https://stanfordgroup.org/

Social Science Archives

Vol 5, Issue 2, 2025

SMART ROAD SAFETY AND VECHICLE ACCIDENT PREVENTION SYSYTEM FOR MOUNTAIN ROADS

Dr. U. SATEESWARAN[1], K. MOUNIKA[2], S. YASWANTHI[3]

[1]Associate Professor, Dept. of ECE, PRAGATI ENGINEERING COLLEGE

[23]UG Students, Dept. of ECE, PRAGATI ENGINEERING COLLEGE

ABSTRACT

Growth in population has led to growth in technology People use car on large number and number of accidents are undoubtedly the most frequent happening cases and overall the cause of the most damage. There are many dangerous roads in the world like mountain roads, narrow curve roads, T roads. In some of the curve roads, the other end of the curve road cannot be seen by the driver because of the obstacles like trees or rocks etc present in the middle. In these type of roads thousands of people die because careless or presence of unexpected obstacles.

To avoid these problems in curve roads or T roads we are introducing sensor based accident prevention system. That is we are keeping Infrared sensor in one side of the road before the curve and keeping a LED light after the curve. Infrared sensor which is also called as obstacle sensor sends signal as pulse from trigger. If vehicle is present signal will hit the vehicle and it is received by the sensor. At that time light will glow at the other side of the curve. In the absence of the vehicle the signal will not be received by the sensor and the light will not glow. As soon as the light glows driver can slow down his vehicle and he could even stop it if it's necessary. This sensor based light system can be applicable when the driver cannot see the vehicle coming from other end of the road. Using this idea we can make all the mountain roads and curve roads safer from accidents and can save thousands of lives.

INTRODUCTION

Growth in population has led to growth in technology People use car on large number and number of accidents are undoubtedly the most frequent happening cases and overall the cause of the most damage. There are many dangerous roads in the world like mountain roads, narrow curve roads, T roads. In these some mountain roads will be very narrow and they contain so many curves. For example, Kinnaur road in Himachal Pradesh, Zoji La Pass in the Himalayas, the Road of Death Bolivia, Fairy Meadows Road. If the road is in remote areas sometimes there

will be the chances of animals on the road and that is also dangerous if the driver couldn't see them.

In some of the curve roads, the other end of the curve road cannot be seen by the driver because of the obstacles like trees or rocks etc present in the middle. In these type of roads thousands of people die because careless or presence of unexpected obstacles. According to Million Death Study (MDS) about 2.3 million people die in India per year. In that 137 thousand is because of road accidents. That is about 377 people per day. In that 3.7% because of failed to look the road.

The problem in these curve roads is drivers can't able to see the vehicle or obstacles coming from other end of the curve. If the vehicle is in very speed then it is difficult to control and there are chances of falling to cliff.

The solution for this problem is alerting the driver about the obstacle or vehicle. Usually horn is used for this purpose. But in the rainy seasons horn will not be heard. Some people will not use horn itself. So horn is not a good solution to solve this problem. These are the major reasons for accidents.

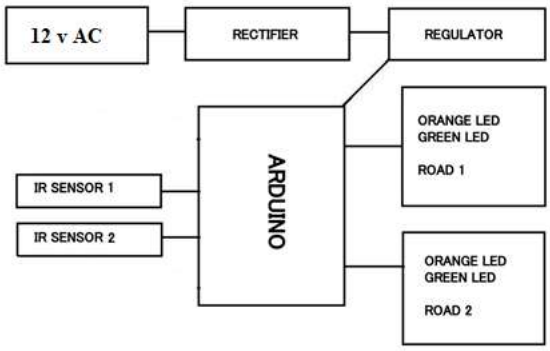

Figure.1 Block Diagram

LITERATURE SURVEY

Define Keywords and Search Queries:

Start by defining keywords related to your topic, such as "smart road safety," "mountain road accident prevention," "intelligent transportation systems," etc.Use these keywords to search in academic databases like IEEE Xplore, Google Scholar, ScienceDirect, and transportation engineering journals.

Review Academic Papers:

Look for academic papers published in journals and conferences related to transportation engineering, road safety, ITS, and accident prevention.

