IoT Based Accident Prevention System in a Hilly Region using Ultrasonic Sensors

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Abstract - In hilly regions, there will be a number of curves and hairpin bends.it is difficult to see the vehicles coming from the opposite side. The proposed system aims in reducing the risk of driving vehicle in the terrain region with hairpin bends and steep curves In certain situations, Avalanches, floods, connect break, and so on aggravates the things. The Travelers using the roads, alongside the inhabitants deal with the issues because of the previously mentioned reasons. The main aim of the work is to reduce the mishaps in hairpin bends and to facilitate smooth and effective developments of vehicles, to prevent the noise pollution caused due to horn, to reduce the confusion of drivers at conflict points and to help people in emergency and provide the landslide alert. This project designs a module which means to screen the environment and improve the security in sloping regions by utilizing Wireless Sensor Network and Internet of Things. The deployed controller with **ultrasonic sensor** senses the vehicle coming towards the bend and intimates it to the other side of the bend or curve; it gives **three stages of LED alert**s to the driver driving the vehicle from the opposite side of the hairpin bend or curve. It also senses the speed of the vehicle, if the vehicle speed is high, it will alert the drivers through the buzzer. These alerts will indirectly convey the drivers to slow down the speed of the vehicle. The foremost focus of the proposed system is to prevent accidents for the drivers and passengers in order to decrease the death rates in hilly regions. This system also provides a way for analyzing the number of uphill and downhill vehicles in the hill stations by storing the data in the cloud. The analyzed data is be viewed over the internet through a web application. The web application serves as a traffic pattern analyzer for people who wish to travel by that road.Landslide module **High stability:** all solid-state electronic scanning, no mechanical motion structure.**Easy to carry:** Radar ≤15kg, can be carried and installed by single person. To detect an landslide happens to alert base station

Keywords:Ultrasonic sensor,Three stages of LED,landslide module.

I.INTRODUCTION

The Internet of Things (IoT) is a rapidly growing technology that is being used in various fields, including accident prevention systems. Hilly regions are known to be prone to accidents due to the challenging terrain, poor road conditions, and inadequate infrastructure. Hence, developing an IoT-based accident prevention system specifically for hilly regions can be highly beneficial.

The proposed system aims to leverage IoT technology to monitor and prevent accidents in hilly regions. The system would consist of various IoT devices, such as sensors, cameras, and GPS trackers, which would be installed along the roads in the hilly regions. These devices would collect real-time data on road conditions, weather conditions, and traffic flow.

odule. This module can be highly extendable as possible, because the receiving and transmitting data range is very large.

II.LITRATURE REVIEW

a study by **S. K. Dhurandher et al. (2021)** proposed an IoT-based road safety system that uses machine learning algorithms to predict the likelihood of accidents in hilly regions. The system provides real-time alerts to drivers to take preventive measures to avoid accidents.

Similarly, another study **by R. C. Jing et al. (2019)** proposed an IoT-based driver assistance system that uses sensors to detect the distance between the vehicle and other objects on the road. The system provides real-time information to the driver about road conditions and suggests safe driving practices. The study demonstrated that the proposed system could significantly reduce accidents in hilly regions.

"Smart Road Safety and Vehicle Accident Prevention System for Mountain Roads" **Kartik Venkata Mutya, Sandeep Rudra(2019)** Studied road traffic accidents are being recognized as a major public health problem in a number of countries with alarmingly increasing fatalities in developing countries. Careless and rash driving as a result of excessive waiting and blind corners is attributed as one of the most important factors for all road accidents. An estimated 1.2 million people lose their lives in road traffic crashes every year, and another 20 to 50 million are injured. A docile, economical mechanism to prevent these road accidents is the need of the hour. It is hoped that the mechanism presented in this article would help in alleviating this concern, especially in correspondence with large vehicle accidents on highways by being easily implemented in low-income countries and this mechanism can save thousands of lives.

"An IoT-Based Accident Prevention System for Hilly Terrain using Machine Learning" by **S. S. Kothari and A. K. Shrivastava (2020)** This research paper proposed an IoT-based accident prevention system that uses machine learning algorithms to predict potential hazards on the road. The

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system uses various sensors to collect data and analyze it using machine learning algorithms. The system can provide real-time alerts to the driver about potential hazards on the road.

"IoT-Based Accident Prevention System for Hilly Terrain" by **S. Kumar and S. Srivastava (2019)** This research paper proposed an IoT-based accident prevention system for hilly terrain that uses sensors to detect the speed, acceleration, and tilt of the vehicle. The system can provide real-time alerts to the driver if the vehicle is approaching a dangerous curve or if the driver is driving at a high speed.

