

A REVIEW PAPER ON IoT BASED UNMANNED GROUND VEHICLE

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Abstract:

Unmanned Ground Vehicles (UGV) are robotic platforms that are used as an extension of human capability. This type of robots are generally capable of operating outdoors and over a wide variety of terrain, functioning in place of human. This paper describes the design and implementation of a prototype of an unmanned ground vehicle which can detect the obstacles in the path of challenging environments.

Keywords:

Unmanned Ground Vehicle, Obstacle Detection, GPS, Internet of Things

Introduction:

An Unmanned Ground Vehicle (UGV) is a vehicle which operates on ground without an on-board human presence. UGV can be used for many applications where it can be inconvenient, dangerous, or impossible for human presence. Usually, the vehicle has a set of sensors to get a first-hand perception about the surroundings.

Based on application, UGV will have a platform, sensors, control system, communication link, and system integration features.

The Internet of Things (IoT) is the extension of internet connectivity into

physical devices and everyday objects. Embedded with electronics, internet connectivity, and other forms of hardware such as sensors, these devices can communicate and interact with others over the internet, and they can be remotely monitored and controlled.

Literature Survey:

1. Obstacle avoidance with ultrasonic sensors

In this paper, obstacle avoidance strategy is used for mobile robot. The mobile robot uses ultrasonic range finders for detection and mapping. It explains the methodology of ultrasonic detection.

2. Obstacle Detecting System for Vehicle Collision Safeguard

This paper describes design and implementation of an ultrasonic obstacle detecting system. It explains the working of ultrasonic sensors for obstacle detection.

3. A Cost-Effective Ultrasonic Sensor-Based Driver-Assistance System for Congested Traffic Conditions

This paper describes an accurate and fast driver assistant system that detects the obstacles and warns the driver. The proposed system tells us the interface of sensors with microcontroller.

4. Design and Development of Remote-Operated Multi-Direction Unmanned Ground Vehicle

This paper proposes design and development of a remote operated multi-directional Unmanned Ground Vehicle (UGV). This paper gives an idea about the movement of the UGV in various directions.

5. A Cost-Effective Design and Development of a Surveillance Robot

This paper proposes the design of robot which move forward and detect obstacles in front of it. Ultrasonic sensors are used to detect the obstacles. The microcontroller used to make the robot operational is Arduino Uno.

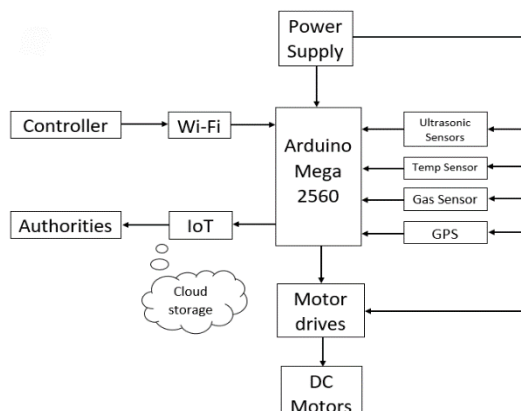
6. Drainage Overflow Monitoring System using IoT

This proposed system will monitor the water level and the gas level in sewage system and the measured values will store in cloud storage. The data will be sent to nearby corporation office using GSM module.

7. Android based Home Security Systems using Internet of Things and Firebase

This paper proposes design and implementation of wireless home automation control using Wi-Fi technology. The proposed system gives an insight about wireless transmission of data from NodeMCU to Firebase.

Block Diagram:



Microcontroller:

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins, 16 analog inputs, 4 UARTs (hardware serial ports), a 16MHz crystal oscillator, a USB connection, and a power jack.

Motor & Motor drive:

The main advantage of a DC motor is that it can develop constant torque over full range of operating speed. The DC motor used can develop a torque of 3kg-cm peaking at a speed of 45rpm.

The L298 is an integrated monolithic circuit in a 15-lead Multiwatt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors.

Ultrasonic Sensor:

HC-SR04 is an ultrasonic ranging module that provides 2 cm to 400 cm non-contact measurement function. The ranging accuracy can reach to 3mm and effectual angle is $< 15^\circ$.

Temperature sensor:

The LM35 series are precision integrated circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. The LM35 device is rated to operate over a -55°C to 150°C temperature range.

Gas Sensor:

The Grove - Gas Sensor (MQ9) module is useful for gas leakage detection. It is suitable for detecting carbon monoxide

(CO), methane (CH₄) and liquefied petroleum gas (LPG).

GPS (Global Positioning System) module:

It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on the Earth where there is an unobstructed line of sight to four or more GPS satellites.

Outcomes:

The outcome of this project is to get the prototype which is capable of performing following applications:

- Detection of hostile forces in border region
- Self-driving vehicles
- Obstacle detection in industries
- Obstacle detection for mining vehicle
- In challenging environments where humans cannot reach

Conclusion:

Ensuring the safety of people in challenging environments is the most important and difficult task. There are so many situations where humans cannot reach without prior knowledge of the surroundings. This vehicle can be used in such situations to ensure human safety.

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