SMART ROAD AND INTELLECT HIGHWAYS USING IOT

Mrs.V.DEEPA[1], N.VISHNUCHARAN[2] , T.SHRUTHI[3] , N.RITHVIK REDDY[4] , T.SAKETH[5]

[1]Assistant Professor, Department of Electronics and Communication Engineering, TEEGALAKRISHNA REDDY ENGINEERING COLLEGE, Meerpet , Hyderabad , 500097
[2,3,4,5] UG Students, Department of Electronics and Communication Engineering, TEEGALA KRISHNAREDDY ENGINEERING COLLEGE, Meerpet , Hyderabad , 500097

ABSTRACT

The "internet of things (IOT)-Based Smart Roads and Intelligent Highways" project introduces a transformative concept for enhancing road and highway infrastructure by incorporating real-time data monitoring and intelligent decision-making. By leveraging IOT technologies, including arduino, ultrasonic sensors, and rain sensors, this project establishes smart roadways that can adapt to changing conditions and provide critical information to drivers. The primary objective of this project is to create an adaptive and responsive road network capable of mitigating the impact of climate fluctuations and unexpected events, such as accidents and traffic jams. This is achieved through a combination of advanced sensors and communication technologies. Key components of the system include arduino units strategically placed along roadways, equipped with ultrasonic sensors to monitor traffic and road conditions, and rain sensors to detect precipitation. These sensors collect data in real-time and transmit it to a central control system for analysis and decision-making. In the event of adverse weather conditions like rain or snow, the system can proactively generate warning messages displayed on electronic signboards along the road.

These messages alert drivers to potential hazards, encouraging them to adapt their driving behavior accordingly. Moreover, the system can assess traffic congestion and accidents. In the case of a traffic jam or accident, it can suggest alternative routes or diversions to drivers in real-time, thereby reducing delays and enhancing road safety. The system's intelligence is derived from the real-time data it collects, allowing it to make informed decisions. By creating a network of interconnected smart roadways, this project exemplifies how IOT technology can enhance road safety, efficiency, and convenience for all travelers

INTRODUCTION

The Internet of Things (IOT) is the network of physical objects-devices, vehicles, buildings and other items embedded with electronics, software, sensors and network connectivity that enables these objects to collect and exchange data. The IOT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IOT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber physical systems, which also encompasses technologies such as smart grids, smart homes and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate between the existing internet infrastructures.

This paper proposes a system for smart highways of future cities. Common city roads have to face many problems such as traffic jams which cause loss of valuable time. And also there is no display indication on our roads showing traffic conditions in the city. This paper proposed a wireless sensor-based system which will be situated in the city roads and read the traffic data and send it to the displays or road signs which are digital led boards providing information about all data the integration of Internet of Things (IoT) technology into various aspects of our daily lives has revolutionized how we interact with and manage the world around us. One promising application of IoT is in the development of smart roads and intelligent highways, which aim to enhance road safety, traffic management, and overall transportation efficiency. This innovative approach leverages real-time data collection and communication to provide timely warnings, diversions, and adaptability to changing climate conditions and unexpected events such as accidents and traffic jams.

OBJECTIVE OF THE PROJECT

The primary objective of this project is to create an responsive road network capable of mitigating the impact of climate fluctuations and unexpected events, such as accidents and traffic jams. This is achieved through a combination of advanced sensors and communication technologies. Mainly in the fogy conditions.

LITERATURE SURVEY

Search Academic Databases: Utilize academic databases like IEEE Xplore, Google Scholar, Scopus, and ACM Digital Library.

Review Recent Publications: Focus on recent publications (last 5-10 years) to ensure you're accessing the most up-to-date research in the field. Pay attention to articles that have been cited frequently, as they often represent seminal works.

Check Journals and Conferences: Look for articles in relevant journals (e.g., IEEE Transactions on Reducing emergency services response time in smart cities) and conference proceedings (e.g., IEEE International Conference on A Taxonomy of Cyber Physical Smart Traffic Light System).

Browse Theses and Dissertations: Explore theses and dissertations from universities worldwide. Search for terms like " traffic management," " IOT ," "driver awareness warning system," etc., in online repositories like ProQuest Dissertations & Theses Global or institutional repositories ofuniversities.

Review Technical Reports and Whitepapers: Check technical reports and whitepapers published by robotics companies, mining industry organizations, and research institutions. Websites like arXiv and ResearchGate can be useful for accessing preprints and technical documents.