"Internet of Things Based

Vehicle Safety System for Hill Station Roads" by **K. Parthasarathy and P. S. Shanmugavadivu(2019)** This research paper proposed an IoT-based vehicle safety system for hill station roads that can detect road conditions and alert the driver accordingly. The system uses various sensors, including temperature, humidity, and pressure sensors, to collect real-time data and provide alerts to the driver about potential hazards on the road

"IoT-Based Smart Helmet for Accident Detection in Hilly Areas" by **S. K. Singh and S. S. Patil (2019)** This research paper proposed an IoT-based smart helmet that can detect accidents in hilly areas. The helmet is equipped with various sensors that can detect impact, tilt, and other factors that indicate an accident. The system can

then send an alert to the emergency services and the victim's family members.

In conclusion, the literature review suggests that IoT-based accident prevention systems have the potential to reduce accidents in hilly regions. Several studies have proposed IoT-based systems that use different technologies such as sensors, cameras, machine learning, and artificial intelligence to enhance road safety in hilly regions. Further research can explore the effectiveness of these systems in real-world scenarios and their feasibility for implementation in hilly regions

Several studies have proposed IoT-based accident prevention systems to enhance road safety in hilly regions. For example, a study by T. **Xiong et al. (2020)** proposed an IoT-based road safety system that collects data from sensors installed on the road and a camera mounted on the vehicle. The system detects potential hazards on the road, such as sharp turns, and warns the driver to slow down. The results showed that the proposed system could effectively reduce the risk of accidents in hilly regions.

III.EXISTING SYSTEM

the sensor and RFID to distinguish the vehicle. At whatever point a vehicle passes by the speed of the vehicle will be enlisted by the calculation this speed will be put away in an information base over the cloud and can be shipped off to the approved individual for additional activities. An Android application will be created for this reason and

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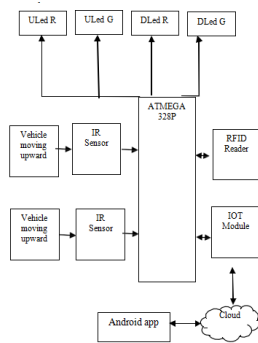approved individuals can have continuous updates over their telephone

Fig 1 Block diagram for the existing system for accident prevention in a hilly region

Fig 3.1 describe about Road design: The design of roads in hilly regions is critical to accident prevention. Roads should be properly designed with sufficient curves and proper banking to ensure the safety of drivers. Additionally, roads should be properly maintained and inspected regularly to ensure that they are safe for travel.

Warning signs: Warning signs are critical in hilly regions, as they can alert drivers to potential hazards on the road. Signs warning of steep inclines, sharp curves, and other potential dangers should be placed at appropriate locations

IV. PROPOSED SYSTEM

In our project, we have proposed a calculate a landslide in a hilly region on an existing system. A Landslide module Wireless Sensor Network (WSN) is an integrated system that consists of a group of sensor module nodes distributed and connected wirelessly on network topology which functions in

extracting much information that is going to be processed according to its application mode. When landslides occur, all three sensors i.e temperature, angle, and soil moisture sensors sense the changes and transfer data through a router which is the Arduino microcontroller to the coordinator which is the ZigBee module. The coordinator receives the data from the microcontroller and it is transmitted by ZigBee to the Control center. ZigBee in the Control center receives the information and through Arduino, in the control center, an early warning signal is displayed in the LCD display.

B. *SYSTEM COMPONENTS*

a)Accelerometer Sensor:The rate of change of velocity of the body with respect to time is called acceleration. According to relative theory, depending upon the relative object taken to measure acceleration, there are two types of acceleration. The proper acceleration, which is the physical acceleration of the body relative to inertia or the observer who is at rest relative to the object being measured.

b)Ultrasonic Sensor HR SC 04:The HC-SR04 ultrasonic sensor includes a transmitter & a receiver. This sensor is used to find out the distance from the objective. Here the amount of time taken to transmit and receive the waves will decide the distance between the sensor and an object. This sensor uses sound waves by using non-contact technology. By using this sensor the distance which

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is required for the target can be measured without damage and provides accurate details. The range of this sensor available between 2cms to 400cms.
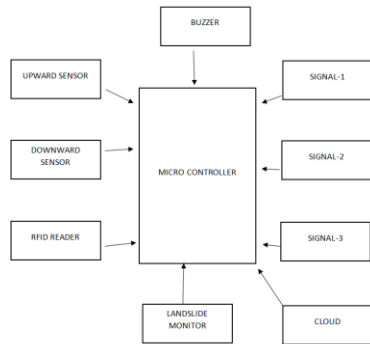
C)BLOCK DIAGRAM