Focus on papers that discuss the design, implementation, evaluation, and case studies of smart road safety systems and accident prevention measures for mountain roads. Pay attention to research on sensor technologies, data analytics, vehicle-to-infrastructure (V2I) communication, and human factors in mountainous driving environments.

Explore Patents:

Search for patents related to smart road safety and accident prevention systems for mountain roads. Patent databases like Google Patents or the United States Patent and Trademark Office (USPTO) can provide insights into innovative technologies and solutions.

Look for patents related to vehicle safety systems, road infrastructure technologies, and communication protocols tailored for mountainous terrain.

Check Technical Reports and Theses:

Technical reports and theses may contain detailed studies, simulations, and field trials of road safety systems in mountainous regions.

Search university repositories and transportation research organizations' websites for theses and technical reports on ITS applications in mountain road safety.

Look for Review Articles and Book Chapters:

Review articles and book chapters can provide comprehensive summaries of existing research in smart road safety and accident prevention systems.

Look for literature reviews and survey papers that summarize the state-of-the-art technologies, challenges, and future directions in this field.

PROPOSED SYSTEM

To prevent accidents at U-turns by altering the driver about the vehicle coming from the opposite side. This is done by keeping IR sensors one red LED and green LED on both sides of the U- turn and so if vehicle comes from one end of the curve then sensor senses and this IR sensor gives signal to Arduino and Arduino gives command LED lights on the other side in order to alert the driver.

CASE 1: Whenever vehicle comes from right side then the IR sensor senses the vehicle and gives signal to Arduino then Arduino makes Red LED will glow and buzzer rings on the

opposite side of the U-turn in order to alert the driver. This will reduce accidents on the curved roads.

CASE 2: Whenever vehicle comes from right side then the IR sensor senses the vehicle and gives signal to Arduino then Arduino makes Red LED will glow and buzzer rings on the opposite side of the U-turn in order to alert the driver. This will reduce accidents on the curved roads.

CASE 3: Whenever vehicle comes from both sides then both sides sensors can senses the vehicle and gives signals to Arduino then Arduino makes Red LED will glow and buzzer rings on both opposite sides of U-turn in order to alert the driver on both sides. This will reduce the accidents on both sides of curved roads.

