Iot Based Automatic Vehicle Accident Detection and Rescue System

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Abstract-The main issues in metropolitan areas are traffic congestion and road accidents. There is now, technology available for accident identification. The likelihood of a victim dying is further increased by the ambulance taking longer to get at the scene of the accident and by traffic jams between the scene and the hospital. Implementing a system is necessary to lower the number of fatalities brought on by mishaps and the length of time it takes for an ambulance to arrive at hospital. The worried vehicle's GPS and node MCU module will transmit the accident's position to a nearby hospital. Which will send him to the closest hospital to the scene of the accident.

Index Terms— Esp32 camera, Real time video monitoring streaming, IoT capabilities, accident detection, operational efficiency, location tracking, etc

I. INTRODUCTION

The IoT-Based Automatic Vehicle Accident Detection and Rescue System is an innovative solution designed to improve road safety and emergency response times.

This system utilizes Internet of Things (IoT) technology to detect vehicle accidents and automatically alert emergency services, ensuring timely assistance and potentially saving lives.

Road accidents are one of the leading causes of death worldwide, with thousands of lives lost every year due to delays in emergency response.

To address this critical issue, the development of an IoT-based automatic vehicle accident detection and rescue system offers a smart and efficient solution. This system leverages sensors such as accelerometers, gyroscopes, and GPS modules to detect accidents in real-time. Upon detecting an impact, the system automatically transmits the location and severity of the accident to emergency services and predefined contacts via the Internet.

By integrating Internet of Things (IoT) technology with vehicle safety systems, this solution aims to minimize the time between accident occurrence and medical response, potentially saving lives. The system is designed to be cost-effective, reliable, and scalable, making it suitable for wide adoption across various types of vehicles.

II. PROPOSED METHOLOGY

The proposed system employs Internet of Things (IoT) technology to enable real-time accident detection and automatic emergency response in the event of a vehicle crash.

The core of the system is built around a microcontroller, such as Arduino or Raspberry Pi, integrated with various sensors including an accelerometer, gyroscope, GPS module, GSM module, and a vibration sensor. These sensors continuously monitor the vehicle's movement and detect any sudden changes in orientation or acceleration that may indicate an accident.

When a significant impact or abnormal motion is detected—exceeding a pre-defined threshold value—the system interprets it as a potential accident. At this point, the GPS module is activated to acquire the vehicle's real-time geographical location. Simultaneously, the GSM module sends an automated alert message to pre-configured emergency contacts. This message typically includes crucial details such as the time, date, and exact coordinates of the accident site.

In addition to messaging, the system can also push data to an IoT cloud platform for remote monitoring via a mobile application or web dashboard. This enables family members or emergency response teams to view the vehicle's status in real time. A local alert mechanism, such as a buzzer or LED, can also be activated to notify nearby individuals of the incident, potentially speeding up rescue efforts.

To reduce false positives, the system can include logic to filter out normal vibrations or bumps, and a manual override switch may be provided for the driver to cancel the alert if no real danger exists. In future iterations, the system can be enhanced by integrating AI for severity

assessment, camera modules for visual context, and direct links to nearby hospitals or emergency services. Overall, this methodology leverages IoT for proactive accident response, aiming to reduce emergency response time and potentially save lives.

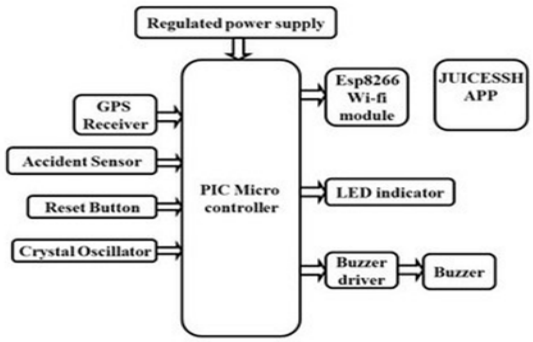
The system may also include a buzzer or LED indicator to alert nearby individuals. To avoid false alarms, a threshold-based filtering mechanism and a manual cancel switch are incorporated. This autonomous and responsive approach significantly reduces the time taken to notify rescue teams, enhancing the chances of timely medical assistance and saving lives. The system is scalable and can be further improved with features like camera modules, AI-based crash severity analysis, and integration with emergency services.

III.IMPLEMENTED DESIGN

The IoT-Based Automatic Vehicle Accident Detection and Rescue System aims to reduce response times and improve road safety by automatically detecting accidents and alerting emergency services in real-time. The system's primary objective is to save lives and minimize injuries by ensuring timely medical attention. It achieves this by providing accurate location information, streamlining emergency response processes, and minimizing manual reporting errors. By leveraging IoT technology, the system enhances emergency response, enabling responders to provide quick and effective assistance. Ultimately, the system seeks to improve outcomes for accident victims, reducing the severity of injuries and saving lives.

The implemented design of the IoT-based automatic vehicle accident detection and rescue system integrates multiple sensors and communication components into a compact and efficient unit mounted within the vehicle.

