Real-Time Accident Detection and Ambulance Assistance System

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Abstract

Traffic accidents are a leading cause of fatalities worldwide. This system aims to address accidents caused by driver negligence. Often, emergency services and hospitals are not promptly informed, causing delays in assistance. Furthermore, accidents can occur in remote or unknown locations, making it difficult to locate victims. To address these issues, we propose a real-time accident detection and ambulance assistance system that utilizes the Internet of Things (IoT) technology.

INTRODUCTION

The issue of over speeding vehicles causing accidents is a major concern for society, and the need for an effective solution to this problem has become increasingly urgent. In response, an innovative IoT-based system has been proposed that leverages NODEMCU modules to detect accidents and provide rapid medical assistance to victims.At the heart of this system are NODEMCU modules equipped with sensors and GPS modules, which continuously monitor for accidents and transmit immediate notifications via the popular messaging app Telegram to nearby medical centers and emergency contacts. This enables emergency responders to quickly and efficiently provide medical assistance to those involved in the accident.

In addition to accident detection and notification, the system also includes an automatic traffic signal control feature that allows ambulances to move smoothly and quickly through the route. This feature helps to reduce the time required for emergency responders to reach the accident site, as they are not delayed by traffic signals. This is especially important in situations where every second counts.

Overall, the proposed system using NODEMCU modules is a game-changer in reducing the rate of accidents and improving the response time to accidents. It has the potential to save countless lives and represents a significant step forward in the ongoing efforts to improve road safety. As technology continues to advance, we can expect to see further innovations in this area that will further improve road safety and reduce the incidence of accidents caused by overspeeding vehicles.

LITERATURE SURVEY

1. Principal Component Analysis of Fatal Traffic Accidents Based on Vehicle Condition Factors
• Author: Tang Youming; Zhong Deliang;
• Publication: 2018 11th International Conference on Intelligent Computation Technology and Automation (ICICTA)
• Findings: Principal Component Analysis (PCA) method of multivariate statistical analysis is used to analyze and examine the traffic conditions, several pivotal influencing factors of fatal traffic accidents, concluding that tire wear, rim damage, exhaust system failure, and coupling failure are the most important factors.

2. Sandesh Categorized Accident Alerting System
• Author: S. Kumar, D. Akash, K Murali, R. Shriram
• Publication: "Call Ambulance Smart Elderly Monitoring System With Nearest Ambulance Detection using Android and Bluetooth", Second International Conference on Science Technology Engineering and management (ICONSTEM), 2016.
• Findings: All sensors used in the vehicle are embedded in the microcontroller. By this, accidents can be detected and informed to the authorized person and rescue team.

3. Alert System for Emergency Medical Assistance
• Author: Tanushree Dalai
• Publication: "Emergency Alert and system of Service for Automatives for India," International Journal of Advanced Trends in Computer Science and Engineering,Vol. **2.no**. 5, 2016.
• Findings: The Android application in the mobile phone will send text message to the nearest medical center.

PROBLEM STATEMENT

Ambulance services are often impacted by traffic congestion, which can have serious consequences for urgent or critically ill patients who require immediate transportation to the hospital. Delays in ambulance arrival can lead to increased risk of mortality. Despite the importance of swift ambulance response times, traffic congestion can impede their progress, and vehicles on the road must yield to allow ambulances to pass. Unfortunately, ambulances may still get stuck in traffic, leading to potentially life-threatening delays.

EXISTING SYSTEM

The increasing population has led to a rise in the number of vehicles, resulting in an increase in the number of accidents. This has unfortunately caused loss of life due to delayed arrival of ambulances to the accident site. The current system can be beneficial if traffic signals on the way to the hospital are green. However, the heavy traffic caused by the high volume of vehicles often causes delays in ambulances reaching the site on time. Additionally, there is currently no existing vehicle system capable of automatically detecting accidents and notifying nearby hospitals.

