Obstacle Avoiding Robot

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Abstract— Most of the military organization now takes the help of robots to carry out many risky jobs that cannot be done by soldiers. These robots use in military are usually employed with the integrated system, including video screens, sensors. Our system basically has one mode is user control mode. The robot is controlled from the Bluetooth communication using application software forward, right left and backward direction command from the application software will drive the robot in any desired direction also will run with the application software. Microcontrollers get command from Bluetooth and transmit the information to the robot. Microcontroller receives the data and performs the necessary movement of the robot using dc motors.

Keywords— Microcontroller, Ultrasonic Sensor, Motor Driver, Bluetooth Module

I. INTRODUCTION

Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. The most common wireless technologies use radio. With radio waves distances can be short, such as a few meters for television or as far as thousands or even millions of kilometers for deep-space radio communications. It encompasses various types of fixed, mobile, and portable applications, including two-way radios, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of applications of radio wireless technology include GPS units, garage door openers, wireless computer mice, keyboards and headsets, headphones, radio receivers, satellite television, broadcast television and cordless telephones.

Defense robots are autonomous robots or Bluetooth-controlled devices designed for military defense applications. Such systems are currently being researched by a number of militaries. The techniques of distance measurement using ultrasonic in air include continuous wave and pulse echo technique. In the pulse echo method, a burst of pulses is sent through the transmission medium and is reflected by an object kept at specified distance. The time taken for the pulse to propagate from transmitter to receiver is proportional to the distance of object. For contact less measurement of distance, the device has to rely on the target to reflect the pulse back to itself. The target needs to have a proper orientation that is it needs to be perpendicular to the direction of propagation of the pulses. The amplitude of the received signal gets significantly attenuated and is a function of nature of the medium and the distance between transmitter and target. The pulse echo or time-of-flight method of range measurement is subject to high levels of signal attenuation when used in an air medium, thus limiting its distance range.

The use of robots in warfare, although traditionally a topic for science fiction, is being researched as a possible future means of fighting wars. Already several military defense robots have been developed by various armies. The use of autonomous fighters and bombers to destroy enemy targets is especially promising because of the lack of training required for robotic pilots, autonomous planes are capable of performing maneuvers which could not otherwise be done with human pilots, plane designs do not require a life support system, and a loss of a plane does not mean a loss of a pilot.

However, the largest drawback to robotics is their inability to accommodate for non-standard conditions. Advances in artificial intelligence in the near future may help to rectify this.

Defense and security robots perform multiple missions for troops and public safety professionals. More than 5,000 have been delivered to military and civil defense forces worldwide. Defense, Security and Surveillance Robots are much more robust than their hobby grade or educational counterparts. They are built to take abuse and save lives by placing themselves in harsh or dangerous environments humans would rather not find themselves in.

II. DESIGN AND IMPLEMENTATION

Arduino is the main processing unit of the robot. Out of the 14 available digital I/O pins, 6 pins are used in this project design.

The ultrasonic sensor has 4 pins: Vcc, Trig, Echo and Gnd. Vcc and Gnd are connected to the supply pins of the Arduino. Trig is connected to the 11th pin and Echo is connected to 10th pin of the Arduino.

L293D is a 16 pin IC. Pins 1 and 9 are enable pins. They are connected to Vcc. Pins 2 and 7 are control inputs from microcontroller for first motor. They are connected to pins 9 and 8 of Arduino respectively.

Similarly, pins 10 and 15 are control inputs from microcontroller for second motor. They are connected to Pins 4 and 3 of Arduino. Pins 4, 5, 12 and 13 of L293D are ground pins and are connected to Gnd.

First motor (consider this as the motor for left wheel) is connected across the pins 3 and 6 of L293D. The second motor, which acts as the right wheel motor, is connected to 11 and 14 pins of L293D.

The 16th pin of L293D is Vcc1. This is connected to 5V Vcc. The 8th pins is Vcc2. This is the motor supply voltage. This can be connected anywhere between 4.7V and 36V. In this project, pin 8 if L293D is connected to 9V supply.

