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IoT Based Accident Detection & Street Light Management

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Abstract— The Internet of Things (IoT) has limitless prospects for both the public and private sectors. Automakers are interested in IoT applications to enhance vehicle safety, meet consumer demand, and finally deliver cutting-edge goods that maximise profit. The feasibility of equipping an automobile with technology that may instantly alert emergency services to an accident and identify it is investigated in this study. The Internet of Things (IoT) may be used to generate an automated notice and reaction to the circumstances. Once a GPS and accelerometer signal have been sent to the cloud, everybody who has subscribed to that car will instantly receive a warning message. The signal will reveal the magnitude of the accident and its GPS position. The Internet of Things-based Smart Street Light System aims to reduce electricity waste and operating expenses while saving energy. The streetlight is turned on and off using the LDR sensor in accordance with the quantity of ambient light.

Keywords— IoT devices, Node MCU, Infrared Sensor, LDR, Buzzer and Power supply.

I. INTRODUCTION

In cities, accidents happen often, and many of them are manageable. It might be challenging for an ambulance driver to find the scene of an accident with the aid of citizen calls when it occurs at night or when visibility is very poor. If the driver is aware of the precise position of the incident, the distance between the accident scene and the hospital will be significantly reduced.To assist the ambulance driver with finding the spot promptly when an accident is reported, the same setup will transmit accident coordinates to the ambulance. A second setup is linked to the patient once the ambulance has been loaded, and it will continually monitor the patient's vital signs to keep him stable. Now, streetlights—which use embedded brightness sensors to modulate brightness—consume a significant amount of electricity around the globe. They automatically come on when it gets dark and go off as soon as it becomes light. This must be corrected since it is a significant source of global energy waste. There are some methods for reducing the amount of energy lost by streetlights.

II. PROBLEM STATEMENT

Demand for cars has significantly increased because of population growth, which has alarmingly increased traffic congestion and automobile accidents. Both the percentage of fatal road accidents and their frequency are sharply increasing. The primary cause of the increased risk of mortality is, however, the delay in providing emergency aid. Many lives might be saved by successful rescue operations. Traffic backups or inconsistent connections with the medical units are to blame for the delay. There are several approaches to automated accident detection in the literature. The methods include machine learning methods, mobile ad hoc networks, GPS-based systems, and crash prediction utilising cell phones. It is typical to see the streetlight on all night, which is a significant energy waste. Every day, there is a comparatively significant amount of power consumption. Some streets don't always have people on them, unlike the main city streets; occasionally, they remain deserted for a while. To improve the street lighting management system and guarantee that the streetlight can operate effectively, street lighting was observed. This mechanism will make it possible.

III. EXISTING SYSTEM

The main cause of traffic congestion is poor traffic management. The only alternative, given that the current foundation cannot be further enlarged, is to enhance traffic control. Existing Street light systems must be manually turned on and off. The current street lighting system consumes a lot of power and costs a lot to

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maintain. To manage the functioning of the current street light system, more personnel are needed.

IV. PROPOSED SYSTEM

The controller receives information from the sensors and sends an accident alarm to the roadside unit, which then sends a message to the rescue team. Additionally, Wi-Fi and GPS are used to locate the car, and that information is also sent to the rescue team. Through IOT technology, it will be easier to connect to the closest hospital and deliver medical assistance. The usual street light control system turns on the lights at night and turns them off during the day using transistors. To complete the procedure, an LDR sensor can be employed. Energy conservation is currently necessary since energy supplies are running out faster than they can be produced. As a result, our future generations may experience several problems as a result of this resource deficit. This technique eliminates the need for manual streetlight on/off switching. Whether or not illumination is needed is determined by the street lighting system.

