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HUMAN DETECTION USING WIRELESS ROBOT

Mr. Mohan Kumar M [1], Ms. Preeti R.K[2], Ms. Aishwarya Mutteppa Vanasanavi [3],

Mr. Karthik V[4], Ms. Sabira H[5]

[1]Assistant Professor, Dept. of ECE, Yenepoya Institute of Technology, Moodbidri, India-574225
[2-5]Students, Dept. of ECE, Yenepoya Institute of Technology, Moodbidri, India-574225

Abstract - *There are various types of situation where a person cannot go to check or help or to take a specific action. At those points if we can use the robots then we can solve any problems or save lives. For this we have to design a system in which we can receive signals and give it to controller by decoding it so that controller can drive the robot and there must be a transmitter which can send the commands to the robot. So we are designing a system in which we can send commands wirelessly and that will be received by the robot system and as per the commands robot will be driven.*

The main aim of this embedded application is to design a PC controlled Robot which can detect live humans and transmit the location details wirelessly. It can also be used in war fields and places where disaster has occurred. Human detection is also required in hazardous sectors like boilers, reactors where only authorized person can enter. The live body sensor in this project is a special type of sensor known as PIR sensor. Any alive body with a temperature above absolute temperature emits radiations which are invisible to the normal eye. It senses these passive infrared rays to detect the live human. Human identity is carried out using a Human live detection sensor. The PIR sensor is used to detect the motion in any kind and will inform to micro controller. In this project we are using GSM based wireless system for the efficient communication. If the micro controller unit receives the detected signal, it will send a message through GSM modem. The GPS receiver receives the Longitudinal and latitudinal value when the system detects the movement of the human body it sends the location details to the stations using GSM modem.

Key Words: *buzzer, IR rays, Sensors, robots, Wireless Technology.*

1. INTRODUCTION

The advent of new high-speed technology and the growing computer capacity provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new control devices, new drives and advanced control algorithms. This project deals with a live human detection robot. 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. This can be used to detect terrorists/thieves hiding inside a building. This can also be used for rescue operations in earthquake.

The main objective behind developing this robot is for the surveillance of human activities in the affected areas or border regions in order to reduce infiltrations from the enemy side. The robot consists of night vision wireless camera which can transmit videos of the war field in order to prevent any damage and loss to human life. Military people have a huge risk on their lives while entering an unknown territory. The robot will serve as an appropriate machine for the defense sector to reduce the loss of human life and will also prevent illegal activities. It will help all the military people and armed forces to know the condition of the territory before entering it.

A Infrared Sensor is utilized in the project which emits IR Rays (Infrared Rays) in order to detect humans. As a human body emits thermal radiation. This thermal radiation is detected and manipulated accordingly by the IR sensor in order to detect the humans. Upon detection the person is in need of help is located, at the receiver side it immediately provide an audio alert (buzzer) visual and image alerts to the concerned authorities so that the person in need of help whether buried or unable to move can be reached abruptly. This IR sensor is placed in front of the moving robot that can move in all directions. The robot moves in either direction of the geared dc motor for optimum torque and minimum speed and motor derives with relays for turning and movement in forward and reverse directions with accuracy. The motor derive is a two wheel geared drive with DC motors attached to perform movements in either forward or reverse directions. On a contrary note Detection of human by designated rescue workers is tiring, reliable but very time consuming; therefore using the human detection robot for earthquake and other disastrous areas is much more beneficial for detection which is then followed by a rescue operation upon detection.

2. PROPOSED ARCHITECTURE

2.1 Arduino Microcontroller

Arduino microcontroller is based on UNO AtMega328. It is used to receive commands sent by the user via the internet and processes according to the code and also used to control the motors. Wi-Fi module ESP8266 is also connected with the arduino so that Wi-Fi facility can be provided to the robot.

2.2 HC-SR04 Ultrasonic sensor

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

2.3 L298D Motor Driver shield

L293D is a monolithic integrated, high voltage, high current, 4-channel driver. Basically, this means using this chip we can drive DC motors with power supplier up to 36 Volts, and the chip can supply a maximum current of 600mA per channel. L293D chip is also known as a type of H-Bridge. The H- Bridge is typically an electrical circuit that enables a voltage to be applied across a load in either direction to an output, e.g. motor.

