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CONFLICT AVOIDANCE AND LANDSLIDE UPDATE OF VEHICLE IN DEEP CURVES

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Abstract : The paper aims to decrease the number of accidents that occur on curved roadways. To do this, a warning display that displays as a vehicle approaches from the other side of the bend serves as a message to the driver. The IR transmitter and receiver sensor, which is connected to the Arduino Uno microcontroller, is used to detect the vehicle. And motor operated gates are fixed upon each sides for free passage of vehicles from one side to other side. On the winding roads in the ghat portion, this might save thousands of lives. By implementing a new technique, they come up with a plan to prevent accidents after determining their causes and effects. Two IR sensors make up the new method, which alerts the vehicle on the opposite road. Landslide is one of the hazardous and critical geographical process, which damages to civil infrastructure and property as well as causes loss of life. The Arduino Uno is a heartbeat of all these, since all of the ML algorithms, computations and making live connections.

IndexTerms **- IR sensors, ADXL sensors, Yolo v5 Algorithm, Buzzer, Internet of Things, Arduino Uno**

I. INTRODUCTION

The "Conflict Avoidance and Landslide Update System for Vehicles in Deep Curves" paper leverages a combination of advanced technologies, including Arduino Uno, IR sensors, ADXL' sensors, LCD displays, and Zigbee communication, to enhance road safety in areas with deep curves and potential landslide risks. This system offers real-time assistance to drivers by detecting obstacles, monitoring vehicle dynamics, and providing critical updates on road conditions. Deep curves on mountainous roads and the threat of landslides pose significanthazards to drivers and passengers. These challenges include reduced visibility, limited reaction time, and the potential for sudden obstructions due to landslides.

This paper aims to address these issues by creating a comprehensive solution that assists drivers in navigating challenging road conditions while keeping them informed about potential landslide risks.
Deep curves, often encountered in mountainous terrains, pose unique challenges to vehicle safety due to reduced visibility and increased risk of conflicts. This report addresses these challenges through the integration of conflict avoidance and landslide update systems.
Conflict avoidance in the context of vehicles typically refers to systems and technologies designed to prevent collisions or conflicts between vehicles.
These systems use sensors such as cameras, radar, lidar, and advanced algorithms to detect potential conflicts and take corrective actions. In the context of deep curves, vehicles may encounter challenges due to limited visibility or difficulty in navigating tight turns. To address this, vehicles equipped with advanced sensors can anticipate potential conflicts with other vehicles, obstacles, or the road layout. Automated steering, braking, and acceleration systems can then be employed to avoid collisions or conflicts.
The safety of vehicles navigating through deep curves, particularly in regions susceptible to landslides, is a critical concern that demands careful attention. Negotiating sharp turns in hilly or mountainous terrains presents unique challenges, and the potential threat of landslides adds an additional layer of complexity to the equation. In this context, ensuring the safety of vehicles requires a comprehensive understanding of the terrain, coupled with effective measures to detect and respond to landslide risks in real-time. This introduction sets the stage for exploring the various aspects of landslide safety for vehicles in deep curves, highlighting the importance of proactive strategies and technological solutions to mitigate potential hazards.

II. OBJECTIVE

- Develop a real-time conflict avoidance system using Arduino Uno and IR sensors to identify obstacles and potential conflicts on the road, especially in deep curves. Implement an ADXL sensor to monitor Land slides and provide drivers with information on vehicle tilt and lateral acceleration in real-time.
- Utilize an LCD display to present visual warnings and updates to the driver regarding road conditions and potential conflicts.
- The primary goal here is to prevent accidents or conflicts between vehicles as they maneuver through deep curves.
- This objective focuses on keeping drivers informed about any potential landslides or hazardous conditions

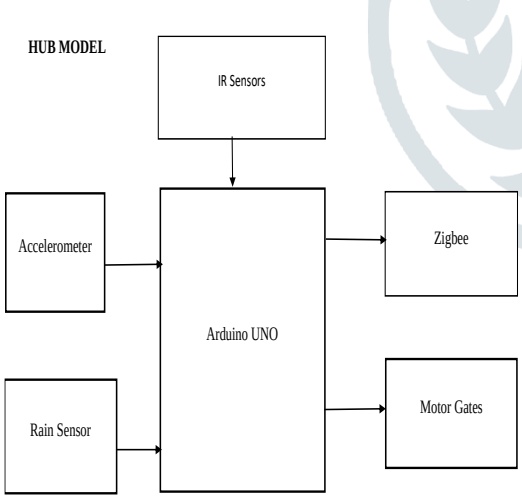
along the route, particularly in areas prone to such events.