Nowadays, the unprecedented increase in road traffic congestion has led to severe consequences on individuals, economy and environment, especially in urban areas in most of big cities worldwide. The most critical among the above consequences is the delay of emergency vehicles, such as ambulances and police cars, leading to increased deaths on roads and substantial financial losses. To alleviate the impact of this problem, we design an advanced adaptive traffic control system that enables faster emergency services response in smart cities while maintaining a minimal increase in congestion level around the route of the emergency vehicle. This can be achieved with a Traffic Management System (TMS) capable of implementing changes to the road network's control and driving policies following an appropriate and well-tuned adaptation strategy. This latter is determined based on the severity of the emergency situation and current traffic conditions estimated using a fuzzy logic-based scheme. The obtained simulation results, using a set of typical road networks, have demonstrated the effectiveness of our approach in terms of the significant reduction of emergency vehicles' response time and the negligible disruption caused to the non-emergency vehicles travelling on the same road network.

This paper introduces an international student project on a cyber-physical systems application with an area of concentration in smart traffic light systems. A smart traffic light takes into account the natural flow of traffic which results in a certain traffic rhythm. With this in mind, the smart traffic light control system as part of a cyber-physical system will have an important impact on the quality of urban living in cities. Therefore, the smart traffic light project also focuses on the requirements for using sensors, actuators, and communication technologies to calculate the arrival time of vehicles at a traffic light at a road intersection by monitoring the actual speed of the vehicles. Based on this calculation, it is assumed that the vehicles will arrive on time at the traffic light when it has changed from its red phase to the green phase.

` In today's life we have to face many problems, one of which being traffic congestion and it's becoming more serious day after day. Conventional traffic system does not have proper monitoring system and often requires manual handing at traffic junction. In this, traffic is sense using digital IR Sensors and IR Sensors detect vehicles further based on the signal reflected from them. Sensors placed adjacent to the road to control the traffic density by changing traffic signal appropriately. All IR Sensors are interfaced with Arduino Uno and it reads data from IR Sensors. Traffic Signal for the system is designed using LEDs and each signal consist two LEDs for each lane. Using this system development at traffic junction we need not to worry about handing the traffic manually and also consumes less time as compared to the conventional traffic system. We harness solar power from solar panel and this is used to build prototype working model of smart traffic signal which automatically adjusts its timing based on traffic direction.

PROPOSED SYSTEM

Drivers are alerted to the presence of rain, helping them adjust their driving behavior to maintain safe speeds and increase following distances, which can reduce the risk of accidents. Enhanced Driver Awareness: The LCD display provides real-time information about rain detection and distance measurement, increasing driver awareness and helping them make informed decisions. Audible Warning System: The buzzer provides an audible alert, ensuring that drivers are alerted even if they are not actively monitoring the visual display. Audible alerts are crucial for situations where visual attention might be compromised. The ultrasonic sensor measures the distance to an obstacle, potentially useful for assessing road conditions, such as the depth of standing water on the road. The system can contribute to public safety by providing real-time information about road conditions, such as flooded areas or slippery roads, via electronic road signs or mobile apps. The system can trigger alerts to roadside assistance services, notifying them of specific road conditions that may require attention, such as flooded areas or icy patches. The distance measurement feature using the ultrasonic sensor can be used for driver assistance. It can help drivers maintain safe following distances and avoid collisions, especially in low-visibility conditions.

BLOCK DIAGRAM:

