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Smart Vehicle Solution Kit for Advanced Driving Assistance

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***Abstract*—**The following paper presents a noble model for solving the problems faced by the drivers while driving and thus provides them with advanced driving assistance. The solution demonstrated by our designed project is helpful in saving the lives of vehicle occupants. Automation is a key to solve day to day issues and reducing the complexities. The paper provides the solution for the major problems faced by the driver on road and also helping them in case of an accidents. The paper provides the information regarding the entire design of the automated system and its role in saving the lives and its broader aspects.

Keywords*—Troxler's fading , GPS , GSM , Headlight Dipping , ABS, SVM.*

I. INTRODUCTION

The 21st century has been a game changer in the field of automation and has a great future ahead. Each developmental activity should be solving a specific issue faced by the society or a specific group. Hence the development process is very much dependent on the way a problem is being addressed and the core innovation in solving the issue.The advancement of technology has led us to the phase where we are pretty safe while on vehicle as compared to the previous scenario. Automobiles were not safe in the early era and very few safety measures were taken by automotive industry. With the advancement in the technology, automation has played a vital role in developing life saving systems like ABS and automated air bag deploy system. But, still challenges are faced by these technologies because this is not the complete solution and comfort what a rider or driver expects. There isn't a package which provides the complete solution and at the same time analyzes the accidental certainties and that too at a nominal economic rate. Thus, the design of the project provided by this paper takes into account in solving some of the major problems faced by the drivers as well as providing it at a low cost[1].

II. CHALLENGES

Deaths due to accident has been a major issue in the roadways which has caused huge loss. The analysis of on-road death shows that deaths on road have caused about $ 8 Billion economy loss in India itself.

Several potential factors such as- TROXLER'S FADING DRINK & DRIVE, Premature death after accident and poor information about the road conditions have been the major reasons behind all the losses. Still, the problems remain and have not yet been solved[2]. Problems and difficulty still persist in the mentioned fields. To overcome the life taking certainties, we have proposed a system which will not only help in preventing accidents but also will provide the analysis of the accident-prone zones to improve safety. In addition to it we have integrated the system that will reduce the premature death taking place after the accidents.

A. Existing System

In the existing system , there have been a number of automated systems helping the drivers while driving like ABS , headlight splitting system , and a no of other systems but , they are not still very much effective in helping the drivers and moreover, systems relating to helping the drivers during accidents have not been developed too and the cost of the existing systems are also not much economical.

III. PROPOSED SYSTEM

The design of the project has the following features integrated into it.

A. Automatic Headlight Dipping Technology

Automatic Headlight Dipping Technology [3] - to automatically dip the headlights of the opposite incoming car if the brightness of the headlight is above the threshold level. It will save the driver from Troxler's Fading and thus effectively prevent accidents. In the designed the communication will be established in between the two cars only if they are at a specific distance from each other and as soon as, the cars are not in range communication will not and

the headlights will go their previous state. mm-wave Technology is used to design the entire system and for this mm-Wave sensor [4] ,chips are used along with other components. The biggest advantage of this robot is that it can work in any environmental conditions like rain, dust, smoke, fog, or frost and in complete darkness or in the glare of direct sunlight These sensors are also small and lightweight when compared to other types of LIDAR based sensors.

- IWR1642 [5] is a very large scale integrated single-chip mmWave sensor which is based on FMCW radar technology. It has the ability to operate in the 76- to-81 GHz band with continuous chirp up to 4 GHz. This device is built with TI's low-power 45-nm RF CMOS process, which enables it to possess unparalleled extent of integration into an extremely tiny form factor as shown in Fig.1. IWR1642 is the perfect provision for industrial applications such as construction automation, industrial automation, drones, self-driving vehicles, traffic supervision, and surveillance. This advanced module can work in any weather condition and poor visibility conditions making it extremely robust to use in practical and real-life implementation.

Fig.1. IWR1642

- TIDEP-0094 [6] is a development platform which is used to detect the object using IWR1642 evaluation module (EVM) .This will help to determine the position (azimuthal plane) along with the velocity of the objects at a distance of up to 84 m as shown in Fig.1.

