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Pothole Detection and Blind-Turn Alert System

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ABSTRACT

The design and deployment of a traffic monitoring and reporting system using the Internet of Things is demonstrated in this project. Many incidents that result in severe property loss and fatalities occur every year. The Internet of Things is being used in this project to show how to design and construct a road monitoring and reporting system.Across the world, there are a lot of accidents that result in both property damage and fatalities.There are two aspects in the project: reporting and alerting. The project's principal feature describes potholes in the road that were discovered by the car as it drove over the flaw using a three-axis accelerometer and GSM module. Using the cellGPRS service, the embedded system may connect to the internet and report the fault.

The GPS module is also usedto provide the vehicle's real- time location at the moment of pothole detection. A backend website and database have been created to display all of the road faults.With regard to the second function, it serves to warn the driver while making a blind turn or lane change. It is carried outby utilising an ultrasonic sensor to measure the separationbetween the items.For the purpose of assessing the entire system, a model that simulates a road with twists and potholes is employed.

The technology was able to detect potholes in the road, record the information automatically into the database, and alert the driver before blind turns when a car was approaching from the other side.

INTRODUCTION

Poor road conditions, such as cracked asphalt, extremely tight turns, and unpaved roads, are a key contributor to on-land collisions. The structural condition of the road is the main factor in determining the driving experience. Only roads that meet all safety regulations can make driving safe, hence careful engineering is required while designing roadways. The timely maintenance of roads is equally important as their effective construction. The governing body might suffer significant financial losses and perhaps lose lives if the problem of road degradation is not addressed in a timely manner.Road accidents claim the lives of around 1.3 million people annually, costing most nations about 3% of their GDP (GDP) Several nations worldwide are doing research and creating systems in an effort to reduce traffic accidents, whether by assisting the driver directly or through the road management process with the use of cutting-edge technologies.Globally, the incorporated driver assistance system in cars is referred to as Advanced Driver Assistance System (ADAS). ADAS is made up of a variety of sophisticated sensors that can read physical data and interpret it to help the driver. With parking, lane changes, emergency braking, cruise control, and many other safety features, it can help.

Problem Definition

In emerging nations in particular, roads are a wonderful form of transportation. As it is a more environmentally friendly form of transportation overall, it is highly well- liked everywhere. Since they may be built across any terrain, roads are very simple to create. Roadways are able to link even the world's most inhospitable terrain since they don't require a long runway or railroad rails to run. While having several benefits over other forms of transportation, it nevertheless requires routine maintenance since the asphalt can deteriorate over time as a result of numerous external natural and human causes. Moreover, roads cannot be designed as properly as they should be owing to topographical challenges, particularly in India.Building a good road is incredibly challenging because hills dominate the majority of India’s terrain. In the steep area, the roads in India are smaller and have more twists.

Methodology

Several technologies can be used to construct project systems. Using a machine learning technique, images processing technology employs a camera to record the picture and warn consumers when potholes are detected early. This strategy requires a decent camera that can capture the image in low light as well as powerful processing. The model and datasets need to be updated often, which raises the cost of the system. As sound waves travel further through holes in the ground than they do on smooth surfaces, potholes may also be found using an ultrasonic distance measuring sensor.Nevertheless, in a real-world use case situation, this technology will not be practical for early pothole detection and alerting the motorist. The vehicle's speed outperforms its ability to measure distance and range. In changing lanes or making an overtake in a blind turn, the driver can be helped by using this sensor to identify the presence of an object.

When there is less space between two things, the presence of an object may be determined. Users of ultrasonic sensors may also determine how close another vehicle is by using these devices.Because it senses motion and the vehicle is always moving, for this project, a PIR motion sensor cannot be utilized. This method's main disadvantage is the it necessitates the automobile owners possession of a smartphone, which is expensive and performs better than the cost-effective.The results of the literacy evaluation indicate that utilizing an accelerometer to discover potholes is a cost-effective and effective method.Notwithstanding the fact that this strategy has several drawbacks. This approach must go over potholes in order to detect them because it cannot do so in advance. Due to its ability to operate at any temperature

Objective

∗Using a sensor or microprocessor to identify potholes and warn the motorist when making blind turns.

