International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 07 | July 2020 www.irjet.net p-ISSN: 2395-0072

WIRELESS SURVEILLANCE ROBOT WITH MOTION DETECTION AND LIVE VIDEO TRANSMISSION

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Abstract - *Wireless surveillance robot is a robot that can detect the motion of an object It sends the signal from the transmitter to receiver side and notifies it to user by the visual camera and also gives the IR image of the object. Robot can move in all direction to increase space of detection. The robot is automated to move in left, right, forward and backward direction based on obstacles it encounters. A wireless remote controlled robot which employs a PIR sensor detects the presence of human being and indicates it to the user. As it is a wireless robot it can be easily mobilized and controlled. Detection by rescue workers becomes time consuming and due to the vast area that gets affected it becomes more difficult. So the project Wireless Human Detection Robot is an autonomous robotic vehicle that moves in the earthquake prone area and helps in identifying alive people. The main aim of the project is to detect the human being by using a wireless remote controlled robot, which have the sensors that detects the presence of the human being and indicates the presence to user.*

Key Words: **Infrared Signals, PIR sensor, Obstacle sensor, Radio Frequency Transmitter and Receiver**

1. INTRODUCTION

Natural calamities do occur and they are unstoppable. But humans are becoming increasingly aware of the concept of intelligent detection operations in such calamities so that precious life and material can be saved. Still there are lots of disasters that occur all of a sudden and earthquake is one such thing. Earthquakes produce a devastating effect and they see no difference between human and material. Hence a lot of times humans are buried among the debris and it become impossible to detect them. A timely detection can only save the people who are trapped and wounded. Detection by detection workers becomes time consuming and due to the vast area that gets affected it becomes more difficult. So the project Wireless Human Detection Robot is an autonomous robotic vehicle that moves in the earthquake prone area and helps in identifying alive people.

1.1 Proposed System

This system uses a temperature sensor in order to detect the existence of living humans and a low cost camera in order to acquire a video of the scene as needed. The wireless camera shows the path moved by the robot that is displayed on a laptop at the control section. This approach requires a relatively small number of data to be acquired and processed during the detection operation. This way, the real-time cost of processing and data transmission is considerably reduced. This system has the potential to achieve high performance in detecting unauthorized persons entry in around environments relatively quickly and cost-effectively.

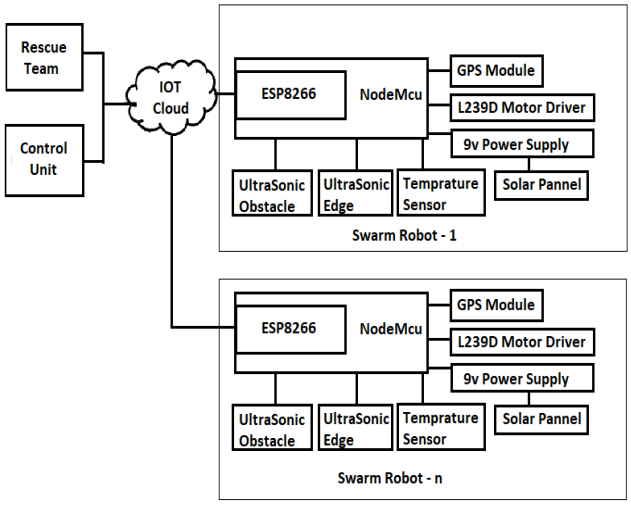

Fig- 1: Proposed diagram

1.2 Working Principle

This system consists of transmitter and receiver unit. Furthermore transmitter unit consist of rotational unit which has a specific set of sensors mount on it and a microcontroller. Receiver unit consist of camera which gets activated and starts capturing images as soon as ultrasonic sensor detects motion of human being and buzzer gets a beep and there is also an LCD which is used to display the temperature, motion and metal detection.

2. MATERIALS AND METHODS

We are using Arduino nano, PIR Sensor, power supply, Raspberry pi, Motor Driver, DC Gear Motors, Servo Motor, Ultrasonic Sensor and Pi Camera for this project. Raspberry pi is the microcontroller, which control over all system and send information about the plant to former.

2.1 Raspberry PI

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals or cases. However, some accessories have been included in several official and unofficial bundles. The Raspberry Pi is a capable little computer which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheet, word processing, browsing the internet, and playing games.

Fig- 2: Raspberry Pi

2.2 Motor Driver

The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The L298N module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A. The module has two screw terminal blocks for the motor A and B, and another screw terminal block for the Ground pin, the VCC for motor and a 5V pin which can either be an input or output.

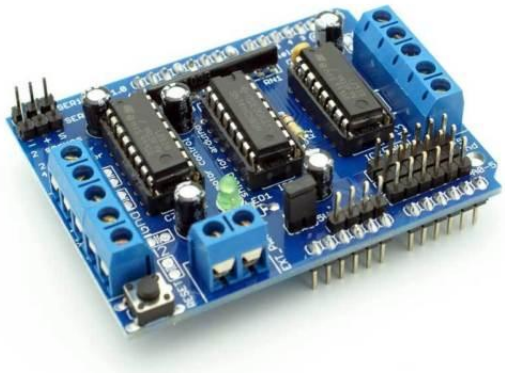

Fig- 3: Motor driver L298N

2.3 DC Gear Motors

A Direct Current (DC) motor is a rotating electrical device that converts direct current of electrical energy into mechanical energy. An Inductor inside the DC motor produces a magnetic field that creates rotary motion as DC voltage is applied to its terminal. Inside the motor is an iron shaft, wrapped in a coil of wire. This shaft contains two fixed, North and South, magnets on both sides which cause both a repulsive and attractive force, in turn, producing torque. Speed of a DC motor can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. A gear motor is an combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output.