  - The operational angle of the radar is orthogonal to the PCB. To enable easy measurements on the sensing objects on the horizontal plane, the PCB can be mounted vertically as shown in Fig.2. The L-brackets provided with the IWR1642 EVM kit, along with the screws and nuts help in the vertical mounting of the EVM as shown in Fig.1.

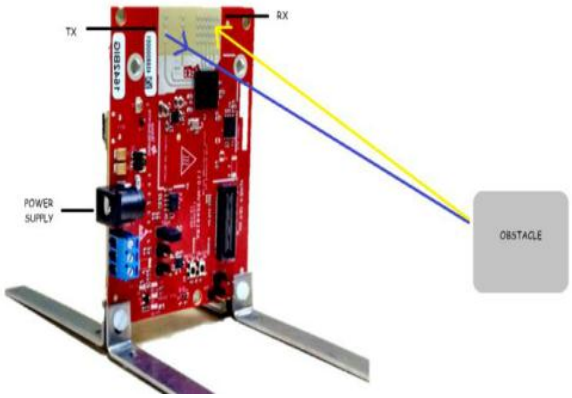

Fig.2. TIDEP-0094

Table.1. General features of IWR1642

FUNCTION	IWR-1642
No of Receivers	4
No of Transmitters	2
On-Chip Memory	1.5
Max I/F (Intermediate Frequency) (MHz)	5
Max Real Sampling Rate (msps)	12.5
Max Complex Sampling Rate (msps)	6.25

Light Dependent Resistor (LDR)[6] .The following diagram below shows the basic design of a Light Dependent Resistor (LDR) and the graphical representation showing the relationship between the Intensity of light falling on the LDR and the change in resistance occurring with it.

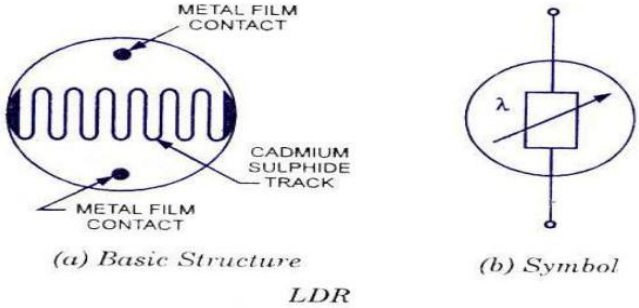

Fig.3. Design of LDR

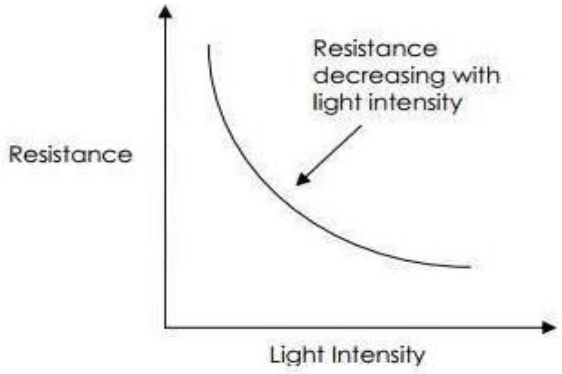

Fig.4. Characteristics of LDR

B. Auto-Speed control

The system will automatically keep track of the level of alcohol consumed by a driver in real time while driving the cars and a relay system is integrated within it which will simultaneously control the speed of the car as per the amount of alcohol consumed by the driver. In fact, the speed will be slowed down automatically as the percentage of alcohol consumed increases thus reducing the risk of the accidents. For this we have included an alcohol sensor which continuously monitors the air inside the vehicle and restricts maximum speed to the predefined limit. The reduced speed provides more time for the driver to react and reduces the risk of accident.

- MQ-3 Alcohol Sensor Module is alcohol sensor which is used to detect the alcohol concentration on your breath.This sensor provides an analog resistive output based on alcohol concentration. It comes with the following specifications:
    - Detecting Concentration:0.05-10 mg/L Alcohol
    - Analog and Digital Output
    -