- Providing real-time updates about landslide risks allows drivers to make informed decisions and take necessary precautions.
- Ensuring that vehicles can safely navigate through sharp bends or deep curves in the road is crucial. This might involve implementing technologies such as advanced traction control systems, stability control, or even warning systems that alert drivers to reduce speed or adjust their steering in challenging curves.
- Establish a Zigbee communication network between vehicles to exchange critical information about road conditions, obstacles, and potential landslide risks.
- Ensure compatibility with existing vehicle systems and navigation devices, making it easy to retrofit vehicles with this system.
- Educating drivers about the specific challenges posed by deep curves and landslide-prone areas is essential. Training programs can teach drivers how to anticipate and respond to these conditions effectively, thereby reducing the risk of accidents

III. SYSTEM DESIGN

- System design is the process of defining the architecture, components, modules, interfaces and data for a system to satisfy specified requirements. System design could see it as the application of systems theory to product development. Theory is some overlap with the disciplines of system analysis, systems architecture and systems engineering.
- System design is one of the most important phases of software development process. The purpose of the design is to plan the solution of a problem specified by the requirement documentation. In other words, the first step in solution is the design of the paper.
- The design of the system is perhaps the most critical factor affecting the quality of the software. The objective of the design phase is to produce overall design of the software. It aims to figure out the modules that shouldbe in the system to fulfil all the system requirements in efficient manner.
- The design will contain the specification of all the modules, their interaction with other modules and the desired output from each module. The output of the design process is a description of the software architecture.

IV SYSTEM ARCHITECTURE



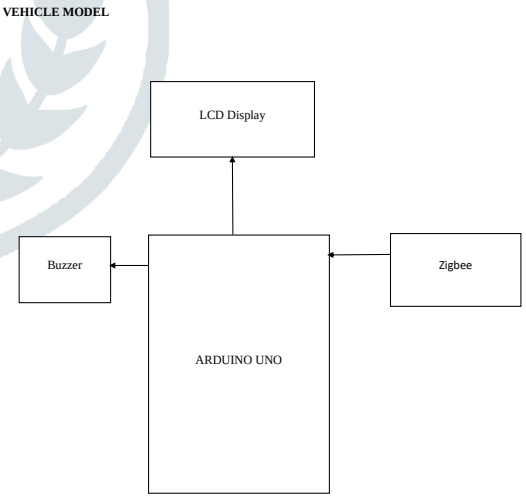


Figure1. Hub Model

Figure2. Vehicle Model

V LITERATURE SURVEY

1. LORATE SHINY,RAJAKUMARAN, S.VIJAY (2019) ARE PROPOSED "VEHICLE CONTROL SYSTEM WITH ACCIDENTPREVENTION BY USING IR TRANSCEIVER"VOL. 4, ISSUE 6 [1].

India has been identified as a hotspot for landslides and related disasters. It is impacting nearly all hilly/mountain regions, particularly the Himalayan region. Disasters are becoming increasingly significant and devastating, both in terms of magnitude and frequency conditions.

2. S. HIDAYAT, H. PACHRI, AND I. ALIMUDDIN, "ANALYSIS OF LANDSLIDE SUSCEPTIBILITY ZONE USING FREQUENCY RATIO AND LOGISTIC REGRESSION METHOD IN HAMBALANG, CITEUREUP DISTRICT, BOGOR REGENCY, WEST JAVA PROVIN[2].

Vehicle over-speed detection and accident- avoidance system is an Internet of Things (IoT) based system which collects data via sensors such as ultrasonic sensors and alerts the driver. The sensor is mounted upon a microcontroller i.e. Arduino which is responsible for the sensors to work. This system consists of an Ultrasonic Sensor, Arduino UNO, Potentiometer, CAN Controller, DC Motor, GSM, LCD display and a buzzer. The ultrasonic sensor detects the object/vehicle ahead of the vehicle and sends the data

to Arduino UNO, if a particular vehicle is in close proximity to the front vehicle, the proposed system automatically controls the vehicle speed.