IV.BLOCK DIAGRAM



This block diagram represents an accident detection and alert system based on a PIC microcontroller. The system is powered by a regulated power supply which ensures stable voltage to all components. A GPS receiver provides the real-time location of the vehicle. An accident sensor detects sudden impacts or collisions and sends a signal to the microcontroller. A reset button is included to manually reset the system, and a crystal oscillator ensures accurate timing for the microcontroller. The microcontroller processes all inputs and controls outputs. It communicates with the ESP8266 Wi-Fi module to transmit accident data to a mobile application called JUICESSH. In case of an accident, the system activates a buzzer through a buzzer driver to alert nearby individuals, and an LED indicator provides a visual signal. This setup enables real-time accident detection and location reporting for quick emergency response.

It also sends the location and alert using the ESP8266 Wi-Fi module to the JUICESSH mobile app, allowing help to be sent quickly.

Open PIC C compiler.

You will be prompted to choose a name for the new project, so create a separate folder where all the files of your project will be stored, choose a name and click save.

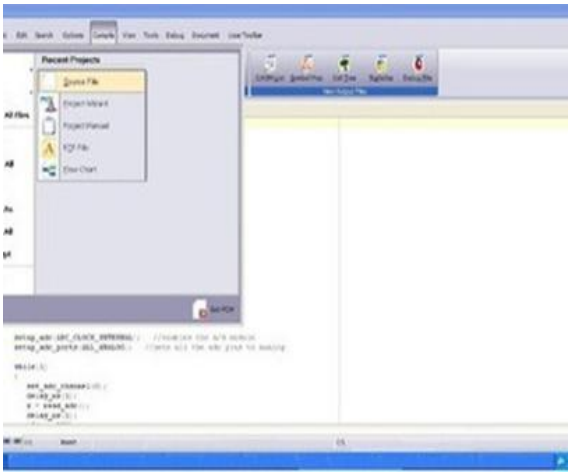


Fig 1:- opening a new file using PIC C compiler

This is how we compile a program for checking errors and hence the compiled program is saved in the file where we initiated the program.

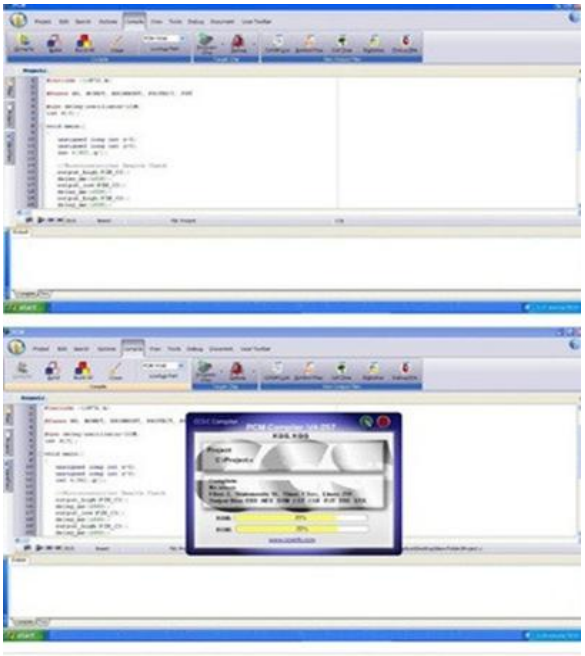
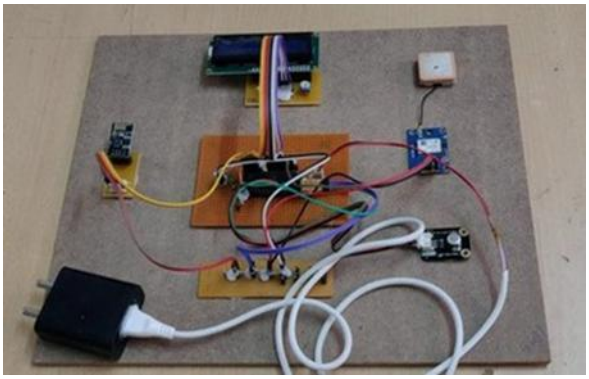


Fig 2:-compiling a new file using PIC C compiler checking errors and warnings using PIC C compiler < Initially before connecting the program dumper to the microcontroller kit the window is appeared as shown below.



After the successful dumping of program the window is as shown below.

Fig 3:-Picture of program dumper window Picture after program dumped into the microcontroller

IV.RESULTS

The project "IOT Based automatic vehicle accident detection and Rescue system" was designed a vehicle accident detection and alerting system can be done with GPS, ESP8266 and accident sensor.

V.ADVANTAGES AND DISADVANTAGES

Advantages:

- Highly efficient and user-friendly design.
- Easy to operate.
- Low power consumption.
- Location of the vehicle can be known using GPS.
- Efficient design.
- Using IOT technology.
- In case of emergency intimation (accident) can be sent to predefined numbers.