Delays in ambulance arrival during the "golden hour" can result in loss of life, particularly if the ambulance is delayed by waiting at traffic signals. To mitigate this issue, it would be advantageous if traffic signals on the path to the hospital were timed to allow for swift ambulance passage.

PROPOSED SYSTEM

The proposed system is a highly innovative and technologically advanced solution designed to improve the efficiency of emergency services. One of the key features of the system is its ability to automatically detect accidents and send an alert message to the control center, which is then forwarded to the nearest ambulance for immediate response. This ensures that critical medical attention is provided to the victim in a timely manner, potentially saving lives.

The system also employs a smart rescue approach, which utilizes cutting-edge technologies to provide quick and effective assistance. For instance, the system can detect the shortest possible path for the ambulance to reach the accident site, even in heavy traffic conditions. Additionally, it has the ability to turn traffic signals to green for the ambulance, ensuring that it can reach the site as quickly as possible.

Moreover, the proposed system includes a patient monitoring system that can help track the health condition of the victim. This system can provide real-time updates on the victim's vital signs, such as heart rate, blood pressure, and oxygen levels. This information can be critical in determining the appropriate course of treatment and ensuring that the victim receives the necessary medical attention.

Overall, the proposed system is a comprehensive solution that utilizes cutting-edge technologies to improve emergency services. Its ability to detect accidents, provide smart rescue solutions, and monitor the health of the victim can help save lives and minimize the impact of accidents. With this system in place, emergency response services can operate more efficiently and effectively, ensuring that critical medical attention is provided to those in need in a timely manner.

OBJECTIVES

➢ The primary objective of this initiative is to create a smart ambulance rescue system that includes a patient monitoring system to improve emergency response times and increase the chances of saving the victim's life.

➢ The solution is a Smart E Hospital Management System that automates patient health records and facilitates seamless communication between ambulances and hospitals.

➢ The aim is to address the issue of delayed ambulance arrivals caused by heavy traffic in urban areas. By continuously monitoring the patient's condition and updating it in real-time, it ensures that they receive prompt medical attention.

➢ Traffic congestion in cities with heavy traffic can make it difficult for ambulances to reach their destination quickly. A proposed solution is to automatically stop traffic signals and give green signals to the ambulance when it approaches a traffic post.

➢ Delayed response times can be critical in emergency situations, and the goal is to avoid such risks. By providing a clear path for ambulances to reach their destination quickly and safely, more lives can be saved and the impact of traffic congestion can be minimized.

➤ The proposed system will use advanced technologies such as GPS and real-time monitoring to track the ambulance's location and provide the hospital with critical information about the patient's condition.

➤ In addition to improving emergency response times, automating patient health records will make it easier for medical professionals to access and manage patient data.

➤ The initiative has the potential to transform the way emergency medical services are provided in cities with heavy traffic, ultimately saving lives and improving the quality of care for patients.

SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS

ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328P, with 14 digital input/output pins (6 of which are PWM), 6 analog inputs, a USB connection, a power jack, and a reset button. It's a versatile board that's easy to experiment with, and the reference model for the Arduino platform.
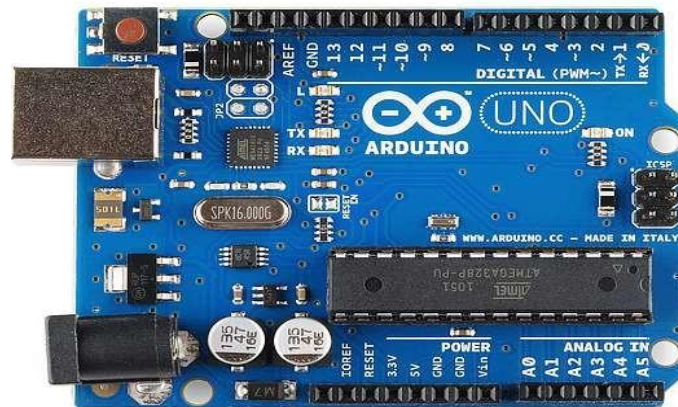
LCD

