IMPROVISATION OF ACCIDENT RESPONSE SYSTEM OF VADODARA CITY USING GIS

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Abstract: The frequency of traffic accidents in India is amongst the highest in the world. An NCRB report revealed that every year about 135000 deaths in India occurs due to road accidents. Many times, deaths occur due to delay in the treatment because emergency response services don't reach on time due to many constraints, such as delay in information delivery, heavy traffic routes, remote locations, bad weather conditions, unknown addresses, etc. To overcome these constraints, we have come up with an idea about how to cut the death count in accidents. The idea is to install a device in the LMVs and HMVs (initially) which sends information to the control room which, in turn, informs the response forces to carry out the rescue mission. This scheme will also can store the accident data and analyzing it on GIS software whenever needed. After analyzing, the cause of the accident can be found out and measures can be taken by improving road design and quality. The need of converting the physical data to digital data will be eliminated because the database will be created in real-time. And above all, it is a benefit to the society that if the accident response forces reach the location on time then many lives can be saved. The aim is not to replace the existing system, but improving it to make it more efficient so that the response time is reduced and lives can be saved.

***Keywords* – Accident Response System, GIS**

I. INTRODUCTION

The intensity of traffic accidents in India is amongst the highest in the world. Below mentioned are some accident statistics in India,

- Over 1,37,000 people were killed in road accidents in 2013 alone, that is more than the number of people killed in all our wars put together.
- There is one death every four minutes due to a road accident in India.
- One serious road accident in the country occurs every minute and 16 die on Indian roads every hour.
- 1214 road crashes happen every day in India.
- 377 people die every day, equivalent to a jumbo jet crashing every day.
- Top 5 Cities with the highest number of Road Crash Deaths (Rank –Wise):
  1.Delhi (City)
  2.Chennai
  3.Jaipur
  4.Bangalore
  5.Mumbai

AIMS AND OBJECTIVES

Following are the aims and objectives of this study:

- To reduce the number of death counts due to accidents.
- To dilute the time required by accident response services to arrive at the accident location.
- To keep a record of accidents in soft copy and update automatically.
- To implement smart accident response system.

DESIGN

The product is still in the development phase. The design is quite simple. It involves programming of GPS and GSM modules on the Arduino board along with the crash impact sensor. As soon as crash sensor senses any type of impact it will trigger the GPS module to send the location details via GSM module. Not only location details, but also driver details, vehicle details and other details such as temperature, time, height above mean sea level, and so forth will also be sent. Figure 1 shows the flow diagram of the design.

ANALYSIS

Before we commenced on forming of the product we gathered some accident statistics of Vadodara. We used data which we had collected from the traffic police and had created a database out of that. The figures in Table 1 to Table 5 are approximate.

We applied this data and formed a sample database in excel sheet. We then imported this data on an open source software called QGIS 2.16 desktop version. We set up the coordinates of the name of the locations mentioned using Google maps. They can likewise be found out using a handheld GPS device that captured the coordinates of the location using one of the satellites passing above us at that fourth dimension. The data in the Table-5 are used to plot the points on the map of Vadodara using QGIS.

We then collected information of a number of police stations in the Vadodara city and using Google maps found out their coordinates. We created the database and mapped all the police stations of Vadodara (Figure 2).

DESIGN METHODOLOGY

The aim of this design is to develop a device equipped with crash impact sensors, a GPS module and a GSM module. The wiring of this sensor has to be done in the entire vehicle because it may be hit from any direction. As soon as the crash impact sensor senses any impact from whichever direction it will send every detail of the vehicle that would be stored in the device itself prior to its installation in the vehicle or at the time of purchase.

These details would be sent to a control room wherein person-in-charge will monitor the position of the accident hit vehicle and inform the nearest ambulance along with location details after determining the shortest path. Ambulances will be well equipped with GPS technology to locate the accident hit vehicle. Also, police will be informed about the accident. With the help of this system, the method of collection of accident data becomes easier, simpler and faster. Otherwise, in many cases, accidents are not recorded due to fear of police complaints.

Utilizing this information, the system can be developed further and be made more efficient. The information can be used in the analysis of the accident-prone zones.

IMPLEMENTATION STRATEGY

The device has to be installed in all the upcoming and existing LMVs and HMVs. Hi-tech control rooms have to be setup at various locations in the state. New vehicles come with the device pre-installed whereas it can be installed in existing vehicles with the help of RTO. The device will have unique ID number which will be assigned to the user at the time of purchase. All the details of the user and his vehicle are to be taken and entered into a database management system.

IMPLEMENTATION

The process of implementation can be divided into phases. These could be viz. The West, The North, The East and The South. The point is not to replace the existing system, but improving it to make it more efficient so that the response time is reduced and people can be saved.

RESULT SUMMARY

The following are some conclusions/ advantages drawn from our present study.

- Accident records can be maintained in a database management system.
- Easy analysis of accident data whenever required.
- Categorization of accident prone zones.
- Analysis of causes of accidents.
- Preventive measures to reduce accidents such as redesigning of intersections, gradients, super elevations, etc. can be taken.

USEFULNESS WITH RESPECT TO EXISTING SOLUTION

The current system works perfectly fine. Sometimes it is difficult to trace the location of the accident site and it may consume time to reach to the accident location and people may die and what if the person does not know the exact address and by chance gives the wrong address then it may worsen the situation. To overcome this problem we have come with this solution. Besides the average time to get to the accident location which is 18 minutes can be abbreviated. Also, the maintenance of accident records becomes easy and can be made available to the public (only statistics) for any sort of accident studies.

