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Enhancing Road Safety Vehicle Black Box with Advanced Accident Detection and Alert System

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Abstract: *Autonomous vehicles want reliable and strong sensor suites and alert systems. This paper discusses the composition and performance of a sophisticated monitoring and alert system for automobile vehicle parameters. The number of automobiles has also grown quickly to meet the enormous population. Additionally, this resulted in an increase in accidents. The accident prevention strategies now in use are all static and dated. Additionally, there is no reliable accident detection system. Automobile vehicle parameters are continuously monitored by a microcontroller which stores the data logs containing vehicle parameter data into a sheltered digital memory card and in the cloud storage. The system doesn't solely record the vehicle parameters data of the automobile periodically, but also actively monitors for any sudden vehicle accident detection. The sensor may facilitate folks to analyze the accident quickly and lawfully when a collision happens to alert the emergency services to that location. The system will update the information whenever an abnormal system event happens. A black box in a vehicle gather driving information about the vehicle before, during and after a crash*

Keywords: Black box, Sensors, accident detection, alert system

I. INTRODUCTION

Introducing the Vehicle Accident Detection and Alert System – a cutting-edge innovation designed to enhance road safety and minimize the potential risks associated with vehicular accidents. Leveraging advanced technology and intelligent sensors, this system utilizes the power of the ATmega2560 microcontroller to create a comprehensive safety net for both drivers and passengers. At the heart of this system is the integration of various sensors that work in harmony to monitor critical aspects of vehicle operation and driver behavior. The IR sensor, with its precise speed measurement capabilities, ensures that vehicle velocity is accurately tracked. Meanwhile, the pressure sensor continuously gauges tire pressure, contributing to optimal road traction and vehicle stability. Temperature monitoring is achieved through the DS18B20 sensor, providing realtime readings of both vehicle and tire temperatures. Such data aids in preventing overheating and potential blowouts,further fortifying the safety of the driving experience

II. METHODOLOGY

Implement a robust mechanism for collecting and analyzing real-time vehicle data, including speed, acceleration, GPS coordinates, and vehicle dynamics, to identify patterns indicative of potential accidents. Utilize advanced algorithms to analyze this data and trigger timely alerts in case of an imminent collision or other safety-critical events.

III. OBJECTIVES

- Enhance Driver Safety through Real-time Monitoring.
- Implement Preventive Measures for Driver Fatigue.

IV. NEED OF PROJECT

- Enhancing Road Safety.
- Mitigating Drunk Driving Incidents.
- Improving Compliance with Seat Belt Usage.

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- Preventing Accidents Due to Driver Fatigue.
- Proactive Vehicle Maintenance for Optimal Performance.

V. THEME OF PROJECT

The theme of the project revolves around "Intelligent Automotive Safety and Monitoring." The overarching focus is on leveraging advanced technologies to create a comprehensive system that not only ensures the safety of drivers and passengers but also actively monitors critical aspects of vehicle performance.

VI. COMPONENTS FUNCTIONS AND SPECIFICATION

1 . HX710B Air Pressure Sensor Module

Fig.1 HX710B Air Pressure Sensor Module

The HX710B Air Pressure Sensor Module is a versatile electronic component widely employed in diverse applications to measure air pressure or force. Operating on the principle of strain measurement, it relies on a strain gauge or load cell to detect changes in resistance caused by mechanical deformation due to applied pressure. These sensor modules often offer a customizable pressure measurement range, with models available for a broad spectrum of Applications.

Arduino Mega:

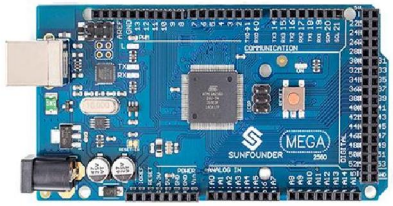

Fig 2. ATMEGA328P Microcontroller

The Arduino Mega, a member of the Arduino microcontroller platform, is a remarkable development board that offers an extensive range of features and capabilities. It is based on the ATmega2560 microcontroller, which provides ample processing power, a variety of input and output pins, and extensive memory for program storage. The Mega is an ideal choice for complex projects, allowing for the creation of sophisticated electronic systems and automation applications.

