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ACCIDENT DETECTOR WITH AUTOMATIC EMERGENCY MESSAGING AND WEB DASHBOARD USING GSM

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Abstrat: The proposed project aims to enhance road safety by providing an intelligent system that detects vehicle accidents in real time and immediately alerts emergency services.The system employs sensors such as accelerometer and vibration sensor to identify sudden impacts or unusual vehicle motion indicative of an accident .Once an accident is detected ,the GSM module automatically sends an emergency message containing the GPS location coordinates to nearby ambulances, hospitals ,and emergency contacts in addition ,the system integrates a web – based dashboard that provides real time monitoring of vehicle status ,accident alerts, and location tracking .the dashboard helps authorities and medical teams respond quickly and efficiently. This project minimizes human intervention ,ensuring that help reaches accident victims as swiftly as possible, thereby potentially saving lives. The combination of IoT, GSM, GPS, and web technologies make this system a reliable and scalable solution for modern intelligent transportation and emergency response system

I. INTRODUCTION

Road accidents are among the most critical issues affecting public safety across the world. Every year, thousands of people lose their lives or suffer severe injuries due to delayed emergency response after an accident occurs .In many cases, by standers may not be available or may hesitate to inform authorities , causing further delays in medical assistance. Therefore , the need for an automated accident detection and alert system has become increasingly essential in today ' s world of an intelligent transportation. The Accident Detector with Automatic Emergency Messaging and Web Dashboard using GSM project is designed to overcome these challenges by integrating modern sensor technology ,IoT, and communication system . The system continuously monitors vehicle motion using sensors such as an accelerometer vibration sensor, and GPS module . In the event of a collision or abnormal impact , the sensors detect the sudden change in motion or orientation and immediately trigger an alert signal. Microcontroller which sends an automatic SMS alert via GSM module containing the exact location coordinates
,vehicle ID, and time of the incident to the nearest ambulance services ,hospitals, and registered emergency contacts.

II. METHODOLOGY:

This project follows a structured and systematic approach to
develop a smart flood safety system for vehicles using IoT and sensor technology. The system integrates water level monitoring, emergency alert communication, GPS tracking, and automatic warning mechanisms to improve passenger safety during flood situations.

- Requirement Analysis

- Identify the purpose: detecting accidents and sending emergency alerts.
- Define stakeholders: drivers, passengers, emergency services, family members.
- Establish constraints: cost, power consumption, network availability.

- Sensor Integration

- Use accelerometers, gyroscopes, GPS, and possibly cameras.
- Collect real-time data on speed, impact force, and vehicle orientation.
- Ensure redundancy for accuracy.

- Accident Detection Algorithm

- Apply machine learning or rule-based thresholds (e.g., sudden deceleration, rollover detection).
- Minimize false positives (hard braking ≠ accident).
- Optimize for quick decision-making.

- Emergency Messaging System

- Automatically send SMS, app notifications, or direct calls.
- Include GPS location, accident severity, and vehicle details.
- Prioritize sending to emergency services first, then family contacts.

- Communication Protocols

- Use GSM, LTE, or IoT networks for reliable transmission.
- Implement fallback mechanisms if primary network fails.
- Ensure encryption for privacy.

Sensors like Accelerometer, Gyroscope, and GPS sensors detect the accident and determine its severity. Microcontroller Processes sensor data and triggers the alert system.
GSM Module Sends SMS alerts to nearby ambulances and emergency services with the accident location.
Web Dashboard Displays real-time accident information, including location and severity.
Real-time Tracking Displays accident locations on a map. SYSTEM:
The proposed system consists of sensing, monitoring, communication, processing, alert generation, and emergency response units. The integration of water level sensors and communication modules ensures continuous flood monitoring and rapid emergency response. The system performs real-time flood detection, driver alert generation, GPS location tracking, and emergency message transmission.