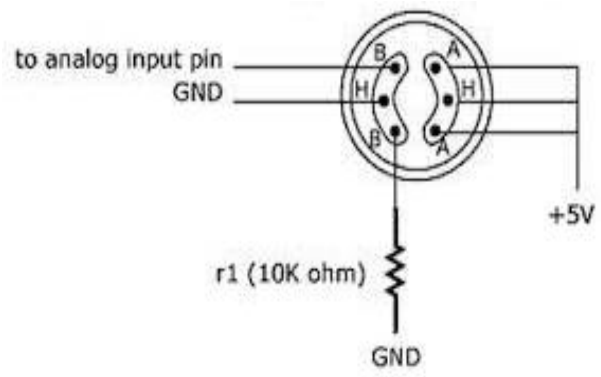

Fig.5: Design Of MQ-3 Sensor Module

- L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. It is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single IC. In a single L293D chip there are two H-Bridge circuit inside the IC which can rotate two dc motor independently. H-bridge is a circuit which allows the voltage to be flown in either direction. H-bridge IC are ideal for driving a DC motor. Due its size it is very much used in robotic application for controlling DC motors.

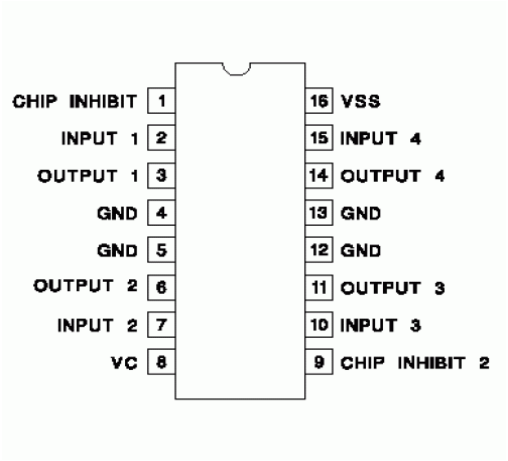

Fig.6(a). L293D Pinout

C. Auto Messaging service

In order to automatically inform the nearest police station and hospital during accident along with Google Map location of the place of the accident.Next , we are solving the problem of delay in medication , i.e , when accidents occur, at the very first moments , nobody comes to know about the accident and thus, the victim do not get proper medication at the proper time. Thus, in our system , we have a Piezoelectric sensor which will be installed in our cars , as soon as the accident occurs , the piezoelectric sensors senses a jerk or impact and if that is above the set threshold level, it automatically activates the GSM (Geo Sensing and Messaging) module as well as the GPS tracking module which is used to give the current location of place of accident)which together functions and thus, automatically sends message a no of times to the nearest police station and the hospital along with informing one of the relatives. In the message, notification regarding accident is sent , along with it, the current latitude and longitude of the place as well as the Google Map location of the place of the accident is also sent. This notification will help in fast reaction to the accident and will increase the chances of saving life of the injured passengers.

- Piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. Based on piezoelectric technology various physical quantities can be measured; the most common are pressure and acceleration. For pressure sensors, a thin membrane and a massive base is used, ensuring that an applied pressure specifically loads the elements in one direction. For accelerometers, a seismic mass is attached to the crystal elements. When the accelerometer experiences a motion, the invariant seismic mass loads the elements according to Newton's second law of motion.Vibration sensors can also harvest otherwise wasted energy from mechanical vibrations.

This is accomplished by using piezoelectric materials to convert mechanical strain into usable electrical energy.

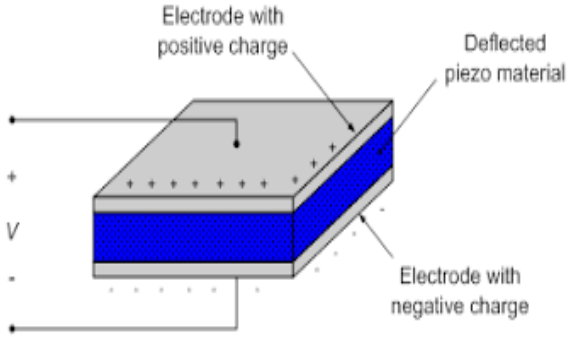

Fig.7. Design of Piezoelectric Sensor

- Geo Sensing and Messaging Service (GSM/GPRS) module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification.

Fig.8: GSM Module

- Geo-Positioning System navigation device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position. Using suitable software, the device may display the position on a map, and it may offer directions. The Global Positioning System (GPS) is a global navigation satellite system (GNSS) made up of a network of a minimum of 24.A GPS device can retrieve from the GPS system location and time information in all weather conditions, anywhere on or near the Earth.