3. S. KUNDU, D. SHARMA, AND A. SAHA, "GISBASED STATISTICAL LANDSLIDE SUSCEPTIBILITY ZONATION: A CASE STUDY IN GANESHGANGA WATERSHED, THE HIMALAYAS," ESRIINDIA.COM, PP. 1–9, 2011[3].

Road accidents are one of the crucial concerns of a nation since almost million people die in road accidents across the world [1]. Mostly the road accidents are caused due to the over speeding of the vehicles, poor road infrastructure, and sometimes when driver is blindsided about vehicles in the opposite direction, especially in deep curves. These deep curves are called as the hairpin curves. It is essential to address safety in road by proving safer infrastructure and technical support. .

4. K.P. SREEVISHAKH, PROF.S.P. DHANURE,(2015) "AUTOMOTIVE CRASH INSIGHT USING AMR SENSOR SYSTEM," INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN COMPUTER AND COMMUNICATION ENGINEERING, VOL. 4, ISSUE 5.MAY[4].

The IR transmitter and receiver sensor, which is connected to the Arduino Uno microcontroller, is used to detect the vehicle. On the winding roads in the ghat portion, this might save thousands of lives. The video was sent through 3g dongle to authorized

5. S. UVARAJA AND V. RAGHAV PRASHANTH, (2012) "ADVANCED PRE-WARNING SYSTEM (RAILWAYS)," IACSIT INTERNATIONAL JOURNAL OF ENGINEERING AND TECHNOLOGY, VOL. 4, NO. [5].

Over past few decades in India, there is drastic increase in vehicle usage for conveyance. Increasement in vehicle usage for transportation routes to traffic congestion and frequent road accidents. Usually not following traffic rules and road abnormalities are the few reasons for accidents. Vehicles encounter into collision due to error done by the drivers and accident occurs due to bad weather related situations.

6. S. Hidayat, H. Pachri, and I. Alimuddin, "Analysis of Landslide Susceptibility Zone using Frequency Ratio and Logistic Regression Method in Hambalang, Citeureup District, Bogor Regency, West Java Province [6].

Road traffic injuries continuously claim the lives of millions of people besides millions of disabled people every year and causing tremendous economic loss. Numerous safety- critical applications, for instance, pre-crash sensing, blind spot warning, emergency braking, lane changing, cooperative collision avoiding, curve speed warning, etc,. proposed in Vehicular Ad Hoc Networks (VANETs) to mitigate road traffic injuries.Both, this vehicle's position and the position of other road participants in the vicinity is a critical condition for the success of safety-critical applications. Many technologies and techniques are proposed, but no one technology is yet able to satisfy the accuracy, integrity, continuity, and availability needed by safety- critical application. Hence, integrating effective positioning or localizing techniques into one system is the solution. This work proposes a Localizing and Driving Direction Estimation System (LDDES) that estimates the position and driving direction of other vehicles in the vicinity. LDDES created using Machine Learning (ML), VANETs, and Multiple Input Multiple Output (MIMO) capabilities. The performance evaluation of LDDES shows that LDDES estimates the location and driving direction of other vehicles with an accuracy percentage of 90 %. LDDES can be integrated with the Global Position System (GPS) and other positioning techniques to enhance the vehicular positioning requirements needed by many safety-critical applications..

7. Mousumi Gupta, M. Ghose, and L. Sharma, "Application of Remote sensing & GIS for landslides hazard and assessment of their probabilistic occurrence - A case study of NH31A between Rangpo and Singtam," J. Geomatics, vol. 3, no. 1, pp. 59–63, 2009 [7].

This study focused on detection technique of landslide susceptible areas in Banten, DKI Jakarta and Jawa Barat by utilizing Weighted Linear Combination (WLC) method based on Geographic Information System using geospatial and satellite data. Several weighting approaches were used to examine the dominant landslide-controlling factors, e.g. : elevation, slope, soil type, land cover, rainfall average and standard deviation WLC results showed that slope gradient was the most dominant factor which caused landslide events. This study also assessed the yearly distribution of landslide susceptible areas which not only depend on fluctuation of dynamic factors such as land cover and rainfall. The accuracy of the results depend on the precision and scale of geospatial data which could be increased using the latest satellite data. The discovery of landslides is essential process in hazard and risk studies and has acquired immense focus among scientists in upcoming years. Remote sensing is an economical solution for detecting landslides and updating classical landslide databases, but discovering landslides in remote sensing data is complex and needs enhancements.