Motor Driver boards are available with on – board 5V voltage regulator. A similar one is used in the project.

III. WORKING

Before going to working of the project, it is important to understand how the ultrasonic sensor works. The basic principle behind the working of ultrasonic sensor is as follows:

Using an external trigger signal, the Trig pin on ultrasonic sensor is made logic high for at least 10μs. A sonic burst from the transmitter module is sent. This consists of 8 pulses of 40KHz.

The signals return back after hitting a surface and the receiver detects this signal. The Echo pin is high from the time of sending the signal and receiving it. This time can be converted to distance using appropriate calculations.

The aim of this project is to implement an obstacle avoiding robot using ultrasonic sensor and Arduino. All the connections are made as per the circuit diagram. The working of the project is explained below.

When the robot is powered on, both the motors of the robot will run normally and the robot moves forward. During this time, the ultrasonic sensor continuously calculates the distance between the robot and the reflective surface.This information is processed by the Arduino. If the distance between the robot and the obstacle is less than 15cm, the left wheel motor is reversed in direction and the right wheel motor is operated normally.

This will rotate the robot towards right. This rotation continues until the distance between the robot and any obstacle is greater than 15cm. The process continues forever and the robot keeps on moving without hitting any obstacle.

IV. METHODOLOGY

Microcontroller:

ATmega328 Microcontroller based prototyping board. It is an open source electronic prototyping platform that can be used with various sensors and actuators.

ATmega328 has 14 digital I/O pins out of which 6 pins are used in this project.

Ultrasonic Sensor:

It is an Ultrasonic Range Finder Sensor. It is a non-contact based distance measurement system and can measure distance of 2cm to 4m.

Motor Driver:

Motor drivers take a low current control signal but provide a higher current signal, thus acting as a current amplifier. The higher current signal drives the motors. L293D is a motor driver that allows direct current (DC) motor to drive on either direction.

Bluetooth Module:

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks(PANs). It was originally conceived as a wireless alternative to RS-232data cables. It can connect several devices, overcoming problems of synchronization.

Gas Detector:

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak or other emissions and can interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals. TINSELPRO have been one of the most leading company of manufacturing semiconductor based gas detectors in India.

Metal Detector:

A metal detector is an electronic instrument which detects the presence of metal nearby. Metal detectors are useful for finding metal inclusions hidden within objects, or metal objects buried underground. They often consist of a handheld unit with a sensor probe which can be swept over the ground or other objects. If the sensor comes near a piece of metal this is indicated by a changing tone in earphones, or a needle moving on an indicator. Usually the device gives some indication of distance; the closer the metal is, the higher the tone in the earphone or the higher the needle goes. Another common type are stationary "walk through" metal detectors used for security screening at access points in prisons, courthouses, and airports to detect concealed metal weapons on a person's body.

V. RESULT

Due to its Wireless controlled nature it can replace humans in places where it is not convenient for us to move forward and provide help to people with better convenience. It can make the work of soldiers much easier as the life can be saved by replacing them with defense bots and provide better protection from a safer distance.

The robot is controlled from the Bluetooth communication using application software forward, right left and backward direction command from the application software will drive the robot in any desired direction also will run with the application software. Microcontrollers get command from Bluetooth and transmit the information to the robot. Microcontroller receives the data and performs the necessary movement of the robot using dc motors.

VI.   CONCLUSION

Autonomous robotics would save and preserve human life by removing serving soldiers who might otherwise be killed, while in service, from the battlefield. Increasing attention is also paid to how to make the robots more autonomous, with a view of eventually allowing them to operate on their own for extended periods of time, possibly behind enemy lines.

The ultrasonic receiver shall detect signal from the ultrasonic transmitter while the transmit waves hit on the object. The combination of these two sensors will allow the robot to detect the object in its path. The ultrasonic sensor is attached in front of the robot and that sensor will also help the robot navigate through the hall of any building.

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