2.4 SG-90 Servo motor

A servo motor is an electrical device which can push or rotate an object with great precision. If we want to rotate and object at some specific angles or distance, then we use servo motor. It is just made up of simple motor which run through servo mechanism. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight packages. Doe to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc. The position of a servo motor is decided by electrical pulse and its circuitry is placed beside the motor.

2.5 DC Motor – Gear Motor

Gear Motors – The most common electrical motors convert electrical energy to mechanical energy. A gear motor is an all- in-one combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output.

2.6 Radio frequency identification

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID tag consists of a tiny radio transponder; a radio receiver and transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number inventory goods.

2.7 Digital display

Digital displays are essentially flat panel screens that rely on different technologies to present multimedia content to an audience. The most common are LCD screens which use liquid crystal cells to display content and LED screens that are based on Light Emitting Diode technology.

2.8 Power supply

A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply).

2.9 Buzzer

A buzzer or a beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical use of buzzers and beeper include alarm device, timers, and confirmation of user input such as mouse click or key stroke.

3. IMPLEMENTATION AND WORKING

3.1 Obstacle detection and human recognition

The robot uses the Ultrasonic distance sensor to measure the distance in front of it. When this distance reduces to a particular level, the robot interprets it to mean the presence of an obstacle in its path. When the robot detects an obstacle in its path, it stops, goes backward for a few cm, looks

around (right and left) then turn towards the direction that shows more free space in front of it.

The Robot has two sides, receiver side and the transmitter side. The transmitter side consists of ATMEGA328 microcontroller (Arduino Uno); 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.

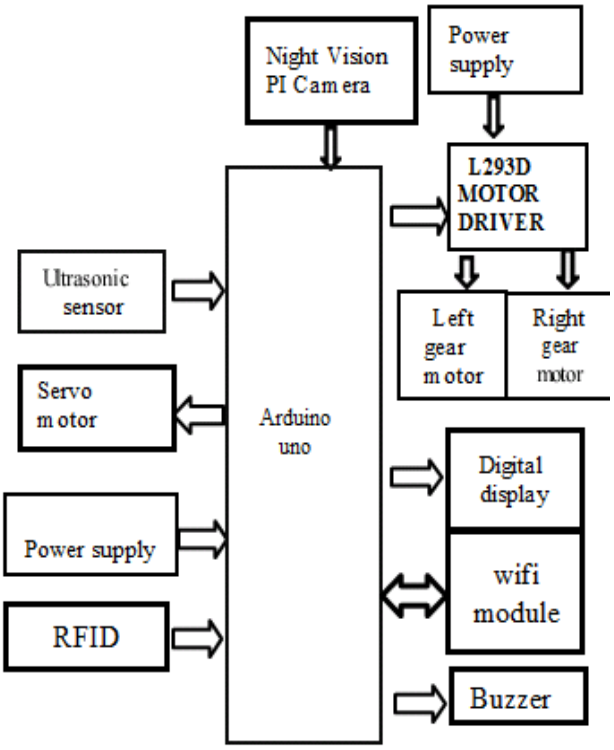

Fig -1: human detection using wireless robot

Obstacle sensor uses infrared signal to find if there are any obstacles present in front of it, its range is up to5 cm. The obstacle sensors are placed in front, right and in left directions. If any sensors sense any obstacle it changes to the direction where there is no obstacle. This makes the robot move automatically without external source controlling it. 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 transmitter to produce Radio Frequency signals. Radio Frequency signals can travel up to 200 ft.

The Receiver Side consists of ATMEGA328 microcontroller (Arduino Uno). Its input and output are Radio frequency receiver and a buzzer respectively. Once the signal from the transmitter is received by the RF receiver it notifies the Arduino. Arduino in turn sends a signal to the buzzer, which triggers the buzzer to produce continuous beeps. This continuous beep indicates that there is a presence of a human to the user. The diagram below shows the connectivity for the receiver side.

The RFID is mainly used for the purpose of person identification incase the person identification card is made up of RFID. If the person identification card is read through the rfid receiver then that will search the person details and send to the authorities.