VI EXISTING SYSTEM

1.The existing system for landslide monitoring and early warning typically involves a combination of geotechnical instruments, weather monitoring, and geological surveys..
2.In many regions, including those prone to landslides, such as the Himalayan region in India, local geological and environmental authorities often deploy instruments like inclinometers, piezometers, and ground movement sensors to measure soil moisture content, slope stability, and ground deformation . Human drivers can make errors due to factors such as fatigue, distraction, or impaired judgment, which can lead to accidents.
3.Meteorological departments provide weather forecasts that include rainfall predictions, which can be an essential trigger for landslides.
4.Therefore, there is a growing need for more advanced and automated landslide monitoring systems that integrate modern technologies, such as remote sensing and data analytics, to provide timely and accurate warnings to communities at risk.

VII PROPOSED SYSTEM

Comprehensive Sensor Network: Implement a network of sensors to continuously monitor various factors contributing to landslide risk. This may include soil moisture sensors, seismometers, and cameras for real-time data collection.
Data Integration: Use modern technology and data analytics to integrate data from different sources into a centralized system. This system should be capable of processing and analyzing the data to detect patterns and potential landslide triggers.

Machine Learning and AI: Employ machine learning algorithms and artificial intelligence to analyze historical data and predict landslide risk. These algorithms can identify trends and issue warnings based on detected anomalies.
Real-time Alerts: Implement a system that can provide real-time alerts to relevant authorities and local communities through various communication channels, including mobile apps, text messages, and sirens.
Community Engagement: Educate and engage local communities in landslide risk awareness and preparedness. Encourage residents to take preventive actions based on early warnings.

VIII APPLICATIONS

Off-road Safety: These systems keep off-road vehicles safe by warning about dangerous terrain and helping them steer away from trouble.
Construction Sites: Heavy vehicles at construction sites get alerts about unstable ground, helping them avoid accidents like landslides.
Mountain Roads: Vehicles on winding mountain roads use these tools to stay safe by getting warnings about sharp turns and bad spots on the road.
Public Transport: Buses and trains stay safe by using these systems to avoid accidents and landslides, keeping passengers out of harm's way.
Emergency Response: Vehicles rushing to emergencies in tough terrain stay safe with these tools, avoiding accidents and reaching people in need quickly.

IX ADVANTAGES

- Time management is one of the advantage that is taken into consideration in this system.
- Acts as the main control unit for data acquisition, processing, and decision-making.
- Measures slope inclination, tilt, and acceleration changes, providing real-time data on ground movement.
- Early warning by incorporating advanced sensors and monitoring technology, the proposed system can detect potential hazards such as landslides or dangerous road conditions well in advance.
- Customized Alerts, the system can be tailored to provide customized alerts and warnings based on the specific characteristics of each deep curve and landslide-prone area.
- This ensures that drivers receive relevant information that is specific to their location and driving conditions, increasing the effectiveness of the warnings.
- It informs previously about the landslide and save the life's.
- By providing drivers with accurate and timely information about deep curves and landslide risks, the proposed system empowers them to make better-informed decisions while driving.

CONCLUSION

The"Conflict Avoidance and Landslide Update System for Vehicles in Deep Curves" paper utilizes Ardunio Uno, IR sensors, ADXL sensors, LCD displays, and Zigbee communication to provide real-time assistance and updates to drivers navigating challenging terrains. This system aims to prevent accidents, improve road safety, and saves lives while optimizing traffic flow in areas prone to deep curves and landslides. We will be able to remedy the issue by placing the sensors on either side of the curves. The sensor sends a signal that looks like this if the vehicle is meters from the bend. The various hazardous impact of landslides on environment where studied. An efficient environment for analyzing and displaying results with powerful set of tools.

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[3] K P Sreevishakh "Automative Crash Insight using AMR Sensor System" VOL 5 Issue 5 May
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