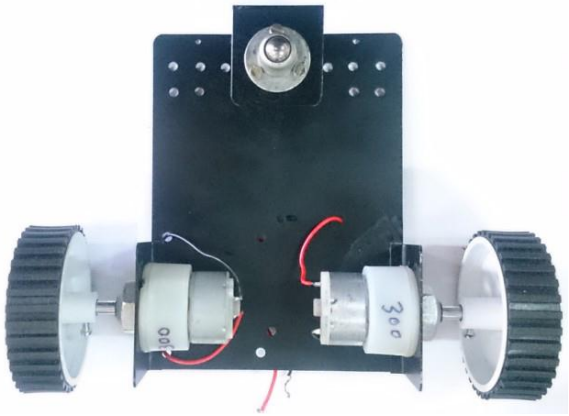

Fig- 4: DC Gear motor

2.4 Arduino Nano

The Arduino Nano can be powered via the Mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically. Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices.

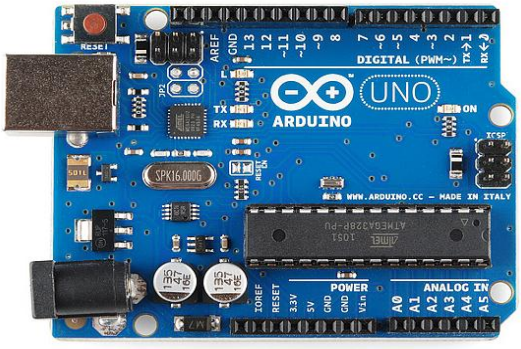

Fig- 5: Arduino UNO.

2.5 Pi Camera

The Raspberry Pi camera module can be used to take high definition video, as well as stills photographs. The Pi camera module is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol. It is normally used in image processing, machine learning or in surveillance projects.

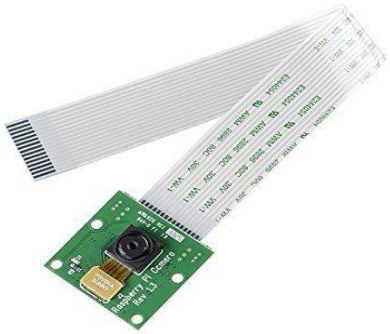

Fig – 6: Pi camera

2.6 Ultrasonic Sensor

Ultrasound is sound waves with frequencies higher than the upper audible limit of human hearing. Ultrasound is not different from "normal" sound in its physical properties, except that humans cannot hear it. This limit varies from person to person and is approximately 20 kilohertz in healthy young adults.

Fig- 7: Ultrasonic sensor

3. SYSTEM IMPLEMENTATION

The Robot has two sides, receiver side and the transmitter side. The transmitter side consists of ATMEGA328 microcontroller (Arduino); the inputs to the microcontroller are PIR sensor, and an Obstacle sensor. The outputs are RF transmitter and L293D motor drive module, to which a DC motor is connected. A DC motor is used to move the robot in left, right and forward and backward directions. L293D motor drive module controls the DC motor to move in the direction. The direction of the movement is decided from the signals given by the obstacle sensors. Obstacle sensor uses infrared signal to find if there are any obstacles present in front of it, its range is up to5 cm.

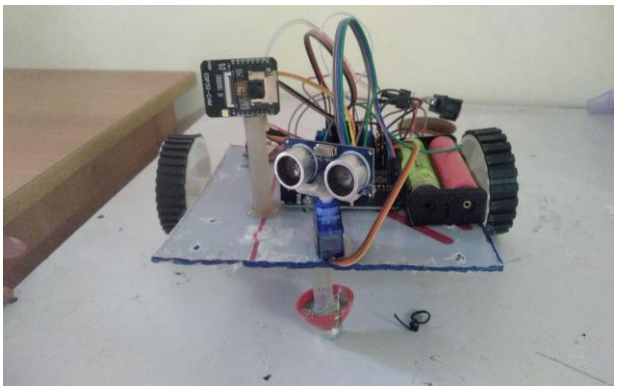

Fig- 8: Front view of Rover

Human can be detected using a PIR sensor. A PIR sensor is a sensor that produces passive infrared signals, these signals can detect heat. Human being produces heat which is detected using this sensor. Human being produces 9 to 10 microns of heat. A PIR sensor's angle of detection is restricted to 180o i.e. except the area below the robot it can sense in all the other directions. The distance up to which PIR sensor can detect is restricted within 12 ft. As the sensor's range is less, the sensor is mounted to a robot that can move automatically. If the sensor detects the human, it sends the signal to the RF transmitter to produce Radio Frequency signals. Radio Frequency signals can travel up to 200 ft. The diagram below shows the connectivity for the transmitter side.

4. CONCLUSION

Human detection Robot is to provide more security for the users to protect their belongings from robbers. The robot can move in all the directions automatically without controlling it, which makes the system more effective to use. As the Robot can move, it covers lot of distance that reduces the use of many sensors or many robots. When the Robot finds a human it can notify the users by producing continuous beeps. If the robot is attached with SONAR (Sound Navigation and Ranging) it can determine the distance between the human and can detect the IR image of the object.

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