FUTURE SCOPE

India is the 7th largest economy in the world and also one of the fastest growing economies in the world. The Government of India has launched a mission to develop 100 cities all over the country, making them citizen friendly and sustainable called the SMART CITIES MISSION. To accomplish this we must use smart techniques to take on society's problems. Developing such an idea and turning it into reality in a country like India is a challenging task but not impossible.

UNIQUE FEATURES

- It sends the location in real time almost in the very next few seconds when the crash sensor senses the impact.
- It not only sends the location details, but also other important details such as driver details, RC book details, license plate number, etc.
- It updates the accident data automatically in a database management system.

REFERENCES

[1] Dinesh Mohan et al, (2015). Road safety in india status report. http://tripp.iitd.ernet.in/road_safety_in_India_status_report.pdf
[2] Tamboli, A. S et al. (2013). Incident Reporting System Using GIS. Engineering Science and Technology: An International Journal (ESTIJ) 3 (1) Pp 62-65
[3] Details about presence of GVK's emergency services - http://www.emri.in/108-emergency/
[4] Details of 108 emergency number https://en.wikipedia.org/wiki/108_ (emergency_telephone_number)
[5] For accident statistics - http://sites.ndtv.com/roadsafety/important-feature-to-you-in-your-car/
[6] For location-based data – Google Maps - https://www.google.co.in/maps

Table: 1 Accident Data

Year	Deaths	Injured	Total
2001	142	1251	1393
2002	123	1325	1448
2003	144	1425	1569
2004	156	1241	1397
2005	162	1351	1513
2006	141	1222	1363
2007	142	1511	1653
2008	144	1432	1576
2009	171	1325	1496
2010	147	1251	1398
2011	161	1152	1313

Table:2 Population data

Year	Population	Deaths	Rate
2001	1030346	142	13.78
2002	1067619	126	11.28
2003	1102151	144	13.25
2004	1148627	156	13.58
2005	1192546	162	12.59
2006	1234462	141	11.39
2007	1232532	142	11.04
2008	1323362	144	10.78
2009	1356248	171	12.34
2010	1426548	147	10.22
2011	1493562	161	10.78

Table: 3 Vehicle details

Category	Rate
2-wheelers	45-55
3-wheelers	20-33
Cars	10.1-18.36
Buses	3.1-8.3
Trucks	0.2-2

Table:4 Vehicular data

Year	Vehicular Population	Deaths	Rate
2001	256634	142	5.53
2002	281763	126	4.37
2003	303805	144	4.74
2004	326486	156	4.74
2005	346585	162	4.53
2006	394258	141	3.59
2007	410251	142	3.29
2008	462186	144	3.05
2009	512469	171	3.32
2010	564785	147	2.61
2011	606248	161	2.66

Table:5 Data Collection from various Conjuctions of Vadodara City

Location	Serious	Fatal Accident	Total
Near Railway Station	05	05	10
Kalaghoda	06	04	10
Gaay cross road	09	17	26
Waghodia Cross Road	10	14	24
Ajwa Road Intersection	11	13	24
Tarsali Bypass	07	11	18
Mandvi Gate	16	00	16
Dumad Intersection NH8	04	10	14
Golden Intersection NH8	03	07	10
Kapurai Intersection NH8	03	07	10
Fajalpur Bridge Near NH8	03	07	10
Padamla Intersection NH8	02	06	08
Kamalapura SH 158	10	06	16

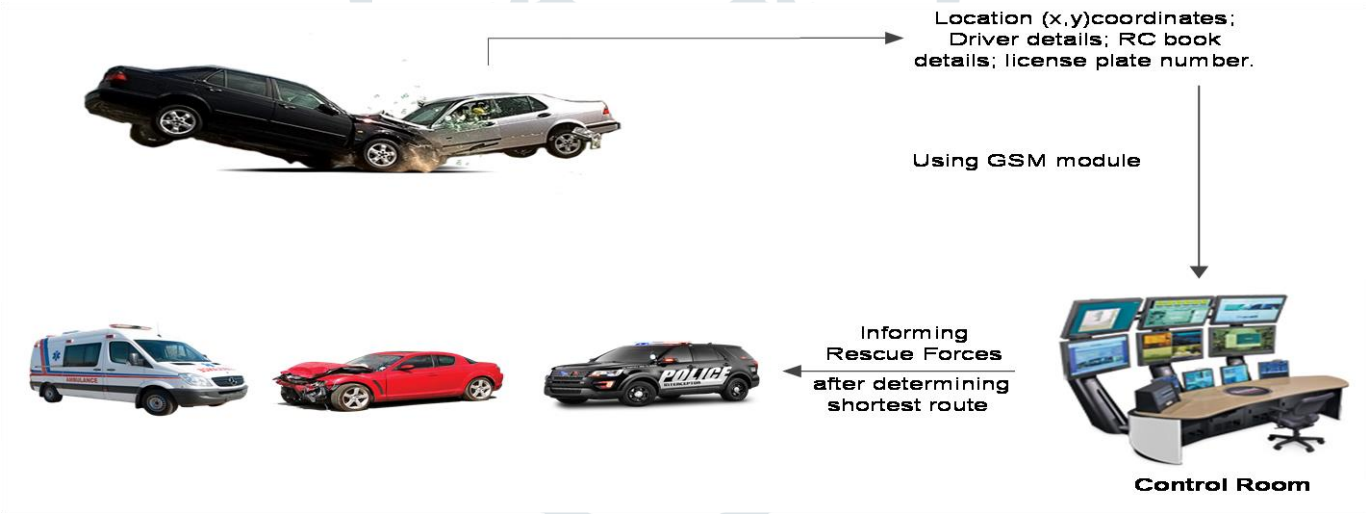

Figure 1: Working of Accident Response System using GIS