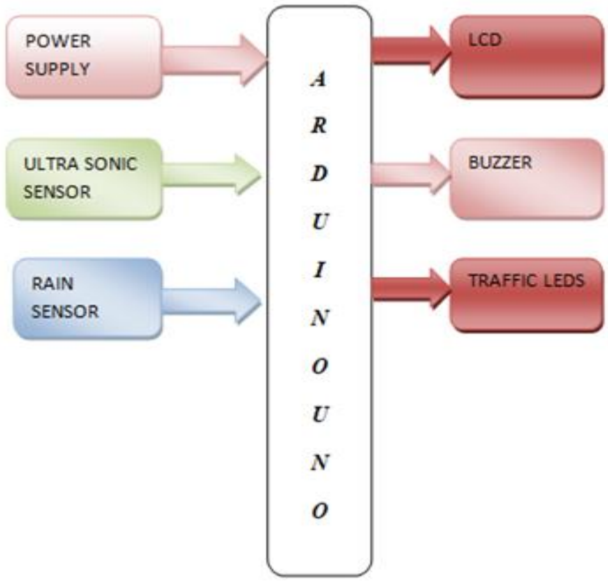

Figure.1 Block Diagram

RESULTS

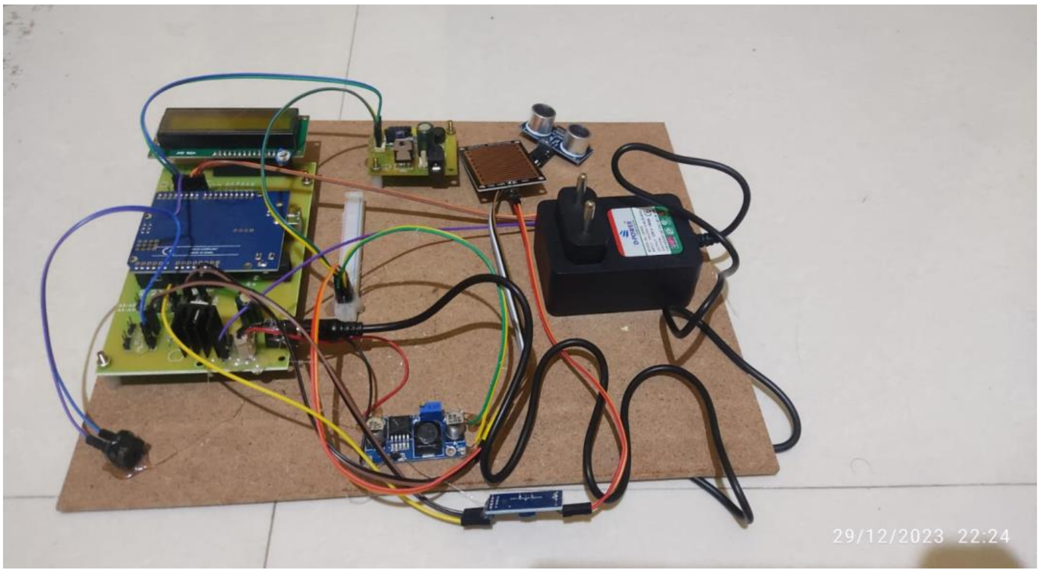

Fig 1 project set up

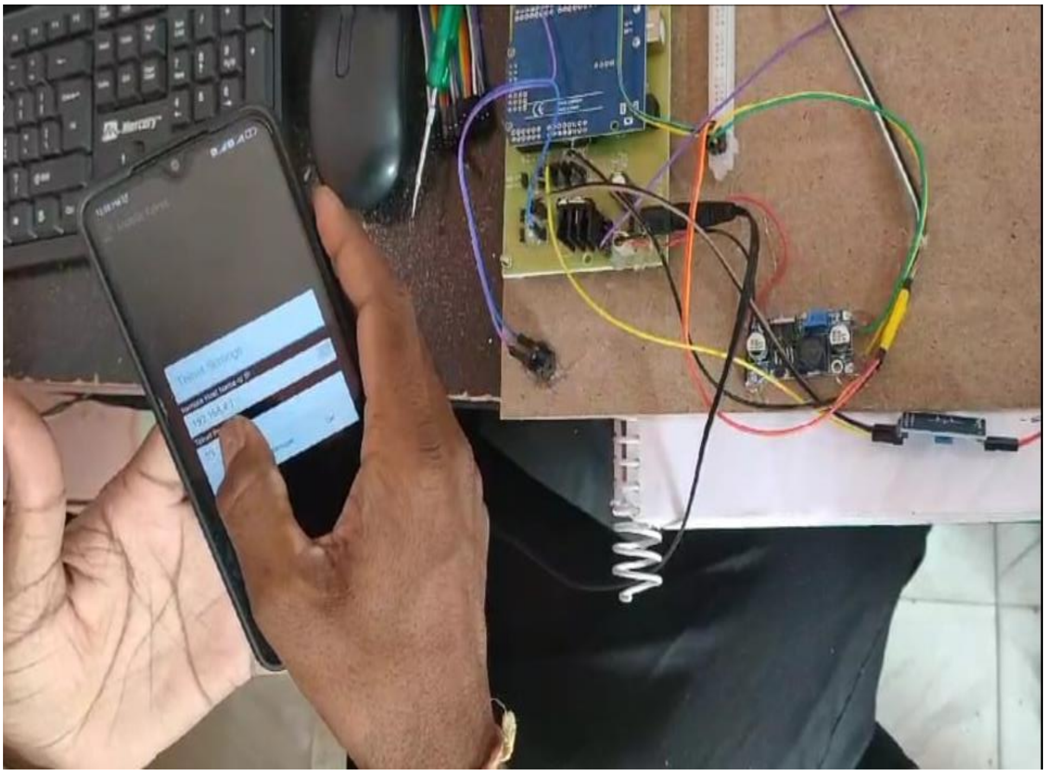

Figure. 2 displaying directions on the mobile using IOT

ADVANTAGES

- Improved Road Safety:
- Enhanced Driver Awareness
- Audible Warning System
- Low-Cost Solution

