Vehicle Identification During Collision Using Network Sensors

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ABSTRACT

Every year about 1.24 million people die as a result of road traffic crashes. A lot of Hit and Run cases occur in India and around the world. There are 7 Hit and Run cases in every hour in India, where the guilty runs away without being caught. In many cases no one takes the responsibility to take the injured to the hospital, which leads to the death of the injured passengers. Many a times it has been observed that the person involved in rash driving/hit and run case, escapes from the crime site without being reported due to lack of any evidence or information regarding him and his vehicle such as number plate etc. The objective of this project is to design an efficient system for collision detections using the network sensors where at the time of collision the vehicle owner's information will be exchanged and it will be easy to identify the guilty in Hit and Run Cases, also the notification of accident and its location is sent to the nearest hospitals and their relatives so the lives of the injured could be saved.

Keywords- Piezo electric sensor, Vehicle Identification, Sensors, RFID, Microcontroller.

ARTICLE INFO

I. INTRODUCTION

In recent years, the number of hit and run cases have increased exponentially, with the number of vehicles on the roads increasing rapidly, vehicle safety has become of utmost importance. So, there is need of a system which would help in collecting the collided vehicle's information. This system would also help in rescue operations of the injured in the collision by notifying about the accident and its location to the nearest hospitals and the victim's relative. The main idea of project is to use the RFID to exchange vehicle's information on collision, as well as storing the collision logs on server for future actions.

II. EXISTING TECHNOLOGIES

Leading innovators in technologies related to RFID have developed vehicular technologies that allow vehicle identification at toll booths, checkpoints, parking lots, etc., using the RFID tags embedded in the vehicle. This system recognizes the vehicles entering the toll booths with the help of RFID tags placed on them and automatic deduction of toll charges takes place in this system. This system uses RFID

to electronically identify vehicles and validate the identity, status and authenticity of vehicle data for a specific application. This project goes two to three steps ahead by using this identification technology to track vehicles in cases of motor vehicle accidents. By using a collision sensor i.e. Piezo electric sensors that detect vibration on collision, an ID system has been designed that is activated only during a collision. A database is made for registered vehicle id and all the information of the owner is stored in it. The logs of accident are stored on server which could be seen on an android app. The android app is developed for the authorities to see the logs generated of the accident and take necessary actions. Also, a notification system is made to notify the nearest hospitals and the relatives of the car owner, about the accident, with the location co-ordinates of the accident site so, necessary help could be provided to the injured on time and lives could be saved.

Analysis of the generated logs of accident overtime, could be used to make necessary changes in the infrastructure to the locations where a large amount of

accidents take place, thus future accident could be prevented.

III. BASIC PRINCIPLE

When two cars collide, they must exchange registration numbers and other required details and all the detail that are recorded during the accident are sent to the Server. This is the basic idea behind the project. To enable the exchange of information between the two cars, RFID techniques have been used. Each car has its details on an RFID tag placed somewhere on its surface. Each car also has its own RFID reader which is activated in case of an accident.
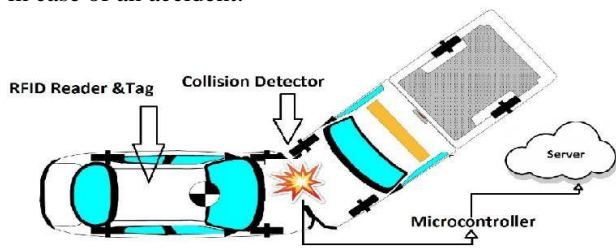
Figure 1: Overall System

Collision is detected using the piezoelectric sensors that are placed on the front and back of each car. These sensor when detect an collision activate the RFID reader placed on the car, which in turn reads the RFID tag of the other car containing essential information about the car. Hence, essential details are exchanged during collisions help a lot in hit and run cases. The level of collision that is considered to be an accident can be adjusted by setting a minimum threshold value for collision sensor using the microcontroller
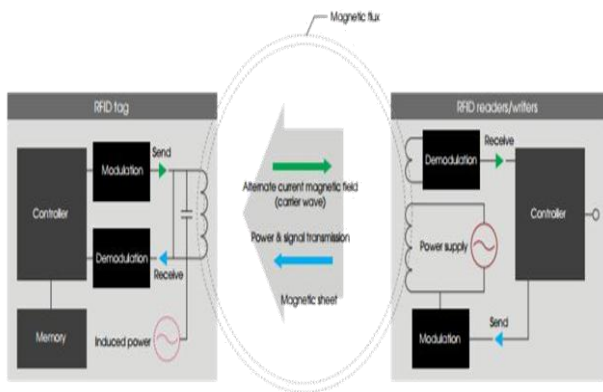