LCD screen technology is based on liquid crystals, which have some properties of both liquids and crystals. A liquid crystal display is a passive device that doesn't emit any light of its own, but instead manipulates the light passing through it to display characters, images, video, and animations. The way the light is manipulated depends on the internal construction of the LCD, which allows it to produce the desired output.
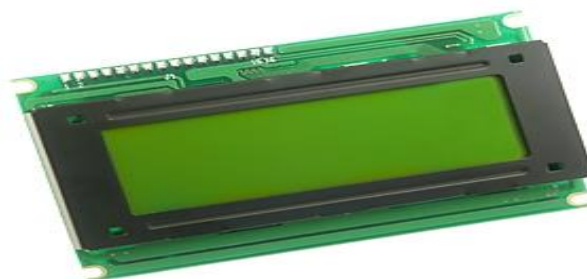
HEARTBEAT SENSOR

A heartbeat sensor is a medical device that detects a person's heart rate. It comes in different types, including handheld and wearable sensors that use either electrodes or optical sensors to monitor the heart's activity. Heartbeat sensors are used in various settings, such as hospitals, clinics, and exercise facilities, to monitor heart health and conditions. These sensors are essential tools that provide real-time information to healthcare professionals, aiding in the management of heart-related conditions.

ACCELEROMETER

An accelerometer is a sensor that measures acceleration and is commonly used in electronics to detect motion, vibration, tilt, and orientation. It consists of a suspended mass that electronically measures its displacement due to acceleration. This measurement can help determine the device's movement and orientation and is often used with other sensors for more precise readings.
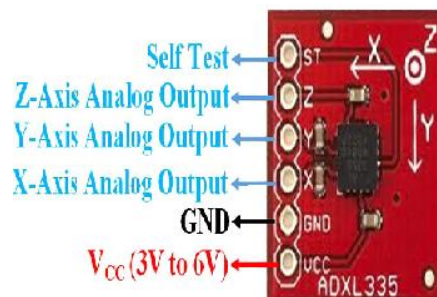

SOUND SENSOR

A sound sensor, also known as a microphone or acoustic sensor, is a device that converts sound waves into an electrical signal. This electrical signal can be further processed and analyzed by electronic devices or computer systems. Sound sensors are widely used in various applications, such as audio recording, speech recognition, noise monitoring, and others.

TEMPERATURE SENSOR

The LM35 is an integrated circuit temperature sensor that provides an electrical output proportional to the temperature in Celsius, making it more precise than a thermistor for temperature measurement.
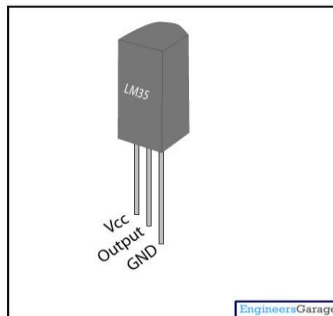
LED

An LED, short for Light Emitting Diode, is an electronic device that emits light when an electric current flows through it. LEDs are highly efficient, durable, and offer a broad range of color and brightness options. These features make them suitable for various applications, such as lighting, displays, traffic signals, and electronic devices. LEDs have brought about a revolution in the lighting industry by providing an energy-efficient and long-lasting alternative to traditional incandescent bulbs.
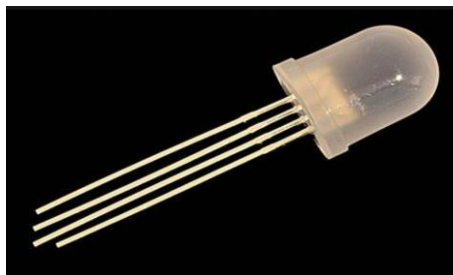

ALCOHOL SENSOR

An alcohol sensor detects the presence of alcohol in a person's breath, blood, or sweat, and is commonly used in breathalyzers for alcohol testing. It works by measuring the amount of ethanol in the sample through a chemical reaction that produces an electrical signal. The device displays the numerical value of the detected alcohol on its screen.