D. Automatic- Road Type Classification

In order to automatically predict the type of road zones based I.e either accident prone zone or not.Along with this, we have developed a Database Management System which will maintain the record of latitudes and longitudes of the accident locations. Using the database we have used Support Vector Machine Algorithm in-order to predict the types of zones ,i.e., Accident Prone Zones or Safe Zones. This information will be crucial to maintain the roads as per the requirement and reduce chance of accidents.In-fact , authorities can alert the drivers about the kind of roads ahead by means of signs.The maintenance of records and control of the road conditions is done through a Web-App interface which is also developed by us . This Web-App interface will enable systematic management of the whole process, rather maintaining vaguely.

- Support Vector Machine Algorithm [8] (SVMs, also support vector networks), in machine learning, are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier(although methods such as Platt scaling exist to use SVM in a probabilistic classification setting). An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall. In addition to performing linear classification, SVMs can efficiently perform a non-linear classification using what is called the kernel trick, implicitly mapping their inputs into high-dimensional feature spaces.

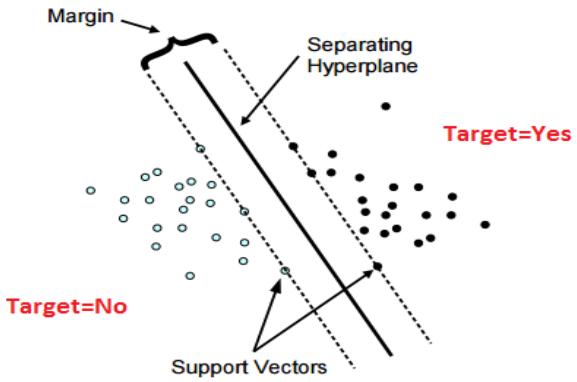

Fig:9. SVM Classifier Algorithm Representation

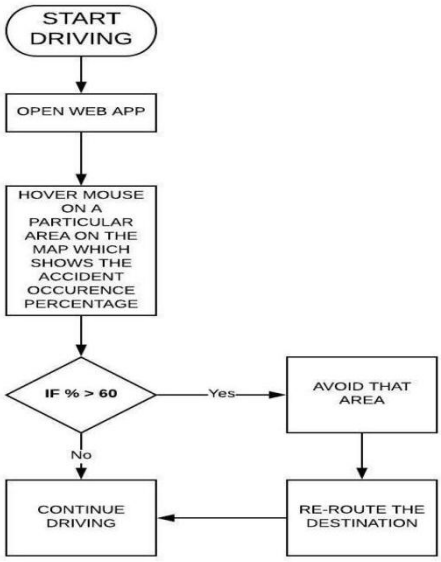

Fig.10:Smart control of the system through Web - App Interface

IV. IMPLEMENTATION

This technology of precise car detection and further dipping of the headlights and other advanced driving assistance system using can be used in various like fields like making of autonomous robots like swarm drones and swarm robots and in various field like in military to develop autonomous stealth bots and also in medical application.Moreover, in the field of Advanced Automotive Electronics and technology, they are useful for Auto-Braking System , Auto-Lane changing system etc on which I am presently working. They can also be used to make autonomous parking system for vehicle and autonomous delivery robots.