Figure 2: Typical model of communication of the 13.56MHz RFID System with a tag and reader (Photo taken from paper 978-1-4799-7193-0)

IV. COMPONENTS

A. RFID Tag and Reader

RFID is an acronym for radio frequency identification device is a generic term which is used to describe the system that can transmit the identity basically in form of serial number. RFID Reader is a device which is used to gather information from RFID tag and communication between Tag and Reader is possible through Radio wave. RFID tag is an electronic tag which exchange data with Reader. Most RFID tags are made up of at least two main parts. The first part is an antenna, which receives radio frequency waves and the second is an integrated circuit , which is used for processing and storing data, as well as modulating and demodulating the radio waves received/sent by the antenna. Usually RFID tag consist of 2KB of data. Reader read the information from tag and at last pass to the Controller.
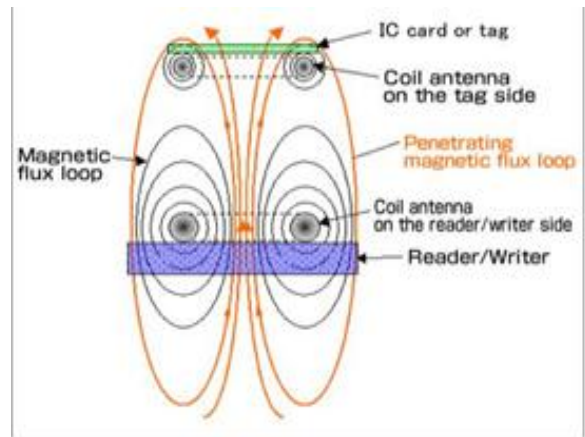

Figure 3: Working of RFID in the absence of metal (Photo taken from paper 978-1-4799-7193-0)

Generally tags is not placed in metal body because metal reflect radio frequency produced by the reader and it unable the reader to read the tag. Since System required the tag to be placed i the metal body i.e. Car So Special mounted tag to be used. Usually NOX-TM4 tag is used. This type of tag is best suited for Proposed System because it reduces eddy current produced by the metal body using a magnetic Shield between tag and metal. This magnetic shield attracts the flux causing it to pass through the tag before being reflected by the metal surface.
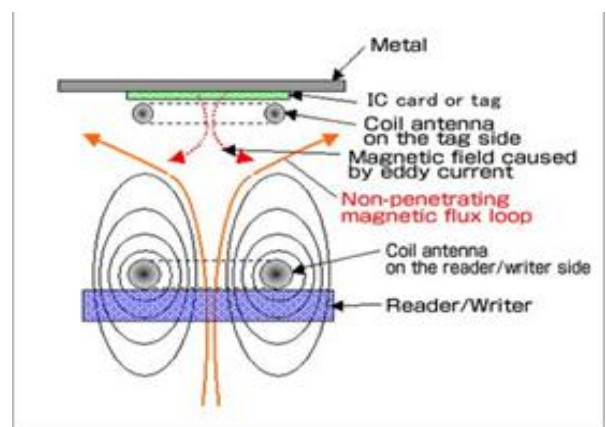

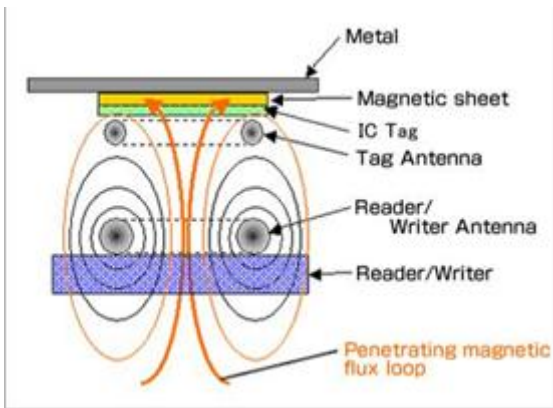Figure 4: Communication failure caused due to presence of metal sheet (Photo taken from paper 978-1-4799-7193-0)

Figure 5: Use of magnetic sheet to nullify effects of metal sheet
(Photo taken from paper 978-1-4799-7193-0)