POWER SUPPLY

A power supply converts AC from a source such as a wall outlet into DC that powers electronic devices. It is used in computers, telecommunications, medical devices, lighting, and industrial machinery. Power supplies come in various sizes, shapes, and voltage levels. Common types include linear and switched-mode power supplies and battery chargers.

KIA 78xx

Series

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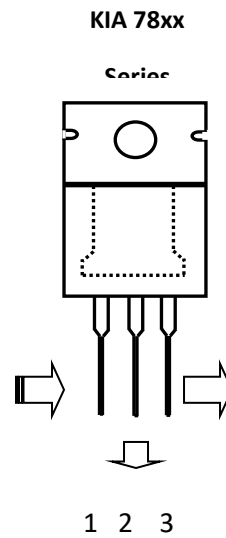
NODEMCU

NodeMCU is an open-source firmware and development kit that uses the ESP8266 WiFi module. It enables developers to create Wi-Fi-enabled IoT projects using Lua scripting language or Arduino IDE easily. NodeMCU provides seamless connectivity to the internet and other IoT devices, making it a popular choice for both hobbyists and professionals.
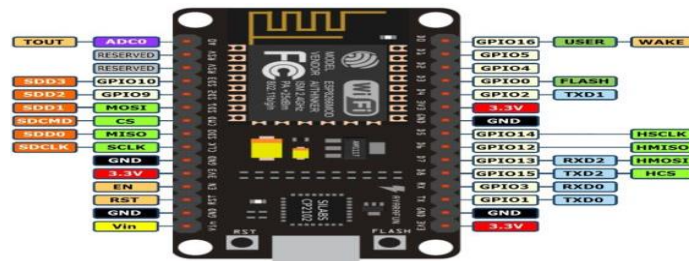
BUZZER

A buzzer is a basic electromechanical device that emits a buzzing or beeping noise when an electrical current flows through it. It typically comprises a magnetized coil of wire, a vibrating diaphragm, and an enclosure that amplifies and directs the sound. Buzzers are widely utilized in alarms, timers, doorbells, and other electronic gadgets that require an audible alert.

SOFTWARE REQUIREMENTS
ARDUINO IDE

The Arduino IDE, or Integrated Development Environment, is a software program designed for creating code for Arduino microcontroller boards. It offers a user-friendly interface that simplifies the process of

writing, compiling, and uploading code to the Arduino board. The IDE includes a code editor with syntax highlighting, a serial monitor for debugging, and a library manager for installing and managing libraries. It supports several programming languages, including C and C++. In summary, the Arduino IDE streamlines the development and deployment of code for Arduino projects.