We have used the digital display in order to correct if any problem occurs in the system to trouble shoot by the handler.

3.2 The project chassis design

Fig-2: The final Design of the Robot Chassis

3.3 Constructing the chassis

To begin, we start by coupling the chassis of the robot. The robot kit, contains the chassis, four geared DC motors, the wheels, the front wheel, battery holder, some screws, and wires.

Fig-3: chassis robot components

Step 1. Connect the motor and wheels to the chassis.

❒ To complete this step, we start by soldering the thick red and black wires to the positive and negative terminals of the motors .

Step 2. Prepare the Switch and connect the Power Source

❒ We add a switch to the battery holder so that we will be able to turn the robot on or off. The switch is connected according to the schematics shown below and attached to the case using ahot glue. The Battery case is attached to the chassis using a double-sided tape to ensure everything sticks together.

Step 3. installation the others parts of the robot

❒ This step is to mount other parts of the robot before we start connecting their wires. The motor shield is stacked on the Arduino and it is mounted on the chassis using a double-sided tape. The current requirements of the motors are often higher than what the Arduino can provide, that is why it's important to use the motor shield as it is equipped with additional circuitry to provide up to 600mA current to each of the motors.

❒ This shield provides power to the motors and the servo motor and ultrasonic sensor and makes it much easier. The Ultrasonic sensor is also mounted on the top of the servo motor which is then mounted on the chassis using some screws

.

Step 4. Wire up the components

❒ To simplify the connections, below is a pin map of how the components connect, one to the other.

❒ Wire up the components together.

3.4 Programming the robot

The controller board is used to communicate with the PC using serial communicator (USB connection). The data is transferred between them bit by bit. An adaptor is used to supply power to the controller board and a USB programmer is used to burn the hardware program (written in Arduino IDE) into the Arduino board. The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General Public License, version 2.

The use of Artificial Intelligence in the designing of the robot is introduced in the programming phase of the robot. The programming for the human detection wireless Robot is done in C Language and uses various pre-defined header file.

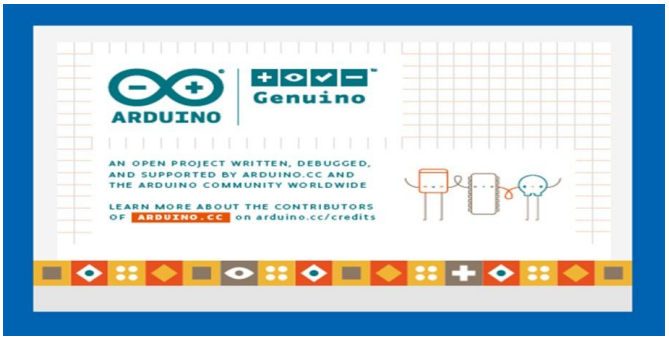

Fig-4: software tool used

4. RESULT AND CONCLUSION

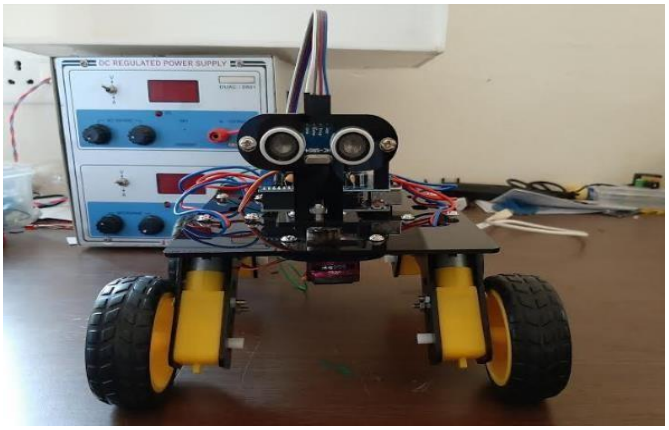

Fig-5: The hardware model depicting the project model

When the robot finds a human it can notify the users by producing continuous beeps. The robot can detect the human by attaching a night vision spy camera where the image of the intruder can be notified. The robot is attached with the ultrasonic sensor which determines the distance between the human and can detect the IR image of the object.

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