B. Collision Detector

A Collision Sensor is an electronic device which measures the Pressure and convert it into measurable electronic signal. When two car Collide Pressure is produced between them and it is detected by the collision sensor. After that Sensor Send electric signal to the input pin of microcontroller.
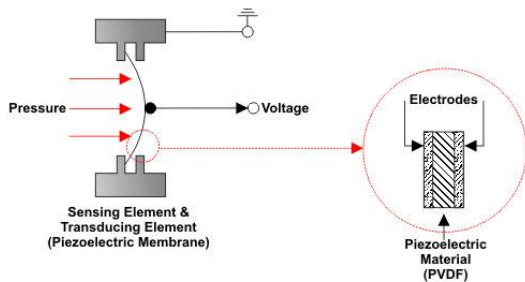
In Proposed System Piezo Sensor is used which convert the measurable pressure into electric signal .This Sensor is a thin strip of piezoelectric material in a circular shape. It can be produced in any shape and it very cheap and easily available.
The way a piezoelectric material is cut produces three main operational modes:
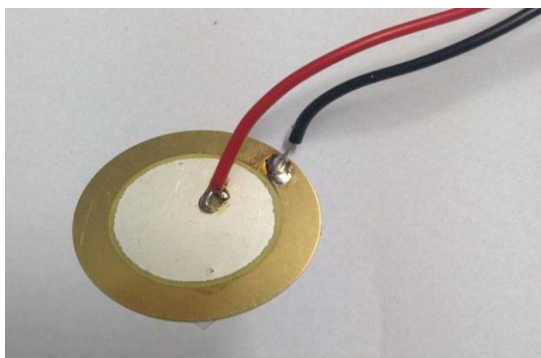- Transverse
- Longitudinal
- Shear.

Figure 7: Simple piezo sensor

C. GPS

A GPS is an acronym for General Positioning Service is a navigation device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position.This device get the current coordinate of vehicle i.e. Latitude and Longitude and Send it to Server.

D. Microcontroller

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory and programmable input/output peripherals. The main function of the microcontroller is to supply power to all component and decide when a collision has occurred and appropriately activate or deactivate the RFID system.

After a certain threshold microcontroller activate a RFID reader. Also its is responsible to send the tag information, Current accident Location to the Server. In Proposed System Node MCU esp8266 is used. It has inbuilt WIFI which is used to connect to the internet and Send Information to the Server.

V. BLOCK DIAGRAM
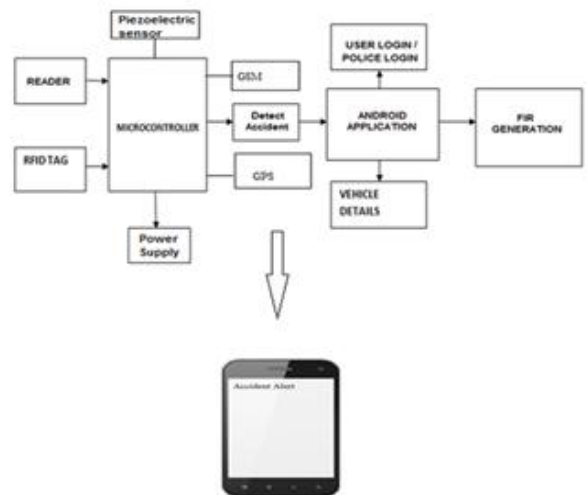
VI. TESTING THE PROTOTYPE

When Vehicle 1 Collide with Vehicle 2 or vice-versa. Piezo-electric Sensor of both the car measure the pressure and if it is above the threshold limit then it Send a Positive Signal to the microcontroller which in turn activate the RFID Reader of both the Car which read the tag of opposite Car. So both the car shares the Information. After receiving information of car it Send to the Server by using

