conference on Industrial Technology (ICIT).

[2]. Kai Jakobs, Carsten Pils, and Michael Wallbaum," Using the Internet in Transport Logistics The Example of a Track & Trace System", P. Lorenz (Ed.): ICN 2001, LNCS 2093, pp. 194–203, © Springer-Verlag Berlin Heidelberg 2001.

[3]. M. AL-Rousan, A. R. AI-Ali and K. Darwish, "GSM-Based Mobile Tele-Monitoring and Management System for Inter-Cities Public Transportations",IEEE International Conference on Industrial Technology (ICIT), 2004.

[4]. Antonio Jose Duarte Santos, Americo Rodrigues Soares, Fernando Manuel de Almeida Redondo, and Nuno Borges Carvalho," Tracking Trains via Radio Frequency Systems", Ieee Transactions on Intelligent Transportation Systems, Vol. 6, No. 2, June 2005.

[5]. Stephen Teang Soo Thong, Chua Tien Han and Tharek Abdul Rahman," Intelligent Fleet Management System with Concurrent GPS & GSM Real-Time Positioning Technology", 1-4244-11 78-5/07/$25.00 ©2007 IEEE.
[6]. Hsin-Yuan Chen and Chen-Hung Liu, "Hybrid GPS/GSM Positioning Systems Design with Fuzzy Logic", Journal of Advanced Computational Intelligence and Intelligent Informatics, Vol.12 No.3, pp. 2008.
[7]. Ali Mousavi, Mohammad A. Rajabi, and Mohammad Akbari," Design and Implementation of a GSM Based Automatic Vehicle Location System", ICCSA 2009, Part I, LNCS 5592, pp. 533–542, © Springer-Verlag Berlin Heidelberg 2009.
[8]. Zhang Fei," The Current Situation and Development Thinking Of the Intelligent Transportation System in China", 978-1-4244-7739-5/10/$26.00 ©2010 IEEE.
[9]. Md. Zaved Parvez, Khondker Zakir Ahmed, Quazi Raguib Mahfuz and Md. Saifur Rahman," A Theoretical Model of GSM Network Based Vehicle Tracking System ",6th International Conference on Electrical and Computer Engineering ICECE, Dhaka, Bangladesh, 978-1-4244-6279-7/10/ ©2010 IEEE.
[10]. Nilesh Dubey, Vandana Dubey, and Shivangi Bande," Cell-ID Based Vehicle Locator and Real-Time Deactivator Using GSM Network", CCIS 147, pp. 82–86, © Springer-Verlag Berlin Heidelberg 2011.
[11]. Iman M. Almomani, Nour Y. Alkhalil, Enas M. Ahmad, Rania M. Jodeh," Ubiquitous GPS Vehicle Tracking and Management System", Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT), 978-1-4577-1084-1/11/$26.00 ©2011 IEEE.
[12]. Mohammad A. Al-Khedher," Hybrid GPS-GSM Localization of Automobile Tracking System", International Journal of Computer Science & Information Technology (IJCSIT) Vol 3, No 6, Dec 2011.
[13]. Montaser N. Ramadan, Mohammad A. Al-Khedher and Sharaf A. Al-Kheder," Intelligent Anti-Theft and Tracking System for Automobiles ",International Journal of Machine Learning and Computing, Vol. 2, No. 1, February 2012.
[14]. Muhammad Ridhwan Ahmad Fuad and Micheal Drieberg," Remote Vehicle Tracking System using GSM Modem and Google Map", Conference on Sustainable Utilization and Dsevelopment in Engineering and Technology 2013 IEEE.
[15]. Imran Jattala, Shakeel Durrani, Junaid Farooqi, Ambreen Shafique, Faisal Hussian and Hassan Mahmood," Secure Automotive Telematics System (SATS)", 978-1-4799-0615-4/13/$31.00 ©2013 IEEE.
[16]. Ibrahim Abdallah Hag Eltoum and Mohammed Bouhorma,"Velocity based Tracking and Localization System using Smartphones with GPS and GPRS/3G", International Journal of Computer Applications (0975 – 8887), Volume 76 – No.11, August 2013.
[17]. M. Behzad, A. Sana, M. A. Khan, Z. Walayat, U. Qasim, Z. A. Khan and N. Javaid," Design and Development of a Low Cost Ubiquitous Tracking System", The 9th International Conference on Future Networks and Communications (FNC-2014), 1877-0509 © 2014 The Authors. Published by Elsevier B.V.