V. OBJECTIVES

A. Accident Detection System

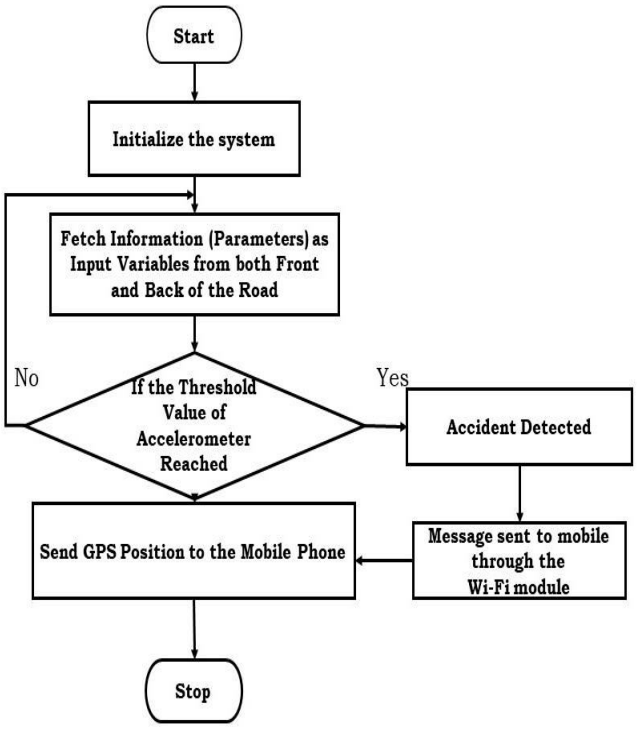

Fig 1 : Accident Detection System

After a vehicle accident is detected, the system instantly alerts nearby control rooms and mobile units, preventing the casualty from losing his or her life because of delayed medical care. The system is set up in the automobile. Accelerometers are fitted for car accident detection, and GPS modules are used for reporting. The Node MCU unit, which serves as the main microcontroller, is interfaced with all these devices.The accelerometer alerts the microcontroller when a mishap happens, so it can keep running. The GPS unit provides the precise position, speed, time, and date of the area where the automobile is in real-time. When an accident occurs, the accelerometer detects it, uses GPS to determine its location, and then uses a GSM module to relay the information to the police and ambulance service. The message received on a mobile device contains the location of the accident scene in the form of a Google Maps link, helping emergency services like the ambulance service and police station locate the injured and save lives.

B. Working of Smart Street Lightning System

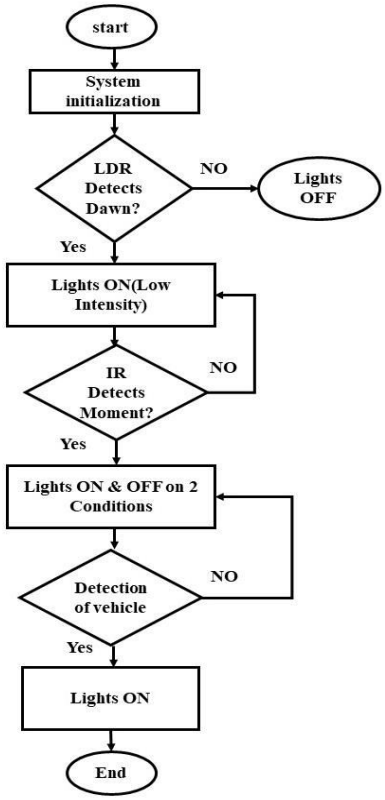

Fig 2 : Smart Street Lighting System

A transistor is typically used in the standard street light control system to turn lights on at night

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and off during the day. To finish the process, an LDR (light-dependent resistor) sensor can be employed. Energy conservation is currently necessary since energy supplies are running out faster than they can be produced. As a result, our future generations may experience several problems as a result of this resource deficit. This technique eliminates the need for manual streetlight on/off switching. Whether or not illumination is needed is determined by the street lighting system.

V. BLOCK DIAGRAM

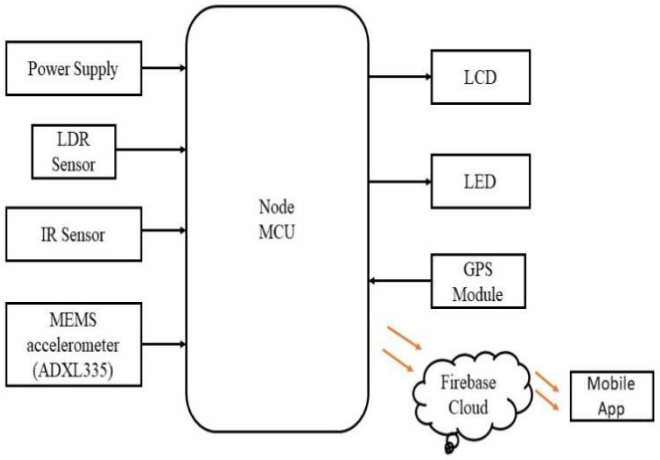

Fig 3 : Block Diagram of IoT Based Smart Highways

VI. WORKING OF PROPOSED SYSTEM

The ADXL335 detects the shock and communicates it to the microcontroller when the accident occurs. At the same time, GPS is used to calculate the latitude and longitude of that specific area. This NodeMCU serves as the system's primary microprocessor. The Global Positioning System is known as GPS. The GPS module is the primary part of our project's vehicle tracking system. It uses a GPS Neo-6m modem, which gets coordinates, time, and date from satellites every second. The GPS receiver is used to establish the vehicle's coordinates, which are then used to establish the precise location of the accident. The ADXL335 is a three-axis MEMS (Micro-Electro-Mechanical Systems) accelerometer with minimal power requirements. It is frequently used in a variety of applications, such as a vehicle accident warning system, to monitor acceleration and tilt. The +/- 3 g range of accelerations can be measured using the ADXL335 sensor. It operates by sensing changes in acceleration and transmitting signals to the NodeMCU, which analyses the information to ascertain whether an accident has happened. The ADXL335 sensor is an excellent option for detecting unexpected deceleration or impact in a vehicle accident since it is highly sensitive and can identify even minute changes in acceleration.