Microcontroller and also accident information is send to the Family member of the Vehicle Owner and the Hospital via a SMS All the Information like Name of Car Owner, Vehicle Number, RFID Tag Number etc are stored in Server which can be access by central authority or Police Official Through an Android app.
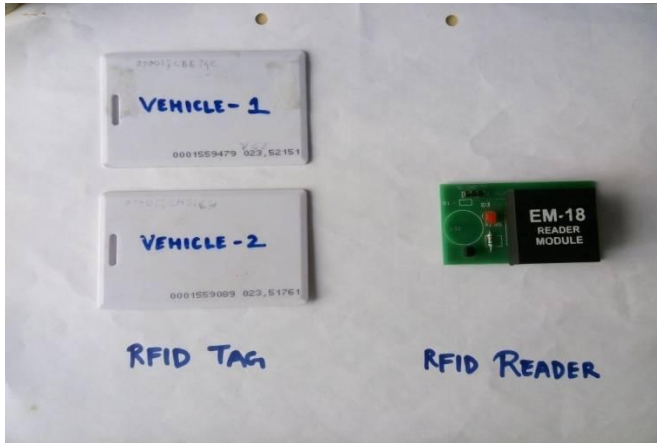
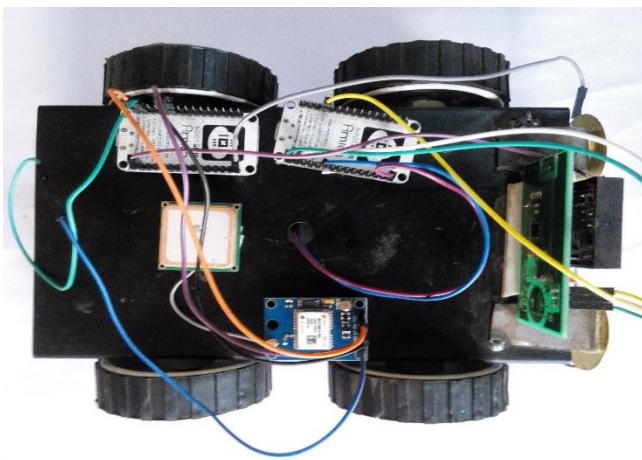Figure 10: The tags and reader used for the prototype

Figure 11: Interior view showing the components of Vehicle 1

Threshold Output Voltage is set to 10.For any impact causes a spike of above 10 then reader is activated and read the tag of the Collided Vehicle .Threshold can be decided accordingly when used practically.
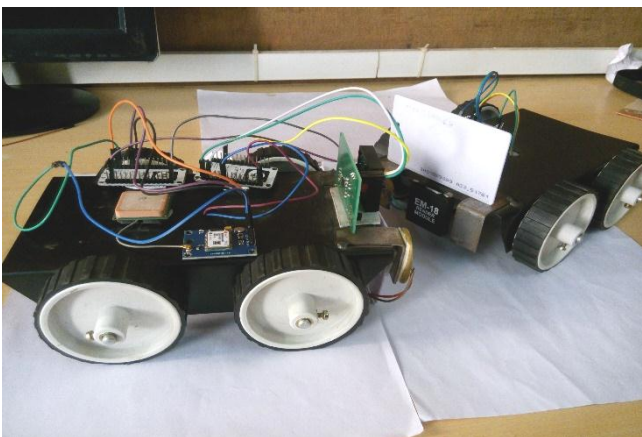

Figure 12: Final prototype with Vehicles 1 and 2

VII.   APPLICATIONS

The RFID based vehicle identification system can be used to track down rash drivers in hit and run cases. It can be used for insurance claims when a vehicle has been damaged. The microcontroller of the system can also tap into the ECU (Electronic Control Unit) of the car to record the vehicle speed at the time of collision. This can serve as evidence in accident cases. This data can also provide driving patterns to a traffic police officer in case of any violation. Ultimately, this motivates people to drive safe. Its also used to Inform Vehicle Owner Family and Hospital so help can be provided as soon. The data can be used to deal with infrastructure Problem.

VIII.   FUTURE SCOPE

The use of this technology can be expanded to develop smart vehicles. NFC (Near Field Communication) can be integrated in this technology to pay at Petrol Pumps to avoid crowd hassle. It can also be useful for Traffic Authorities to track down the previous history of the vehicle. This will be helpful in better Traffic management.

ECU (Engine Control Unit) can also be integrated to the system to note the speed at the time of the collision. It can also record the driving patterns of the vehicle. The patterns then, can be analysed by the authorities to track down the guilty in respective incident.
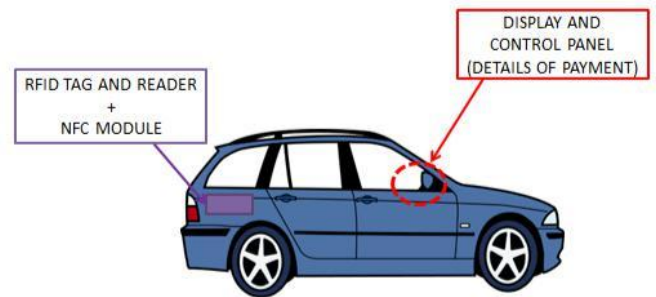

Figure 13: Use of NFC to make payments using RFID tags (Photo taken from paper 978-1-4799-7193-0)

The Hospitals and Toll Plazas of certain area can be integrated into the database. Whenever any accident takes place, the authorities will inform the Toll Plazas with necessary information of the vehicle to block the guilty.
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ACKNOWLEDGEMENT

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