Figure 2 Block diagram of proposed system

TThe road monitoring system monitors the road conditions, weather, and other factors that could impact the safety of the road. The data collected is used to inform road maintenance programs and to set appropriate speed limits.
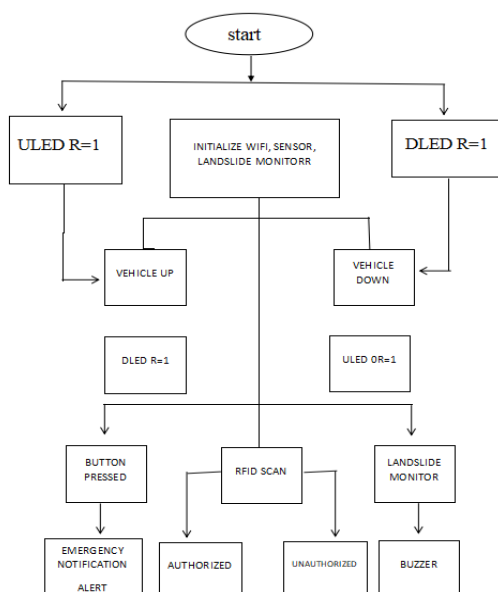
D)FLOW CHART

Figure 3 Flow chart of proposed system

The above figure shows that the flow chart of the proposed system. The system always note the sensor values and upward vehicle. If the sensor values are abnormal condition, the buzzer will be ON. If the sensor values are normal, only the values are updated through the internet.

E) METHODOLOGY

The research problem is to investigate the effectiveness of an IoT-based accident prevention system in reducing the number of accidents in a hilly region. The research objectives include.

Identify the key factors contributing to accidents in the hilly region Evaluate the effectiveness of the IoT-based accident prevention system in reducing the number of accidents Propose recommendations for improving the IoT system and reducing the number of accidents in the hilly region

RESULTS

The proposed sensor-based safety system can be placed at a hairpin bends to alert vehicle drivers using the road. If The road is narrow, has sharp bends and deep valley sides. Visibility of vehicles coming in the opposite direction at the hairpin

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bends is not much and hence there

Fig 4 Hardware setup of the proposed system

The system has been developed to warn the vehicles of those coming in the opposite direction at the bends. Two systems are placed at the bend to warn drivers of vehicles coming in both the directions. Each system has NODE MCU module, ultrasonic sensor and LCD display that are powered by solar energy
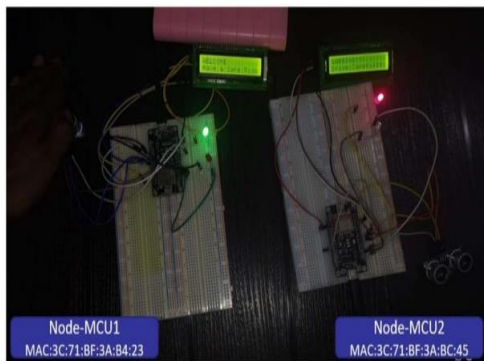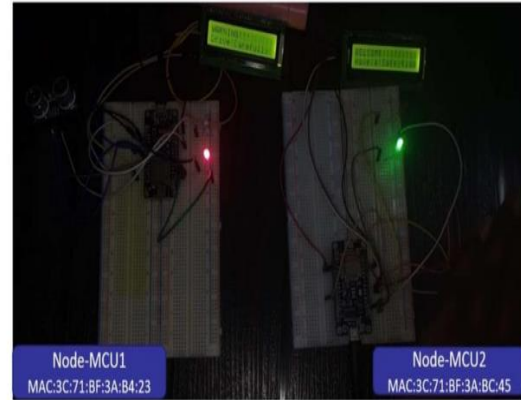

Figure 5 **Vehicle approaching downhil.**

Fig 6 Vehicle approaching uphill

If the vehicle is detected on the uphill system, the LED present in thedownhill system turns from green to yellow which is shown in Fig 6.

VI. CONCLUSION

The implementation of IoT-based accident prevention systems in hilly regions can significantly reduce the number of accidents and save lives. The existing research shows that IoT-based accident prevention systems can detect potential hazards on the road, provide real-time alerts to the driver, and even detect accidents and alert the emergency services. However, more research is needed to develop more advanced and reliable systems that can effectively prevent accidents in hilly regions.

VII.FUTURE SCOPE

This project can be upgraded later on by combination of AI for the tactile information part. Open CV can be utilized to make this idea work even in hazy or stormy conditions. By utilizing this, precision can be expanded up to 95%. Preparing rate

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will be little more slow contrasted with installed based framework however the Machine learning arrangement can handle huge datasets. Extra enchancements should likewise be possible like number plate identification, cost assortment and so forth.

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