IDENTIFICATION OF POTHOLE AND REPAIR COST ESTIMATION USING SEMI AUTOMATED ROBOT

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Keywords:

Arduino nano, Bluetooth module, DC motor, Node MCU, Servo motor, Ultrasonic sensor.

Introduction:

Roads are important means of transport which carry 90 percent of country's passenger traffic. Major problem faced by developing countries is maintenance of roads. As we know most of the roads in India are narrow and congested with poor surface quality and maintenance of the roads are not satisfactory. Due to the poor maintenance and servicing of the roads has led to creation of potholes. According to a survey by automation association one of the major reasons for road accidents are potholes. When a driver slows down the speed of the vehicle there are high chances of collision.

Roads makes a crucial contribution to economic development and bring important social benefits. They are of vital importance in order to make a nation grow and develop. Roads open up more areas and stimulate economic and social development. For those reasons, road infrastructure is the most important of all public assets. However, due to repeated loading and weathering on roads, a pothole may be caused, affecting human life very badly. A pothole is a structural failure in a road surface, Cause due to the presence of water in the underlying soil structure and the presence of traffic passing over the affected area. Every year humans lose more than one lakh lives on Indian roads, and the proportion of accidents due to potholes on the road is quite significant. The problem is exacerbated during the rainy season. Accidents occur mainly due to the coverage of potholes by water in rainy seasons. If these potholes are detected in real-time while driving, it will help vehicle drivers to avoid them and thus to escape from near danger. A pothole is characterized as surface damage to the road. It is typically a whole structure that has grown over time due to weather and transportation.

Objectives:

- Design and development of semi automated robot to detect pothole.
- To detect the potholes, based on the threshold value produced by the ultrasonic sensor.
- To ensure a better maintained road infrastructure and cost estimation to repair potholes.
- The aim of the project is to finding location of potholes in the area.
- To minimize the risk of accidents and damage to vehicles due to pothole.

The objective of a pothole detection and cost estimation system would likely to be improve road safety and infrastructure by efficiently identifying and repairing potholes. This involves utilizing technology to detect potholes accurately and estimate the cost of repairs, enabling timely maintenance and resource allocation. The objective could be to develop a reliable system that automatically detects potholes in roads using sensor technology, and accurately estimates the cost of repairing each detected pothole. This system aims to improve road maintenance efficiency and ensure timely repairs, ultimately enhancing road safety and reducing infrastructure maintenance costs.

Methodology:

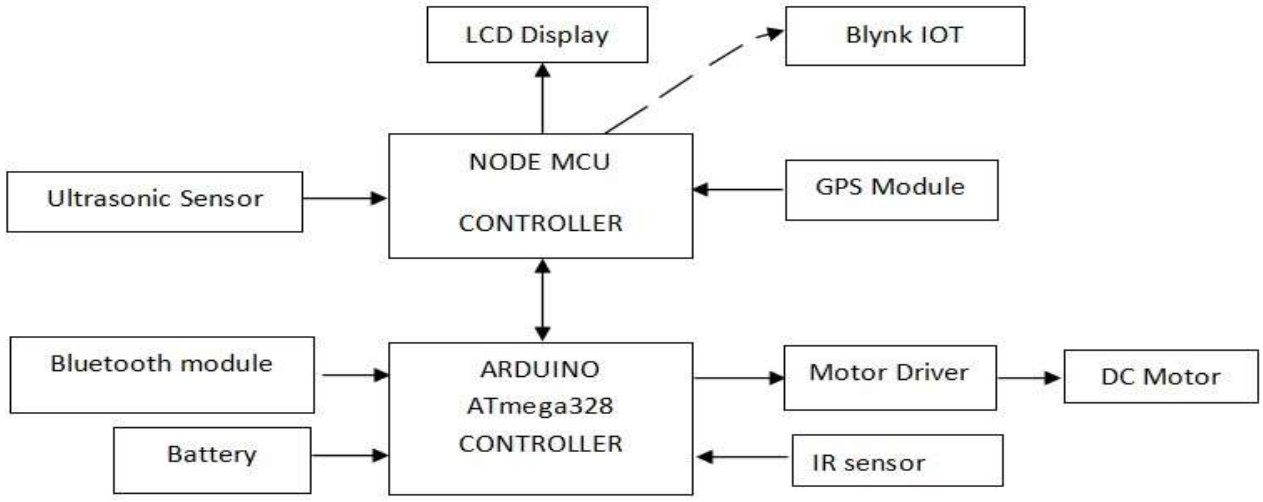

Figure 1 : Block Diagram

Above figure shows the block diagram of pothole detection and cost estimation it mainly consist of two controllers Node MCU and Arduino nano. This proposed system focuses on identifying the potholes as the robot moves. As soon as the pothole is detected the robot stops and estimate the repair cost of the pothole. Along with this, the GPS location of the potholes are shared via Blynk IoT software. After the pothole is detected, the robot moves forward and continues the process. The ultrasonic sensor is used to detect the potholes. The sensor detects the pothole,

when there is a change in the distance between the ground and the sensor. Based on the depth of the pothole cost is estimated depending on the thickness of the road layers. LCD display is used to display the area and repair cost of the pothole. By using bluetooth application the vehicle movements can be controlled and motor driver is used to control the DC motor. IR sensors are used to prevent the vehicle accidents. The GPS co-ordinates of the pothole is also tracked. This tracked location is shared via an IoT platform called Blynk IoT software.

Conclusion:

Many factors, including weather conditions, temperature, and significantly heavy weights caused by vehicles can introduce flaws in the pavement. As a result, this creates several cracks or cavities in the roadway which could lead to damages to motor vehicles and an increase in the rate of road accidents. The pothole detection and cost estimation system identifies a pothole by measuring its depth and generates location database of existing potholes. Along with the detection, the system will be able to estimate the repair cost of the pothole. The pothole detection and cost estimation system can create cautiousness in the riders, decrease number of accidents and maintenance costs of vehicles.

Project aim is to develop a device used for pothole detection and cost estimation. Pothole is detected using ultrasonic sensor and the location of the pothole is also tracked. It is shared via Blynk IoT software. This device is a great use in a country like India with poor road infrastructures. This device ensures an easier method that will help to improve the road transport systems.

Scope for future work:

- This project mainly aims at identifying potholes using ultrasonic sensor and repair cost estimation.
- During rainy season, these potholes maybe filled with water. So, it is difficult to detect the potholes.
- In such cases, a LiDAR sensor with camera can be used to detect potholes filled with water.

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