Disadvantages:

- Its require wi-fi network.

VI. FUTURE SCOPE

- By using this project we can save the time and for vehicle tracking it is very easy.
- By interfacing MMC/SD card to the system we can log the path of the vehicle being traveled.

VII.CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of

REFERENCES

[1] Khattar, A., Sarkar, P., & Peter, J. S. (2020). IoT based accident detection and vehicle tracking system using GPS and GSM module. International Journal of Advanced Science and Technology, 29(6), 1115-1121. https://sersc.org

[2] Sharma, S., & Sebastian, S. (2019). IoT based car accident detection and notification algorithm for general road accidents. International Journal of Electrical and Computer Engineerin g, 9(5), 4020-4026. https://doi.org/10.11591/ijece.v9i5.pp4020 - 4026 every module has been reasoned out and placed carefully,

[3] Sanjana, K.R., Lavanya, S. and Jinila, Y.B., 2015, March." thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested. An approach on automated rescue system

[4] Khalil, U., Javid, T. and Nasir, A., 2017, November." Automatic road accident detection techniques": A brief survey. In 2017 International Symposium on Wireless Systems and Networks (ISWSN) Kumar, D., & Maurya, R. (2019). IoT based vehicle accident detection and alert system. International Journal of Engineering accident-detecti5o.n-and-alert-system

[5] Shinde, S., et al. (2018). Accident Detection and Alert System using Raspberry Pi.international Research Journal of Engineering and Technology (IRJET), 5(1). https://www.irjet.net/archives /V5/i1/IRJET-V5I1239.pdf

[6] Patil, A., & Pawar, D. (2017). Vehicle Accident Detection and Reporting System using GPS and GSM.international Journal of Computer Applications, 168(9),m29–32. https://doi.org/10.5120/ijca201791439

[7] Khattar, A., Sarkar, P., & Peter, J. S. (2020). IoT based accident detec tion and vehicle tracking system using GPS and GSM module. International Journal of Advanced Science and Technology, 29(6), 1115–1121. https://sersc.org

[8] Sharma, S., & Sebastian, S. (2019). IoT based car accident detection and notification algorithm for general road accidents. International Journal of Electrical and Computer Engineering, 9(5), 4020–4026. https://doi.org/10.11591/ijece.v9i5.pp4020-4026 https://doi.org/10.1007/s10586-019- 02989-z

[9] Dashora, C., Sudhagar, P. E., & Marietta, J. (2020). IoT-based framework Research & Technology (IJERT), for the detection of vehicle accident.8(5).https://www.ijert.org/iot-based-vehicle-Cluster Computing, 23, 1387–1395.

[10] Manchala, M., Bommala, H., Raju, V. R., & Pant, R. (2023). IoT-based system for automated accident detection and rescue. E3S Web of Conferences, 430, 01159. https://doi.org/10.1051/e3sconf/202343001 159

[11] Ali, S. K., Hamad, O. S., Ahmed, M. G., Shareef, A. A., & Saber, M. F. (2023). Transforming car accident detection: An IoT and cloud-based approach. International Journal of MultidisciplinaryResearch and Analysis, 6(10), 1850–1858. https://doi.org/10.47191/ijmra/v6-i10-26

[12] Patil, V., More, A., Mahajan, M., & Gholap, H. (2023). AI and IoT based road accident detection and reporting system. International Journal for Research in Applied Science and Engineering Technology, 11(3), 53315. https://doi.org/10.22214/ijraset.2023.53315

[13] V Ciji, E., Xavier, A., Hussain, A. A., Soman, D., Joy, J., & George, D. (2024). IoT-powered emergency vehicle system: Rapid accident response in cities. International Journal of Progressive Research in Science and Engineering, 5(5). https://journal.ijprse.com/index.php/ijprse/article/view/1047

[14] Talukder, S., Ira, S. T. B., Khanom, A., Sneha, P. B., & Saleh, W. (2022). Vehicle collision detection & prevention using VANET based IoT with V2V. arXiv preprint. https://arxiv.org/abs/2205.07815

[15] Kumar, R., & Rajasekaran, M. P. (2016). "An IoT based smart vehicle accident detection system." International Journal of Engineering Research and Applications (IJERA), 6(12), 6-10.

[16] Palanisamy, P., & Krishnamurthi, I. (2016). "Design and implementation of vehicle tracking and accident alert system using GPS and GSM module." International Journal of Computer Applications, 146(5), 17-20.

[17] Vigneshwaran, N., & Prakash, S. (2019). "IoT based vehicle accident detection and rescue system." International Journal of Recent Technology and Engineering (IJRTE), 7(6), 600-604.

[18] Naveen, B., Karthik, K., & Harish, G. (2020). "Smart accident detection and alert system using IoT." Materials Today: Proceedings, 37(Part 2), 1875-1878.

[19] Sujithra, M., & Sivakumar, R. (2021). "Real- time vehicle accident detection and rescue system using IoT." Journal of Physics: Conference Series, 1916(1), 012083.