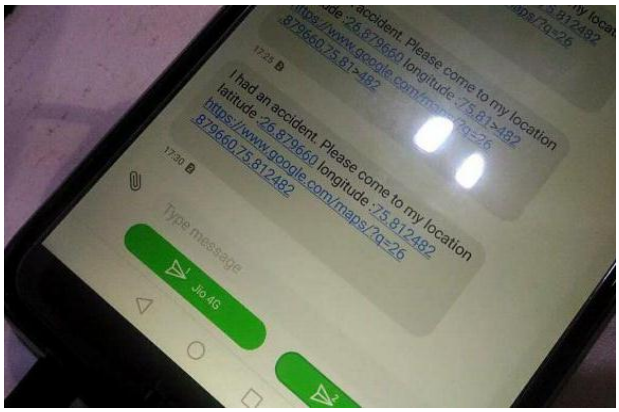

Fig:11. Implemented & Tested Output

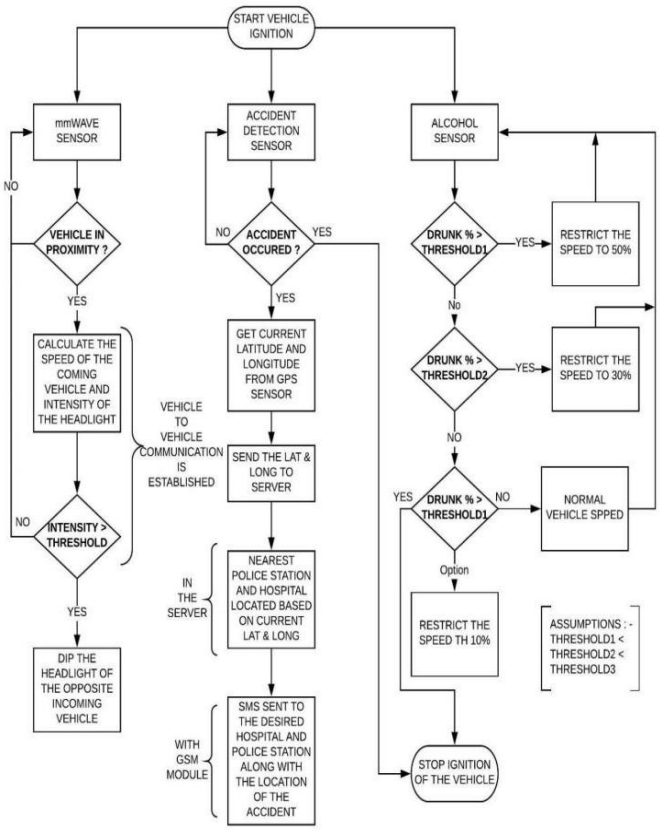

Fig:12. Algorithmic Representation

V. CONCLUSION

We proposed and designed a system in order to provide a solution to reduce the number of accidents occurring every day due to blinding high beam headlights .This technology is highly precise and accurate in determining the position of the cars on the roads and depending upon that further communication is established and thus dipping of the Headlights is done based upon the threshold condition. It also helps in locating the vehicle in case of an accident through Auto Geo-location Tracking, Auto - Messaging and Automated Speed Control System.The robustness of the the complete developed system allows it to work in all kinds of conditions and thus save the lives of people and make a road journey safer and secure .

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REFERENCES

[1] D. S. Smith and P. R. Jackman, "Optical sensors for automotive applications," IEE Colloquium on Automotive Sensors, Solihull, UK, 1992, pp. 2/1-2/3.

[2] P. Song, Y. Zhang, X. Wu and Y. Lan, "Design and Implementation of the Adaptive Control System for Automotive Headlights Based on CAN/LIN Network," 2013 Third International Conference on Instrumentation, Measurement, Computer, Communication and Control, Shenyang, 2013, pp. 1598-1602.

[3] P.F. Alcantarilla, L. M. Bergasa, P. Jimenez, I. Parra, D. F. Llorca, M. A. Sotelo, S. S. Mayoral, "Automatic LightBeam Controller for driver assistance", Machine Vision and Applications.

[4] S. K. Agrawal and K. Sharma, "5G millimeter wave (mmWave) communications," 2016 3rd International Conference on Computing for Sustainable Global Development (INDIACom), New Delhi, 2016, pp. 3630-3634.

[5] B. B. Rhoades, J. P. Sabo and J. M. Conrad, "Enabling a National Instruments DaNI 2.0 robotic development platform for the Robot Operating System," SoutheastCon 2017, Charlotte, NC, 2017, pp. 1-5.

[6] G. M. Salim, H. Ismail, N. Debnath and A. Nadya, "Optimal light power consumption using LDR sensor," 2015 IEEE International Symposium on Robotics and Intelligent Sensors (IRIS), Langkawi, 2015, pp. 144-148.

[7] N. Maheswaran, K. Thamilan, P.S. Vijayakumar, D. Vadivel, "Automatic Light-DIM and DIP Control for Automobiles", IJETT, vol. 29

[8] Zhaoqing Shen, Yuhua Peng, Ning Shu, "A Road Damage Identification Method based on Scale-span Image and SVM", *Geomatics and Information Science of Wuhan University*, vol. 38, no. 8, pp. 993-997, Aug. 2013