APPLICATIONS

- Emergency Alert Systems
- Driver Assistance Systems
- Public Safety Notifications
- Roadside Assistance

CONCLUSION

The integration of Arduino Uno, rain sensor, buzzer, LCD, and ultrasonic sensor in a smart roads system represents a practical and cost-effective solution for addressing specific challenges related to rain detection and driver awareness. The system provides early warnings to drivers about adverse weather conditions, helping them make informed decisions and enhancing road safety. The use of accessible and programmable components like Arduino allows for easy prototyping and customization, making it suitable for various applications. Road traffic congestion is a central problem in most developing countries. Most urban areas have poorly managed traffic networks with several traffic hot-spots or potential congestion areas. In this paper, we study the problem of road traffic congestion in high congestion hot-spots in developing regions. Ultrasonic sensors are used to detect the signal to Arduino about the traffic congestion. Our hope is the localized decongestion mechanisms are potentially easier to deploy in real-world settings and can enhance the traffic flow at critical hotspots in road traffic networks. We believe that this represents only a first step in the development of low-cost, deployable strategies for alleviating congestion in developing regions. The future work lies towards generating electricity by developing smart speed breakers in roads. We can also implement charging system for electric vehicles in traffic signals by deploying induction coil. The paper discussed a means to detect and curb congestion in a localized setting. Although, the solution is feasible to affect local congestion, it is still not able to curb the congestion extending for miles due to the localized focus of the approach.

FUTURE SCOPE

The future scope of smart roads and intelligent highways is vast, with ongoing advancements in technology and increasing emphasis on creating sustainable and efficient transportation networks. Some potential future developments and areas of expansion include:

Advanced Sensor Integration:
Incorporating a wider range of sensors, including cameras, lidar, and infrared sensors, to provide a more comprehensive understanding of road conditions, traffic patterns, and environmental factors.

V2X Communication:
Enhancing communication between vehicles (V2V) and infrastructure (V2I) to enable real-time data exchange for improved traffic flow, safety, and emergency response.

Machine Learning and Predictive Analytics:
Implementing machine learning algorithms and predictive analytics to analyze historical and real-time data for better traffic prediction, maintenance planning, and optimization of road infrastructure.

Cybersecurity Measures:
Implementing robust cybersecurity measures to safeguard smart road systems from potential cyber threats, ensuring the integrity and security of data exchanged within the network.

Environmental Monitoring:
Expanding environmental monitoring capabilities to include air quality sensors, noise monitoring, and other parameters to create environmentally conscious and sustainable transportation networks.

Integration with Public Transportation:
Integrating smart road systems with public transportation networks to enhance connectivity, optimize routes, and provide real-time information to commuters.

REFERENCES

[1] Vikas Desai, "Design and Implementation of GSM and GPS Based Vehicle Accident Detection System", IJIT, Vol 01, Issue 03,pp. 1- 4,2013.

[2] C.Prabha, R.Sunitha, R.Anitha, “Automatic Vehicle Accident Detection and Messaging System Using GSM And GPS Modem”, IJAREEIE, Vol. 3, Issue 7, pp. 1-5, 2014.
[3] Vikram Singh Kushwaha, Deepa Yadav, “Car Accident Detection System using Gps, Gsm and Bluetooth” in IJERGS May-June 2015.
[4] AboliRavindraWakure,ApurvaRajendraPatkar, “Vehicle Accident Detection and Reporting System using Gps And Gsm.”, IJERGS, Vol 10,Issue 4,pp.-25- 28, April 2014.
[5] N. Watthanawisuth, “Wireless Black Box using MEMS Accelerometer and GPS Tracking for Accidental Monitoring of Vehicles”, IEEE conference in Jan, 2012.
[6] Hoang Dat Pham, “Development of vehicle tracking system using GPS and GSM modem” IEEE conference in Dec, 2013.
[7] Rashida Nazir, Ayesha Tariq, Sadia Murawwat, Sajjad Rabbani,”Accident Prevention and Reporting System using GSM (SIM 900D) and GPS (NMEA 0183)”, Int. J. Communications, Network and System Sciences, 2014, 7, 286-293 Published Online August 2014.