EMBEDDED C

Embedded C is a programming language for microcontrollers and embedded systems. It supports low-level hardware interfaces, real-time operating systems, and device drivers. It allows direct manipulation of hardware and memory, with bit-wise operations and fixed-point arithmetic. Embedded C has some restrictions but is powerful and efficient for developing embedded systems, used in industries such as automotive, aerospace, and telecommunications.
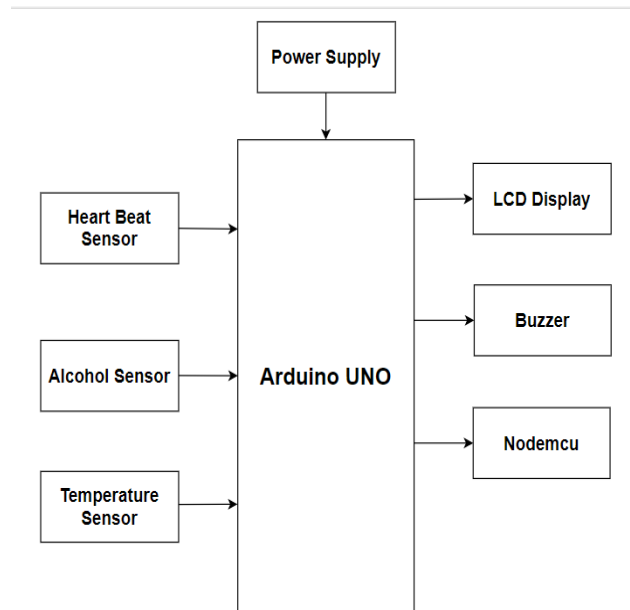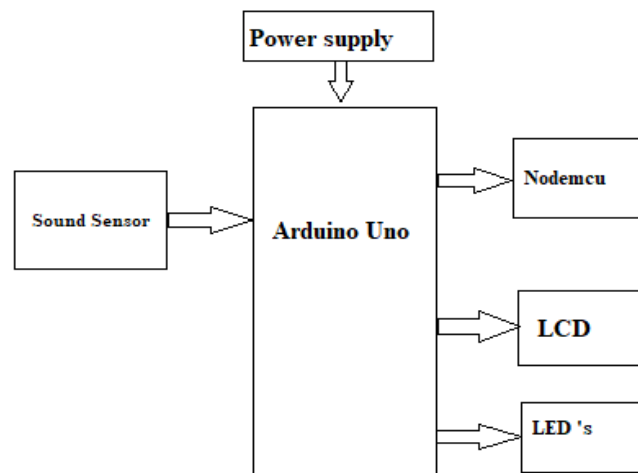
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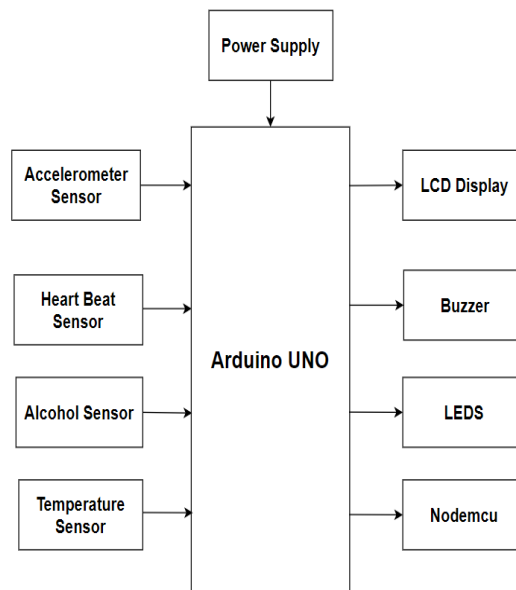
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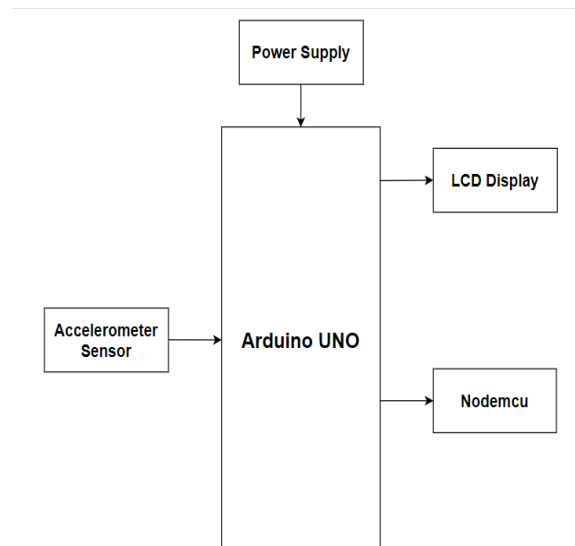
AMBULANCE UNIT

TRAFFIC SIGNAL UNIT

METHODOLOGY

The methodology outlines the systematic process involved in the proposed accident detection and ambulance assistance system. The system is designed to utilize advanced technologies and sensors to detect accidents caused by driver negligence and provide swift assistance.