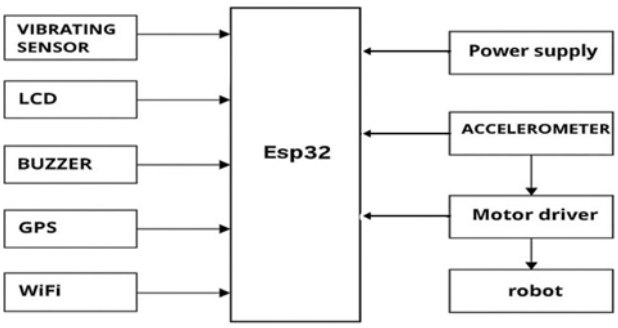

Fig1: block diagram

A. Vibrating sensor

A vibrating sensor, usually an accelerometer or piezoelectric sensor, detects physical motion or shaking and converts it into an electrical signal. Inside, a tiny mass or crystal shifts when vibration occurs, and that movement changes capacitance or generates voltage proportional to the force. The sensor outputs data on frequency, amplitude, and direction of the areas into cells, each with a tower. Your phone's SIM card authenticates you to the network, and GSM digitizes your voice, compresses it, and transmits it over radio frequencies using TDMA to share channels. Although largely replaced by 3G, 4G, and 5G, GSM established global roaming and SMS, and it's still used for basic calls, texts, and IoT devices in many regions due to its wide coverage and low power use vibration. You'll find them in phones for screen

B. LCD

An LCD, or Liquid Crystal Display, creates images by manipulating light with liquid crystals sandwiched between glass plates. The crystals don't emit light themselves, so a backlight shines through. Electric fields twist each pixel's crystals to control how much light passes through colored filters, forming the picture you see. LCDs are used in monitors, TVs, phones, and G. Accelerometer calculators because they're thin, lightweight, and power-efficient compared to older CRT screens.

C. Buzzer

A buzzer is an electronic component that converts electrical energy into sound. When voltage is applied, it makes an internal element vibrate rapidly. In a piezoelectric buzzer, a crystal disc flexes back and forth, while in a magnetic buzzer, an electromagnet pulls a diaphragm. That vibration pushes air and An accelerometer measures acceleration, vibration, and tilt by sensing changes in motion and converting them into an electrical signal. Most modern ones are MEMS chips with a tiny mass suspended by springs. When the device moves, the mass shifts and changes capacitance or resistance, which the sensor translates into data in g-force or m/s2. Accelerometers are used in phones for screen rotation and step counting, in cars for airbags and stability control, in game controllers for motion input, and in industrial machines to detect abnormal vibration. creates the tone you hear. Buzzers are used for alerts H. Motor driver and feedback in alarms, timers, appliances, and toys because they're cheap, small, and only need simple on/off control.Emergency Safety Unit

D. GPS

GPS, or Global Positioning System, finds your location by using signals from a network of satellites orbiting Earth.

A GPS receiver in your phone or car measures how long signals take to arrive from at least 4 satellites, then calculates distance to each one through trilateration. That gives your latitude, longitude, altitude, and speed, usually accurate within a few meters. It's used for navigation, mapping, tracking, and time syncing in everything from phones and cars to aircraft and fitness watches.

E. GSM

GSM, or Global System for Mobile Communications, is a standard for 2G cellular networks that handles voice calls and text messages. It works by dividing geographic

A motor driver is an electronic circuit that acts as an interface between a low-power controller, like a microcontroller, and a high-power motor. It takes small control signals and supplies the larger current and voltage the motor needs to run. It also handles direction control, speed via PWM, and protection features like overcurrent or thermal shutdown. You'll find motor drivers in robots, drones, 3D printers, and appliances, because they let you safely and precisely control DC, stepper, or brushless motors that a controller chip alone can't drive.

F. Power supply

Power supply converts electrical energy from one form to from a wall outlet and transforms it into stable DC voltage, like 5V or 12V, that circuits can use safely. Inside, a transformer steps the voltage down, a rectifier converts AC to DC, and filters plus regulators smooth and stabilize the output. Power

supplies are in everything from phone chargers and PCs to TVs and industrial equipment, because they deliver clean, consistent power and protect devices from surges or noise.