∗In addition, it aids in minimizing road accidents brought on by pit holes and reporting the upkeep of the rod.

∗It alerts the ruling authorities when it discovers the location's pit holes.

LITERATURE SURVEY

1. Ultrasonic Sensor-Based Vehicle Blind Spot Monitoring This study assesses a conception of the Vehicle Blind Spot Monitoring System (VBMS), which employs a more successful method of removing the driver's blind area. The newly created smart blind spot monitoring system merely focused on improving the work that had already been done, while sacrificing cost effectiveness and user friendliness. This new system's main selling points are its compact size, dependability, and low cost, which together make for a very reasonable safety feature. In the current study, choosing components plays a key role in building a low-cost blind spot detection system.Due of their affordable market prices, the VBMS system used the Arduino UNO R3 model and HC-SR04 ultrasonic sensors. Also, in previous applications for blind spot detection systems, the ultrasonic sensor has shown amazing performance. The VBMS is made as a small device that integrates the primary control unit and sensory components into a single body to be situated at the bottom of the side mirror. This allows for simple installation and maintenance on any vehicle.

2.Smart Vehicle Accident Prediction Using Machine Learning Algorithm- This essay analyses how much of the collision was caused by the owner's erratic driving and unevenly stopped automobiles. Many studies have been done on predicting and detecting automobile accidents, but there is no per-warning given to the drivers. In this project, we offer a solution to the accident. Hence,utilizing the supervise machine learning method, we offer a solution based on IOT accident prediction and detection. This system will gather the required data from the sensor, and utilising machine learning algorithms and data sets, it will be possible to forecast accidents.With the help of MEMS and vibration sensors, the crucial data or values are gathered. The KNN algorithm processes the sensor data, and when the threshold value exceeds the specified value, a notice is sent to the user's predefined contacts, the neighbourhood police station, and the hospital. Some people may still be able to be saved at that point, but it may not be feasible due to a lack of knowledge, the circumstances, and the location. The best possible answer will be provided by our project. and independence from the condition of the road, this technology can get over the limitations of ultrasonic sound. It is inexpensive and does not require a lot of computing power. So, this method is used to find potholes, notify them, and warn cars making blind turns. With GPS technology, the position is captured. To connect to the internet and transmit the data, a GSM modem is utilized.

Existing System

The current technology is a collision warning system that gathers the breaking statistics of the rear-end car to detect a driver's intoxicated or sleepy state and alert the driver of the front vehicle.

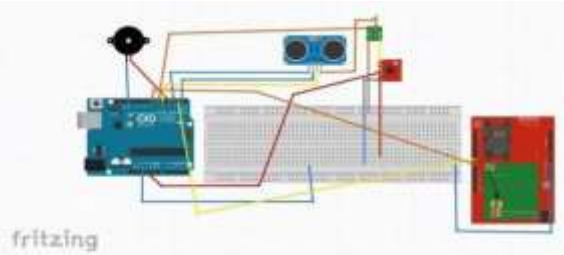
Limitations in Existing System

The aforementioned technologies do not include a feature that will inform the driver of a vehicle approaching the primary vehicle from all four sides and potentially causing a collision.

SYSTEM DESIGN

Architecture- The act of using different approaches and concepts to define a process or system in enough detail to allow for its physical embodiment is referred to as "design" in the system definition.

Fig-1



This diagram shows how each sensor is connected to an Arduino UNO micro-controller. the blind turn overtaking alert system circuit diagram.