To begin with, accelerometer sensors are strategically placed in vehicles to detect sudden changes in velocity, such as those caused by accidents. These sensors play a crucial role in detecting accidents, enabling prompt responses by emergency services.

Upon detection of an accident, GPS trackers installed in the vehicle are used to determine the exact location of the accident spot. The location data is then relayed to the nearby hospitals and emergency services to ensure prompt assistance.

Once the ambulance arrives at the accident spot, the medical team checks the vital signs of the victim, including heart rate, body temperature, and alcohol level, which are then transmitted to the hospital in real-time. This information enables the hospital staff to prepare the necessary equipment and medical personnel, ensuring swift and efficient medical care.

In addition, the system includes a sound sensor that detects the entrance of the ambulance, which automatically turns the traffic signal to green. This feature ensures that the ambulance can quickly and safely navigate through traffic to reach the accident spot without any hindrance.

Overall, the proposed methodology combines various technologies and sensors that work in unison to detect accidents and provide timely assistance, thereby reducing fatalities caused by road accidents.

APPLICATIONS

The key applications of the real-time accident detection and ambulance assistance system:

• Early detection and notification of accidents: The system uses sensors and algorithms to promptly detect accidents and send alerts to emergency services. This can help ensure that the injured receive prompt medical attention, which can be critical in saving lives.

• Analysis of accident data: The system can collect and analyze data on accidents, including their causes and locations. This information can be used to identify accident hotspots, make changes to road design, and improve safety measures, thereby reducing the frequency and severity of accidents.

• Traffic management: The real-time data collected by the system can be used to manage traffic more effectively. The system can detect traffic congestion, provide real-time updates on traffic conditions, and help city planners and traffic engineers make changes that can reduce congestion and improve traffic flow.

• Emergency response: The system can be used to improve emergency response times. By providing real-time information on the location of accidents and the fastest route to the accident site, the system can help emergency services respond more quickly and effectively.

• Public safety: The system can enhance public safety by providing real-time updates on traffic conditions, helping drivers avoid accident-prone areas, reducing the risk of accidents, and improving road safety.

Overall, the real-time accident detection and ambulance assistance system can help improve road safety, reduce traffic congestion, and save lives by enabling faster and more effective emergency response, analyzing accident data, managing traffic, and enhancing public safety.

SNAPSHOT
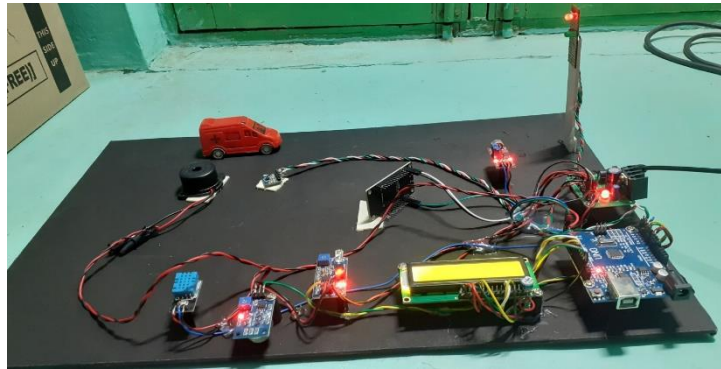
CONCLUSION

The real-time accident detection and ambulance assistance system is an innovative technology that uses sensors and algorithms to promptly detect and analyze accidents. It alerts emergency services, updates ambulance drivers with the fastest and safest route, and equips them with necessary medical supplies. This system enables faster and more effective emergency response, improves road safety, and reduces the burden on emergency services. It is a significant advancement in technology that has the potential to save countless lives.

The purpose is to **"SAVE LIVES AT THE RIGHT TIME !!"**

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