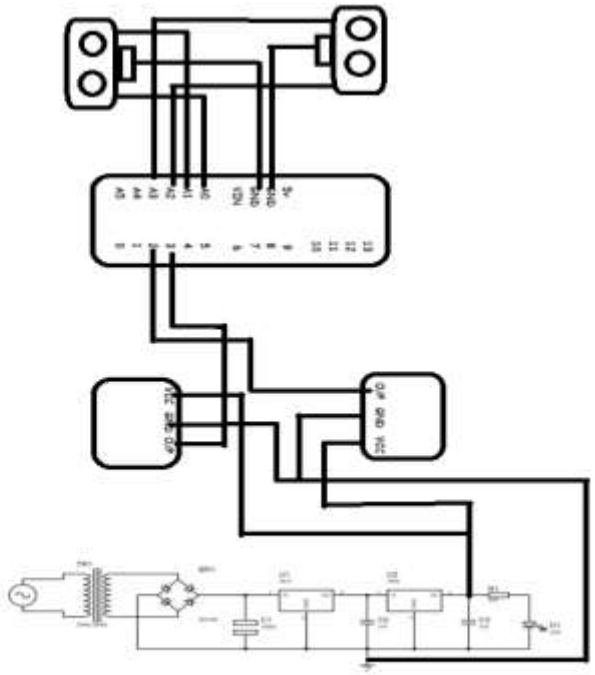

Figure.2 Schematic Diagram

RESULTS

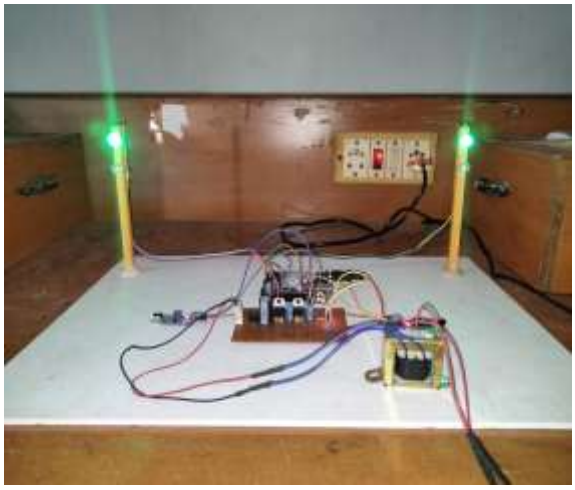

Figure.3 No case

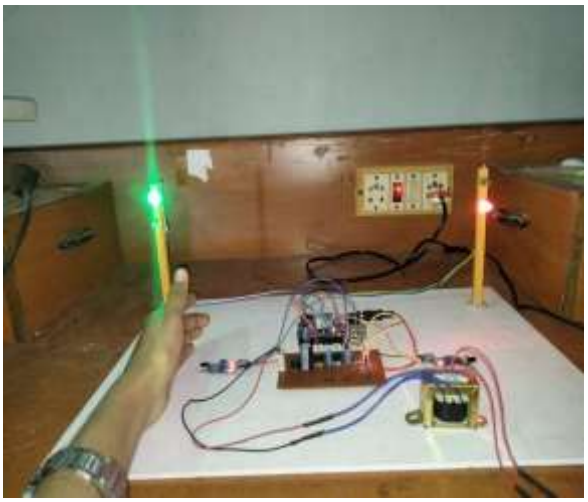

figure.4 Case1

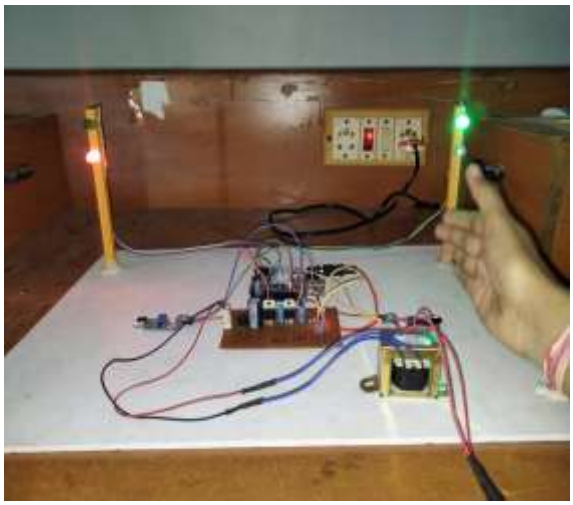

Figure.4 Case 2

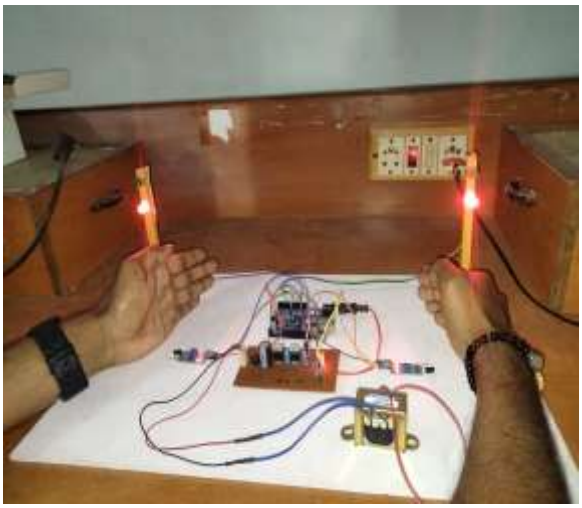

Figure.5 Case 3

ADVANTAGES

- Reduced Accident Rates.
- Early Warning Systems
- Improved Emergency Response
- Enhanced Traffic management
- Increased Visibility
- Economic Development
- Enhanced Safety
- Integration with navigation systems.

APPLICATIONS

- Real Time monitoring
- Data collection and analysis
- Advanced Warning Systems
- Automated Traffic management
- Emergency response integration
- Road Monitoring Sensors

CONCLUSION

In conclusion, the development of a smart road safety and vehicle accident prevention system for mountain roads is crucial for enhancing safety and reducing accidents in challenging terrain. Here's a summary of key points:

1. Improved Road Monitoring: By deploying a network of sensors along mountain roads, we can continuously monitor road conditions, weather, and traffic flow in real-time.