G. Accelerometer

An accelerometer measures acceleration, vibration, and tilt by sensing changes in motion and converting them into an electrical signal. Most modern ones are MEMS chips with a tiny mass suspended by springs. When the device moves, the mass shifts and changes capacitance or resistance, which the sensor translates into data in g-force or m/s2. Accelerometers are used in phones for screen rotation and step counting, in cars for airbags and stability control, in game controllers for motion input, and in industrial machines to detect abnormal vibration

H. Motor driver

A motor driver is an electronic circuit that acts as an interface between a low-power controller, like a microcontroller, and a high-power motor. It takes small control signals and supplies the larger current and voltage the motor needs to run. It also handles direction control, speed via PWM, and protection features like overcurrent or thermal shutdown. You'll find motor drivers in robots, drones, 3D printers, and appliances, because they let you safely and precisely control DC, stepper, or brushless motors that a controller chip alone can't drive.

I. Robot

A robot is a machine that senses its environment, processes information, and acts to perform tasks, often automatically. It typically combines sensors to gather data, a controller or processor to make decisions, and actuators like motors to move or manipulate objects. Robots range from industrial arms assembling cars, to home vacuums navigating floors,

to autonomous drones and surgical systems. They're used to do repetitive, dangerous, or precise work faster and more consistently than humans, and modern robots increasingly use AI to adapt to new situations.

J. Buck converter

A buck converter is a DC-to-DC power circuit that steps a higher input voltage down to a lower output voltage efficiently. It works by rapidly switching a transistor on and off, storing energy in an inductor and capacitor, then releasing it to the load. A feedback loop adjusts the duty cycle to keep the output stable even if the input or load changes. Buck converters are common in phones, laptops, and microcontrollers because they waste less energy as heat compared to linear regulators, often hitting 85-95% efficiency.

K. ESP 8266

The ESP8266 is a low-cost Wi-Fi microcontroller chip that adds internet connectivity to electronics projects. It has a 32-bit processor, built-in TCP/IP stack, and GPIO pins, so it can run code and control sensors or relays directly. It connects to 2.4 GHz Wi-Fi networks, making it popular for IoT devices like smart switches, weather stations, and home automation. You program it with Arduino IDE or MicroPython, and despite its small size and price, it handles web servers, MQTT, and cloud services, which is why makers use it to quickly get projects online.

L. Arduino uno

The Arduino Uno is a microcontroller board built around the ATmega328P chip, designed to make electronics and coding accessible. It has 14 digital I/O pins, 6 analog inputs, a USB port for programming, and a power jack, so you can connect sensors, LEDs, motors, and other modules. You program it using the Arduino IDE with simplified C++, and it runs your code directly without an operating system. The Uno is popular in education, prototyping, and DIY projects because it's cheap, beginner-friendly, and has a huge community with ready- made libraries and tutorials identify rising water levels during flood or waterlogging conditions.

III. WORKING

2.1 Real-Time Sensor Data Processing

Accelerometers, gyroscopes, GPS, cameras, and microphones capture motion, location, and environmental data. Raw signals are collected continuously from sensors.

GPS Location Tracking

During emergency conditions, the GPS module identifies the exact location of the vehicle in real time. The location coordinates are continuously monitored and transmitted to the controller

GSM Emergency Communication

The GSM module is used for emergency communication and alert transmission., The Arduino Nano sends control signals to the GSM module. The GSM module automatically sends emergency alert mess

Power Supply and Continuous Operation

A 12V rechargeable battery powers the complete system. The battery supplies continuous power to sensors, communication modules, alert systems, and the Arduino Nano controller

2.2 System Performance and Safety Improvement

Improving the system performance and safety of an accident detector involves enhancing both its technical efficiency and its reliability in real-world scenarios. Performance can be strengthened through sensor fusion, where multiple inputs such as accelerometers, gyroscopes, GPS, and cameras are combined to provide accurate detection.

IV. RESULTS:

The Accident Detector with Automatic Emergency Messaging to nearby Ambulances with a Web Dashboard and GSM has shown promising results:

1. Reduced Response Time: The system significantly reduces the time taken for emergency services to reach the accident scene.
2. Increased Accuracy: The use of advanced sensors and GPS ensures accurate detection and location of accidents.
3. Improved Emergency Care: Timely medical attention increases the chances of survival and reduces the severity of injuries.

System Performance Results

The Accident Detector with Automatic Emergency Messaging to nearby Ambulances with a Web Dashboard and GSM how often the detector correctly identifies accidents compared to false alarms. A high accuracy means fewer mistakes in detection. Out of all the cases flagged as accidents, how many were actually accidents. This shows how reliable the system is in avoiding false positives.

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