The NodeMCU board can be integrated with the ADXL335 sensor to create a complete accident warning system because the sensor can communicate with the NodeMCU via analogue pins. All of the system's components must be Internet of Things-based and linked to the same networkIn this configuration, the system's central processing unit is the NodeMCU Arduino. It loses resistance when exposed to sunlight during the day, which switches off the light. At night, the sensor's resistance rises in the absence of light, and the light is turned on.

Fig 4: No Accident Detected

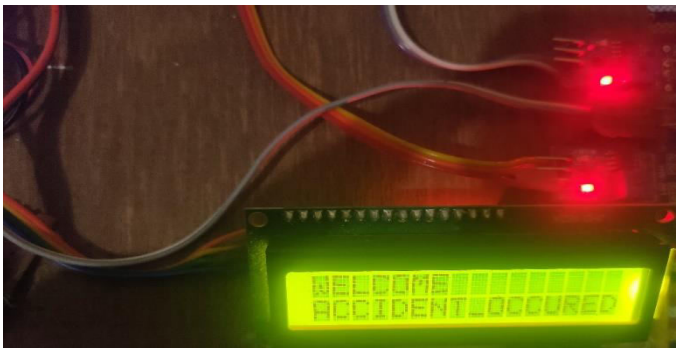

Fig 5: Accident Occurred

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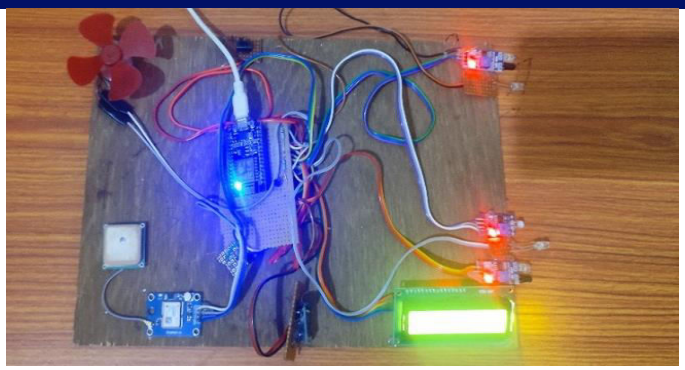

Fig 6: Entire Project Kit

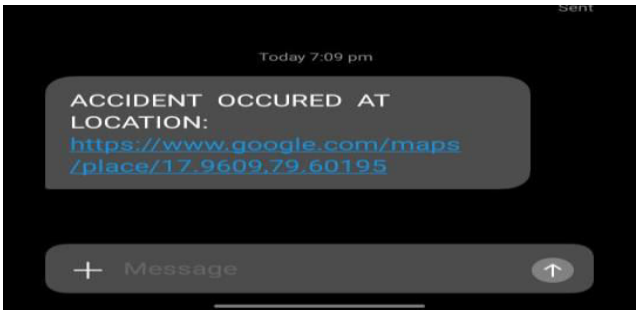

Fig 7: Location Link

VII. SOFTWARE & HARDWARE DESCRIPTION

A) Arduino IDE:

The software for Arduino is called IDE (Interesting Development Environment). The Arduino IDE is used for testing distinctive properties. This is used to code and troubleshoot programmer faults. This applies to the various kinds of system-operating software, including Windows and Linux. C and C++ are supporting languages. Open-source software is available.

B) Nodemcu ESP8266:

The open-source Node MCU (Node Micro Controller Unit) is built on a low-cost system-on-a-chip (SoC) called the ESP8266. The ESP8266 was created and manufactured by Express if Systems, and it has all the necessary parts of a computer, such as a CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. Because of this, it's a great choice for all kinds of Internet of Things (IoT) projects.

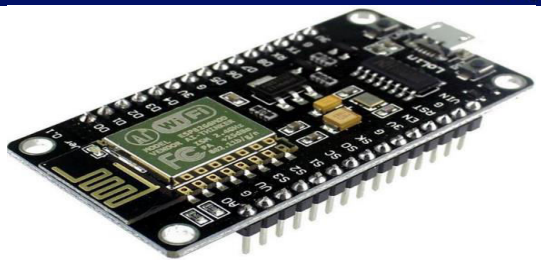

Fig 8: NodeMCU ESP8266

C) GPS Unit:

A robust satellite search capability is provided by the NEO-6M GPS module, a competent complete GPS receiver with an inbuilt 25 x 25 x 4mm ceramic antenna. You can monitor the state of the module with the help of the power and signal indicators. GND, the ground pin of the GPS module, must be connected to GND, the ground pin of the ESP32. The RX pin of the ESP32 must be linked to the TXD transmission pin of the GPS module. The TX pin of the ESP32 must be linked to the RXD, or reception pin, of the GPS module.