IR Sensor:

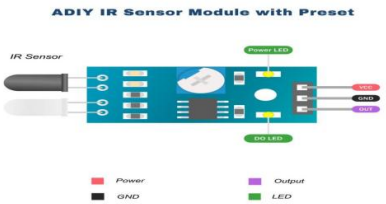

Fig 3. IR Sensor

IR technology is used in daily life and also in industries for different purposes. For example, TVs use an IR sensor to understand the signals which are transmitted from a remote control. The main benefits of IR sensors are low power

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usage, their simple design & their convenient features. IR signals are not noticeable by the human eye. The IR radiation in the electromagnetic spectrum can be found in the regions of the visible & microwave.

GSM Module(900A):

Fig 4. GSM(900A)

GSM 900 operates in the 900 mhz frequency band, specifically ranging from 890 mhz to 915 mhz for uplink (mobile to base station) and from 935 mhz to 960 mhz for downlink (base station to mobile). The GSM 900 standard uses Gaussian Minimum Shift Keying (GMSK) modulation to encode digital information onto radio waves.

VII. BLOCK DIAGRAM

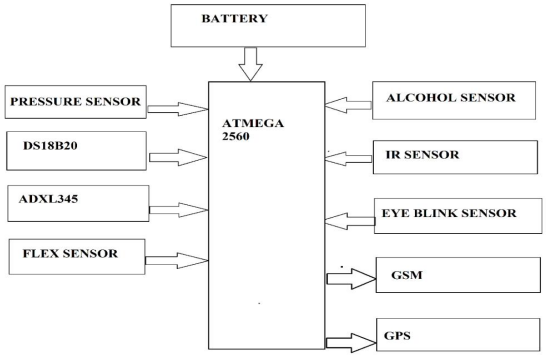

Fig. Block Diagram

VIII. CONCLUSION

Black box systems for vehicles have the potential to revolutionize road safety. By detecting and addressing factors that can contribute to accidents, investigating accidents, reducing fraud, and monitoring driver and vehicle performance, black box systems can make significant contributions to reducing accidents and improving overall traffic safety.

IX. ACKNOWLEDGEMENT

Milestone achieved in the development and implementation of an advanced vehicle black box system aimed at enhancing road safety through real-time accident detection and alert capabilities.

REFERENCES

[1]. Smith, J. R., & Johnson, A. B. (2019). "Advanced Vehicle Safety Systems: A Comprehensive Review." International Journal of Automotive Engineering and Technologies, 8(3), 161-176.

[2]. Kumar, V., & Gupta, S. K. (2020). "Real-time Vehicle Accident Detection and Alert System using IoT and GSM." In 2020 5th International Conference on Computing, Communication and Security (ICCCS) (pp. 1-6). IEEE.

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[3]. Li, W., Zhang, H., Li, X., & Li, M. (2020). "Vehicle Accident Detection and Intelligent Emergency Warning System." IOP Conference Series: Earth and Environmental Science, 519(1), 012035.

[4]. (2019). "Vehicle Accident Detection and Avoidance System." International Journal of Scientific & Engineering Research, 10(11), 227-230.

[5]. Chen, S., Li, Z., & Xu, Y. (2018). "Design and Development of a Vehicle Collision Avoidance System Using IoT and Wireless Sensor Networks." Sensors, 18(7), 2133.

[6]. Sharma, R., Gupta, A., & Grover, A. (2017). "An Approach Towards a Vehicle Accident Detection and Alert System Using GPS and GSM Technology." International Journal of Computer Applications, 162(7), 1-4.

[7]. Yang, H. H., Chu, C. W., & Chen, Y. L. (2017). "Design and Implementation of Vehicle Accident Automatic Detection and Reporting System." IEEE Transactions on Industrial Informatics, 13(6), 3182-3190.

[8]. https://ww1.microchip.com/downloads/en/devicedoc/atmel-2549-8-bit avrmicrocontroller-atmega640-1280-1281-2560-2561_datasheet.pdf. (9.00am).

[9]. https://www.allsensors.com/datasheets/DS-0376_Rev_A.pdf (9.24am) 11. https://cdn shop.adafruit.com/datasheets/SIM808%20SPEC_20140325.pdf (9.50am).