2. Data Analysis and Prediction: Utilizing advanced data analytics and machine learning techniques, the system can analyze sensor data to predict potential safety hazards and proactively alert drivers.

3. Integration with Vehicle Telematics: Integrating the system with vehicle telematics allows for the collection of valuable data from vehicles, enabling better understanding of driver behavior and facilitating targeted safety interventions.

4. Driver Assistance Systems: Implementing driver assistance systems such as collision warnings and lane departure alerts can help mitigate risks and prevent accidents caused by human error.

5. Effective Communication Infrastructure: Establishing reliable communication channels between the road safety system, vehicles, and emergency responders ensures timely response to accidents and emergencies.

6. Public Awareness and Education: Public awareness campaigns play a crucial role in promoting safe driving practices and encouraging drivers to utilize the features of the smart road safety system.

7. Continuous Improvement: Continuous monitoring, feedback collection, and system updates are essential for maintaining the effectiveness of the road safety system and adapting to evolving road conditions and technological advancements.

FUTURE SCOPE

The future scope of the smart road safety and vehicle accident prevention system for mountain roads project holds promising opportunities for further advancements and enhancements. Here are some key points outlining the future scope:

1. Integration of Advanced Technologies: Continued advancements in sensor technology, artificial intelligence, and communication systems will enable the integration of more advanced features into the road safety system. This may include the use of LiDAR and radar sensors for better detection of obstacles and hazards, as well as the incorporation of predictive analytics models for more accurate accident prediction.

2. Autonomous Vehicle Integration: As autonomous vehicle technology evolves, there is potential to integrate autonomous driving capabilities with the road safety system. Autonomous vehicles can leverage real-time data from the system to make informed decisions and navigate mountain roads safely, further reducing the risk of accidents.

3. Enhanced Communication Infrastructure: The future scope includes the development of more robust communication infrastructure, such as 5G networks and satellite communication systems, to support high-speed data transmission and seamless connectivity between vehicles, infrastructure, and emergency services.

4. Augmented Reality and Heads-Up Displays: Augmented reality (AR) and heads-up display (HUD) technologies can be integrated into vehicles to provide drivers with real-time visualizations of road conditions, hazards, and navigation instructions. This enhances situational awareness and helps drivers make safer decisions while driving on mountain roads.

5. Environmental Monitoring and Sustainability: Beyond road safety, future iterations of the system may incorporate environmental monitoring capabilities to assess the impact of vehicle emissions, noise pollution, and habitat disturbance on mountain ecosystems. This information can inform sustainable transportation practices and conservation efforts.

6. Global Expansion and Standardization: The project's future scope includes the potential for global expansion and standardization of smart road safety systems for mountain roads. Collaborative efforts among governments, transportation authorities, and technology providers can lead to the adoption of standardized protocols and interoperable systems worldwide, ensuring consistent safety standards across different regions.

7. Continuous Research and Innovation: Ongoing research and innovation will drive continuous improvements in the smart road safety system, with a focus on addressing emerging challenges and leveraging emerging technologies. This includes research into cybersecurity measures to protect the system from cyber threats and ensuring resilience against natural disasters and extreme weather events.

REFERENCE

1.Published by NOOKALA VENU IN Madhava institute of Technology and science in July 2022

2.Smart Road Safety and Vehicle Accidents Prevention System for Mountain Road. International Journal from Innovative Engineering and Management Research (IJIEMR) 2022.

3.IRJET Journal on smart Road safety and vehicle accident prevention system for mountain roads.

4.International Research Journal of Modernization in Engineering Technology and Science (Peer-Reviewed, Open Access, Fully Refereed International Journal) Volume:05/Issue:04/April-2023 Impact Factor- 7.868 www.irjmets.com.

5.SMART ROAD SAFETY AND VEHICLE ACCIDENT PREVENTION SYSTEM FOR MOUNTAIN ROADS Vaishali Malekar*1, Badal Lanjewar*2, Damini Rajurkar*3, Suyog Shingne*4, Tejas Bagne*5, Pragati Pandey*6 *1Professor, Department Of Electrical Engineering, Abha Gaikwad Patil Collage Of Engineering And Technology, Nagpur, Maharashtra, India.