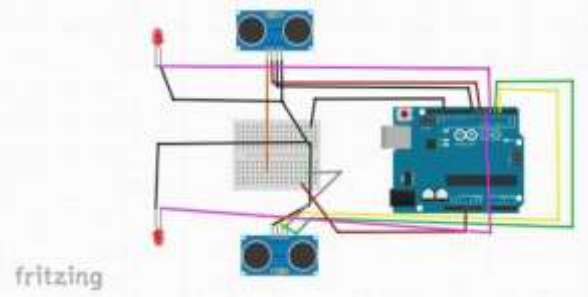


Fig-2

Sequence Diagram-

The aforementioned procedures which begin with the gathering of hardware requirements, component evaluation, and software requirement meeting—make up the pothole detection and blind turn alarm system. As a system is implemented, errors are checked, and attempts are made to fix them before testing is conducted to gather data .

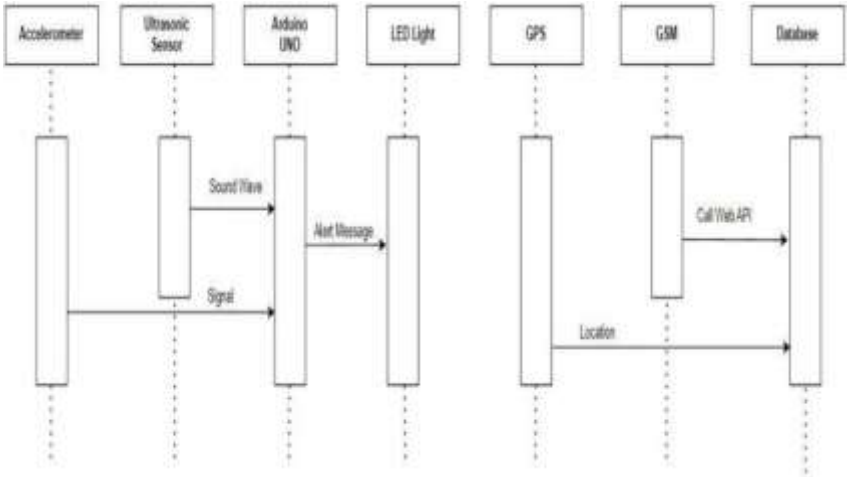


Fig-3

3. Real Time Pothole Detection and Vehicle Accident detection and reporting system and anti- theft(wireless)-Road conditions are one of the growing issues that roads face. Driving on the roads can be challenging for a variety of reasons, including rain, oil spills, car accidents, and general wear and tear. Unexpected roadblocks could lead to more accidents. The vehicle's fuel consumption increases as a result of the poor road conditions, wasting valuable fuel. The importance of gathering information about such poor road conditions, compiling it, and providing it to a government agency is urged by all of these factors. For the sake of property security and life preservation, it also becomes crucial to report accidents and the precise location of vehicles.

Arduino UNO-

Arduino Uno is a microcontroller board based on the ATmega328P. It has digital input/output pins (of which can be used as PWM outputs), 6 pins

Analog inputs, a 16 MHz quarts crystal, a USB cannection, a power jack, an ICSP header and reset button.

Microcontroller:

Atemga328P Analog

Inputs pins:6

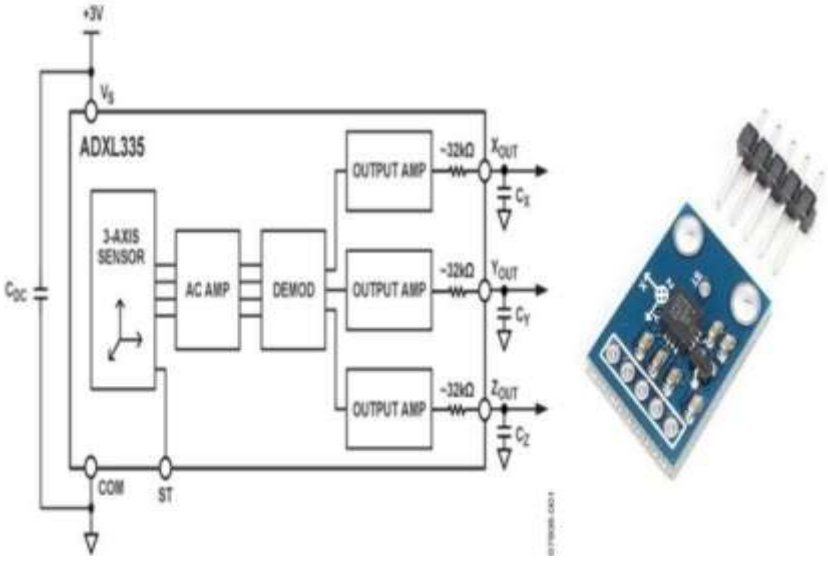
Input voltage: 6-20v

Fig-4

ACCELEROMETER SENSOR ADXL335:

A 3-axis accelerometer sensor called the ADXL335 is used to measure acceleration in three separate directions. It can monitor acceleration ranging from ±3g to ±10g and runs on a supply voltage of 1.8V to 3.6V. With a sensitivity of 330mV/g, the output is an analogue voltage proportional to the acceleration measured in each axis. It has a self-test feature, a sleeping mode, and an integrated high-pass filter to reduce noise. It frequently appears in a variety of uses, including robotics, motion and tilt sensing, and impact detection.

Fig-5



MICRO BREAD BOARD:

For the purpose of prototyping electrical circuits, miniature circuit boards are called micro breadboards. It generally comprises of a grid of holes that may accommodate electronic parts and cables and is intended to sit on top of a bigger breadboard or a PCB (printed circuit board). Little and straightforward circuits, such those used in educational projects, hobby projects, and prototyping, are frequently utilized with micro breadboards. As an alternative to soldering, they can be used to make bridging connections between components. Although micro breadboards exist in a variety of sizes and configurations, they typically have fewer holes and are smaller in size than conventional breadboards. They are frequently offered in sets or as a kit with additional tools and parts for prototyping.

Fig-6

ULTRASONIC SENSOR HC-SR904:

Popular ultrasonic sensors for measuring distances include the HC-SR04. It works by sending out high-frequency sound waves, then timing how long it takes for the waves to return after colliding with an object. Its precision is normally within a few millimeters and has a range of up to 4 meters. The sensor runs on a 5V supply voltage and has two primary parts: a transmitter and a receiver. It is frequently employed in security, automation, and robotics system.

GPS MODULE:

A GPS module is a gadget that uses signals from GPS(Global Positioning System) satellites to figure out where it is, how fast it is moving, and when it is. The standard components include a GPS receiver, an antenna, and a microprocessor for signal processing

Using a serial interface, the module interfaces with a host system, such as a micro-controller or computer. Several applications,tracking, and navigation, require GPS units. They can function in a variety of ways, such as autonomous mode, in which the module calculates the position on its own, or aided mode, In which it gets support from a remote server or cellular network.Depending on the kind and price of the GPS module, the accuracy might vary from a few meters to millimeters.

GSM module SIM900:

The GSM SIM900 is a wireless communication module. It enables 2G cellular networks to be used for data transmission by devices. In addition to TCP/IP, HTTP, FTP, and SMTP, the module also supports other communication protocols.It features an internal microprocessor that can be set up to do a variety of activities, including phone calls and SMS sending and receiving. Using serial communication protocols like UART or SPI, the SIM900 module may connect to a micro controller. It is commonly used in systems for remote monitoring, home automation, and vehicle tracking.

Fig-7

PIEZO SPEAKER:

A piezo speaker is a kind of audio transducer that turns electrical energy into mechanical vibrations and sound by means of a piezoelectric crystal. Piezo speakers, which don't employ electromagnetic coils as conventional speakers do, are compact, light, and have a high impedance, making them perfect for incorporation into small, portable electronic devices. Moreover, piezo speakers are well-known for their dependability, energy efficiency, and capacity for high-frequency sound.

