FATALITY REDUCTION WITH THE HELP OF VEHICLE DETECTION SYSTEM

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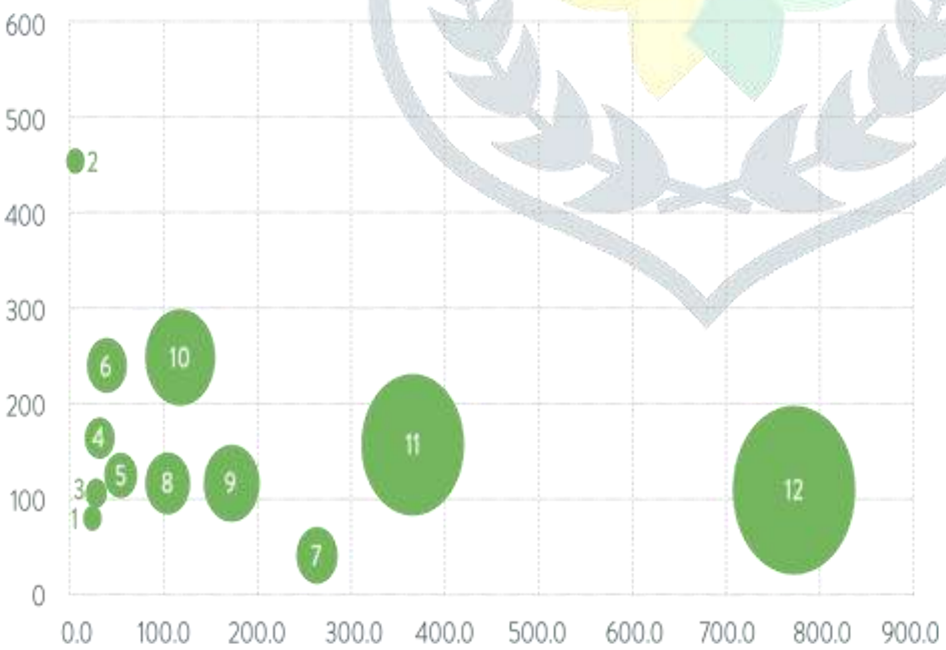
Abstract : This paper analyses the distance of vehicles on the left side of bus or large vehicle with the help of magnetic signatures of the vehicle to help the drivers of those buses to drive accordingly and it will result in decrease in the number of accidents caused by buses and large vehicles due to inability of bus drivers to see on the left side of the road. The magnetic signatures of vehicles and the use of anisotropic magnetoresistive sensors helps to estimate the relative position of a vehicle from its magnetic signature. Theoretical analysis and experimental measurements both show that vehicle magnetic field has a first order inverse relationship with distance at small distances. However, the parameters in the magnetic field-distance relationship vary significantly with the type and size of car. A sensor system consisting of 2 magnetoresistive sensors and an extended Kalman filter can adaptively estimate these parameters in real-time. The developed sensor system can reliably estimate vehicle distance from magnetic field measurements and this distance can be used to detect an imminent collision and its severity just before the collision occurs.

***Index terms :* AMR SENSORS, KALMAN FILTER, SIGNAL AMPLIFIER**

1.INTRODUCTION

The population of India is around 1.25 billion and the population of world is more then 7 billion and for the accommodation of this large population, there are thousands of public transportation buses running on the road. The following graph illustrates the total number of journeys in the countries/regions that were studied. The size of the bubble corresponding to each country/region is an indicator of total number of journeys; the value, in billions. By looking at each axis, we can identify the impact of urban population and journeys per capita on total journeys for each country/region involved.



	COUNTRY	NB OF JOURNEY 2015
1	Oceania	2.1
2	Singapore	2.5
3	Canada	3
4	Ukraine	5
5	Turkey	6.9
6	Korea	9.8
7	U.S.	10.6
8	Russia	12
9	Brazil	19.7
10	Japan	29.2
11	Europe	57.3
12	China	84.5

Fig: Population(millions)

- Different levels of demand per capita(2015)
  Large countries:

For the purpose of this study, 'large countries' were considered to be any with more than 30 million urban residents. Considering a greater proportion of the urban population lives in larger countries, they have the potential of being big markets for public transport. The following graph illustrates annual journeys per capita in large countries:

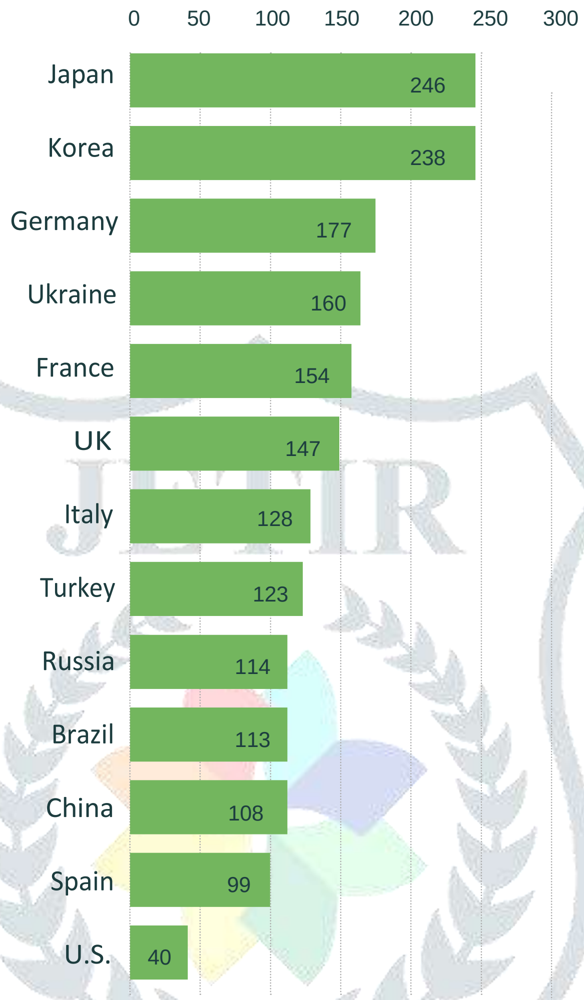


Fig: Annual journeys per capita in large countries (2015)

2. MODAL DISTRIBUTION

This section illustrates the modal breakdown of total journeys in 2015. Insignificant inconsistencies among similar modes (in terms of name or how they serve people in different countries) were clustered as the same. For instance, what is called 'heavy rail' in the US includes. Considering that there is another mode, commuter railway, which serves suburban areas and goes beyond areas covered by heavy rail, we clustered heavy rail as metro and commuter rail as suburban railway.The chart illustrates that, on average, bus is the dominant mode of transport overall; with a 63% share, it is higher than the sum of all other modes combined. Following bus, metro and suburban rail are the most popular modes with a 16% share each.The following chart presents the modal distribution of journeys for all countries:

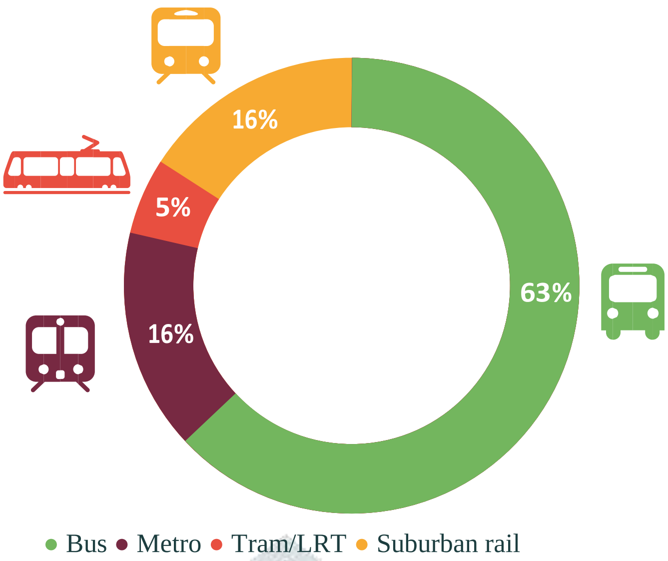


Fig: Average modal distribution of all public transport journeys (2015)

3.NEED OF THE SYSTEM

In the above section there is the data that the bus is used in large number for the people's everyday commute. There is a picture shown below in the fig.1 it shows the common day commute of people of Chennai. It is almost same for all over india. The number of passengers travelling on buses is very large.

Fig: Everyday commute of common people

In the above picture, I tried to show the normal day of the passengers travelling by the bus in the peak hours in the metro city. People choose different modes of accomodation for their daily purpose like auto, bike, car, taxi, etc. which are used by them on daily basis. And while travelling on the roads unfortunately accidents do occur and there are many causes of the accidents and one of the causes of accident is that bus drivers are not able to know the presence of vehicles like auto, bike, cars etc on the left side of the bus because of their small heights with compare to bus and large vehicles. The table below shows the data of bus design features and their impacts on safety. It is data of EMBARQ in 2014.