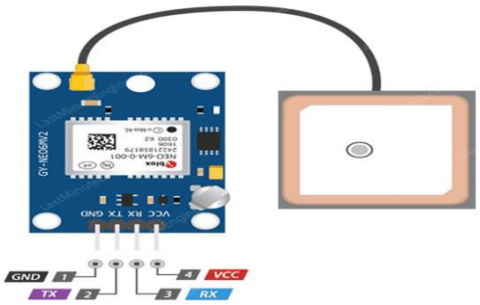

Fig 9: GPS Unit

D) ADXL335 Accelerometer Sensor:

The ADXL335 is a low power, triple axis MEMS (Micro-Electro-Mechanical Systems) accelerometer sensor. It is commonly used to measure acceleration and tilt in a variety of applications including in a vehicle accident alert system. The ADXL335 sensor is capable of measuring acceleration in the range of +/- 3g. It works by detecting changes in acceleration and sending signals to the Arduino UNO, which then processes the signals to determine if an accident has occurred.

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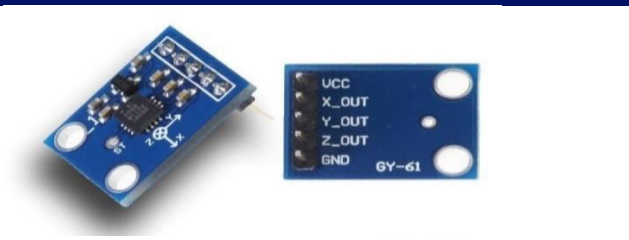

Fig 10: ADXL335 Accelerometer Sensor:

The ADXL335 sensor is highly sensitive and can detect even small changes in acceleration, making it an ideal solution for detecting sudden deceleration or impact in a vehicle accident. Additionally, it is also a low power consumption device, making it suitable for use in vehicles where power availability is limited. It is simple to link the ADXL335 sensor with the Arduino UNO board to create the whole accident alarm system since it can interact with it through analogue pins.

E) Infrared Sensor:

A radiation-sensitive optoelectronic component with spectral sensitivity in the infrared wavelength range of 780 nm to 50 m is known as an infrared sensor (also known as an IR sensor). IR sensors are increasingly being used in motion detectors, which are used in building services to switch on lights or in alarm systems to identify unauthorised visits.

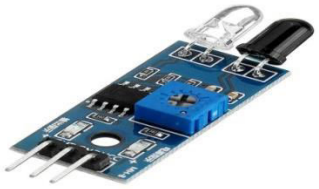

Fig 11: Infrared Sensor

VIII. ADVANTAGES & APPLICATIONS:

A) Advantages:

i. In the Intime information will be passed through the control room.
ii. Losses of death will be decreases.
iii. Lot of electric energy will be saved.
iv. Easily identify the Accident location.
v. Low maintenance cost.
vi. No manpower required.

B) APPLICATIONS:

i. Street light control.
ii. Used in smart city concepts.
iii. It can be implemented in school/college, hospital, hill station, etc zones.

IX. FUTURE SCOPE:

The suggested programme focuses on identifying occurrences, alerting paramedics to a specific area, transporting the injured party to the closest hospital, and providing medical care to them. This can be prolonged by giving the victim medicine right away after the injury. By advancing technology and employing warning systems that can really stop the vehicle, we can prevent accidents as well.

X. CONCLUSION:

Those who have been involved in accidents may be saved by the recommended computerised accident detection system. Anyone without specific expertise may easily apply the proposed method because it is easy to understand. The vehicle's equipment unit contains sensors for accident detection that are constrained by a NodeMCU. On drivers' cell phones, an Android app that has been loaded and is used to get a point-by-point map is the programming element. This system generally has low costs, is secure, and is simple to use. The method used in this study reduces the number of fatal accidents.This article explores possible energy savings as well as the technical facets of the suggested system for smart streetlights. The current problem with the traditional system is its extended operating hours, which lead to high power prices. This would be a terrible waste if it were not handled seriously. This programme therefore provided a solution for lowering the energy consumption of street lighting. Two sensors—an IR sensor and an LDR sensor—are used in the proposed smart street light system. We can control the degree of light intensity and conserve energy by using an IR sensor to detect the vehicle.

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