PHP:

The server-side programming language PHP (Hypertext Preprocessor) is frequently used for creating websites. It is an HTML-embedded general-purpose scripting language that is open-source. On the server, PHP code is run, and the result is transmitted as HTML to the client. PHP is well-known for its simplicity of use, extensive feature set, and interoperability with a variety of operating systems and web servers. Input from users is processed, databases are interacted with, and dynamic web pages are frequently created using it.

Arduino IDE:

For creating and programming Arduino boards, there is a software platform called Arduino IDE (Integrated Development Environment). Open-source hardware and software combine to make the Arduino electronics platform. The Arduino IDE provides a user-friendly interface for writing, assembling, and uploading code to Arduino boards. It comes with a code editor that highlights syntax, a serial monitor for testing and debugging, and a library manager for organizing and installing libraries You may create C/C++ code with the Arduino IDE and upload it to your Arduino board. The Arduino Uno, Arduino Mega, and Arduino Nano are just a few of the Arduino boards that the platform supports. Also, the Arduino IDE comes with a sizable library of code, which makes it simpler to add functionality to your projects. Also, there is a sizable and vibrant online community of Arduino aficionados who exchange ideas, projects, and code libraries.

Result:

The prototyped device can support the drivers and help the government keep track of road defects. The technology automatically detects and reports potholes without assistance from other sources. The procedure becomes swift and efficient as a result of the authorities' ability to locate road holes promptly.

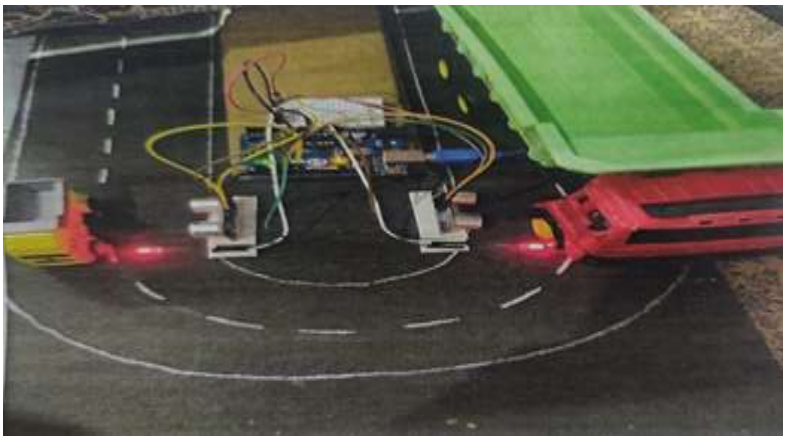


Fig-8

Conclusion and Future Scope:

The possibility to uncover the various issues plaguing the current society in which we live will be made possible by this effort. This project will serve as a fantastic platform for study on current and potential technology-based approaches to resolving society's fundamental challenges. This system's prototype is a low-cost device that can identify potholes and inform drivers to them.By exploiting the IoT infrastructure, in blind turns and while overtaking. The spiral methodology's iterative development process will be used to create this prototype. The authorities can monitor road defects with the help of this system project prototype. It can also help drivers.

Without any outside assistance, the technology automatically finds and reports potholes. Due to the authorities' ability to immediately repair road holes, the process is quick and efficient. The longer the holes in the road go neglected, the more serious the damage is done, raising the overall expense of maintenance as well as the likelihood of structural damage to the vehicles and, in the worst case scenario, an accident.

Moreover, this system may be enhanced to more effectively detect and report potholes for use on roadways

- The percentage of false positives in the identification and reporting of potholes can be reduced by a system that intelligently detects the slope of the road.
- Employing cutting-edge sensors to locate potholes early.
- Manually report a road defect via a mobile or online application.
- Protection measures to keep the private data safe.

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