FEATURE	IMPACTS ON SAFETY
Wide-angle rear-view mirrors that protrude further out of the front side of the bus; side- and rear-view cameras	Minimises blind spots
Long and wide, single-frame windshields Low seating position for the driver	Increases driver visibility of crossing pedestrians, potholes, speed bumps, etc. Situates eyes closer to the road and minimises blind spots
Side, rear, and front underrun protection that is energy-absorbing	Reduces likelihood of vehicle / pedestrian being run over by a bus wheel; absorbs some of the crash force with another vehicle (and reduces severity of the crash)
Retro reflective markings on all sides of the bus Speed governors	Increases visibility of the bus where lighting is poor Limits maximum speed capable by the bus
High-quality breaks, suspension and steering	Significantly lowers risk of being involved in a crash
Automatic doors	Reduces likelihood of passenger falling out of the bus

Fig : Bus design featue and their impact on safety.

Fig : Accident prone area of bus

4. AMR SENSORS AND POSITION ESTIMATION

Research work in the case of predictive crash detection has mostly focused on the use of multiple radars and laser sensors (wide-beam short-range and narrow-beam longrange) for prediction of future collisions (see references [1], [2], [3], [4], [5]). However, such systems can only provide a probability of collision and cannot predict it with certainty. This is because the radar sensors used in such applications cannot make measurements at distances very close to the car (less than 1 meter) and have an extremely narrow field of view at such short distances. Hence these collision prediction systems are primarily useful for providing long-distance collision warnings to the driver, so that the driver can then respond and try to ensure a safe commute. An AMR sensor has a silicon chip with a thick coating of piezoresistive nickel-iron. The presence of an automobile in close range causes a change in magnetic field which changes the resistance of the nickel-iron layer. The 3-axis HMC 1053 set of AMR devices from Honeywell were utilized for the system developed in this paper. Every vehicle has a magnetic field, and researchers have now found that a vehicle's magnetic field has an inverse relationship with distance at small distances. The relationship provides a way to estimate a vehicle's position using its magnetic field when the vehicle is less than a few meters away, The main sources of magnetic fields are the magnetized steel belts in the tires, the ignition, the alternator, air conditioning system, speakers, etc" and "The significant metal in the engine block, transmission, driveline, etc. can also be magnetized” To measure a vehicle's magnetic field, I used anisotropic magnetoresistive (AMR) sensors on the vehicle that's doing the measuring, while the other vehicles do not need to be equipped with any kind of device. The AMR sensors, which contain silicon chips with a thick coating of piezoresistive nickel-iron, can detect a change in the ambient magnetic field induced by a passing vehicle. The change in magnetic field causes a change in the resistance of the nickel-iron layer in the AMR sensors. There is a clear non-linear relationship between the measured magnetic field and distance below about 6 meters.

5.PROPOSED SYSTEM

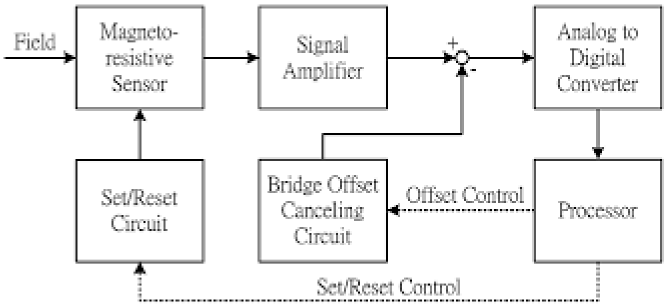


Fig: System architecture

To measure a vehicle's magnetic field, There will be use of anisotropic magnetoresistive sensors on the vehicle from which we want to measure the distance and this will be called this Source vehicle, while other vehicles does not need to be equipped with the device which will be our target vehicle. The AMR sensors, which contain silicon chips with a thick coating of piezoresistive nickel-iron,can detect a change in the ambient magnetic field induced by a passing vehicle. The change in magnetic field causes a change in resistance of the nickel-iron layer in the AMR sensor and with the help of Kalman filter. Device will be fixed on the left part of the heavy load vehicles and a lcd screen near the driver's steering. If any vehicle will be on the left side of that vehicle it will show the dots on the screen which will help the drivers to know the presence of vehicle.

6. CONCLUSION

The proposed system concludes that the use of magnetoresistive sensor and Kalman filter for the estimation of distance of vehicles results a low cost and efficient technique and it will help to decrease the number of accidents on the roads.

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