The Robo: Semi-Autonomous Robot that detects objects and has speech capabilities

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Abstract

The robot is to design it to be semi-autonomous, meaning that the robot will be able to do some of its operations on its own. It can detect an obstacle, such as a wall or person, and when it encounters any such object, it will then stop and wait for two seconds before producing a greeting. During the two second waiting period, any command from the remote will prevent the robot from issuing a greeting. The operations that can be controlled by the infrared remote control will be starting the robot, stopping it, and making it turn left or right.

Introduction

Robotics along with other technology has been a long developing process and is still an ever growing field. There is still much we need to learn about technology, especially the field of robots. A couple of years ago, robots needed to be controlled by a remote and could not be autonomous let alone semi-autonomous. In today's world the new technology has made it possible for autonomous systems to exist. The use of remote controls is becoming less important especially with the increase advancement of voice recognition. Society is moving from traditional robotics to artificial intelligence.

Therefore, having robots perform even the simplest of tasks is already the present and of course our future. Robotic systems today only need to know who, where and what tasks they are performing. A semi-autonomous robot is more common even though the latest technology is getting closer to fully reaching that autonomous state. With the use of different components a fully working system can perform numerous of tasks. Starting with commands like saying hello to fully sorting medicine. Having a robot actually accomplish everyday task is becoming the new normal.

Components

The components for this project are two continuous rotating servo motors, A speaker, Two Infrared Proximity Long distance sharp sensors, Arduino Mega 2560 microcontroller and a Audio Sound Breakout board.

The most important component was the microcontroller and the audio sound breakout for the audio without these two the project cannot work. The audio sound breakout takes an SD card and can store up to 512 different sound files. Because it takes an SD card it made transmitting the audio files easier. The Arduino Mega 2560 had everything we needed for the project especially with the amount of pins and flash memory it has.

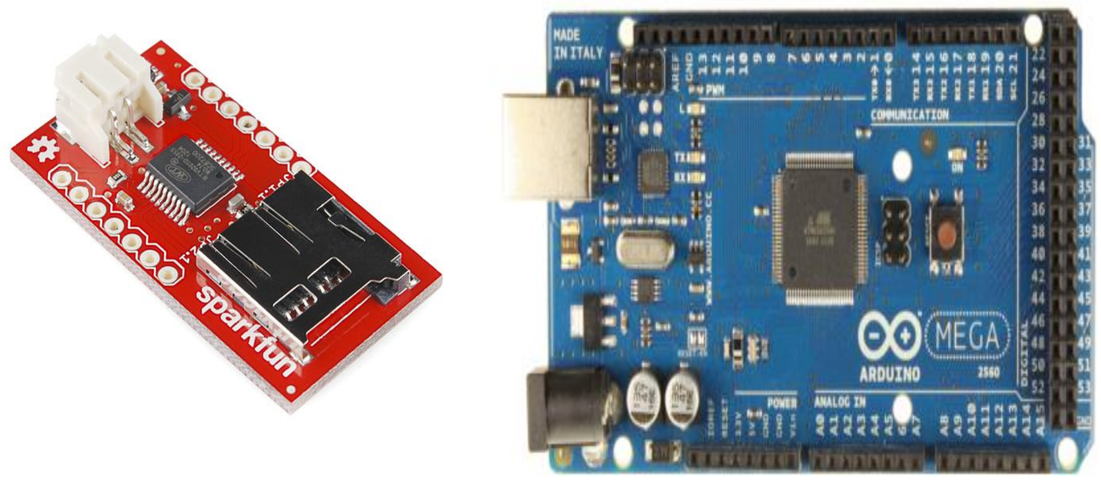

Figure 4-5: Most important Components for robot.

Mechanical Construction

The robot was design using a multilayer chassis that could be broken into smaller pieces making the robot smaller. It has a two wheel design along with a caster to provide balance and support

Two 5 V continuous servo-motors drive the wheels. A 9.6 V Tenergy NIMH battery pack is mounted to the back of the robot. The Arduino Mega 2560 microcontroller is at the top of two layer robot mounted with screws. Two sharp long distance sensor, a speaker and an audio sound breakout chip also on the robot. The sensors and the break out board is controlled by the programmed uploaded onto the micro controller.

The PC sends commands to the MCU through a serial port at 9600 bps baud rate. Using the Arduino IDE and the libraries such as the servo library and the SPI library commands are sent to the robot from the microcontroller. The audio sound breakout stores the audio files / greetings in an SD card. Then takes the audio files and transmit the audio through a serial interface.

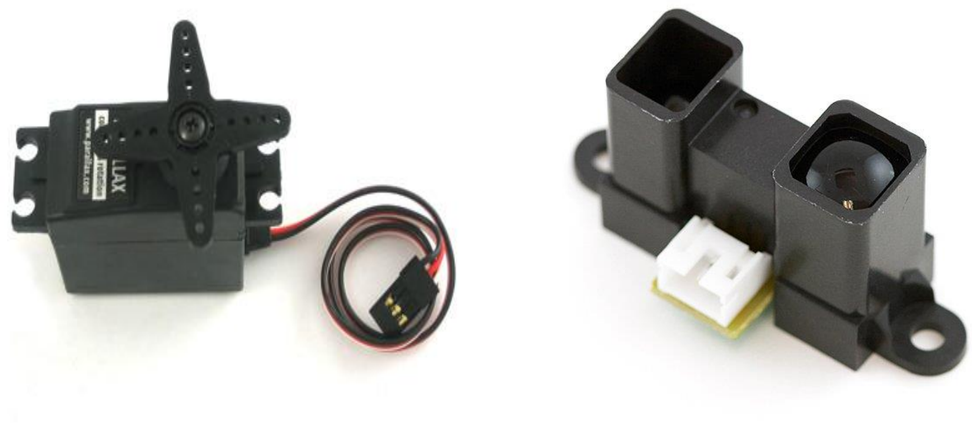

Figure 6-7 : The Components that control the movements.

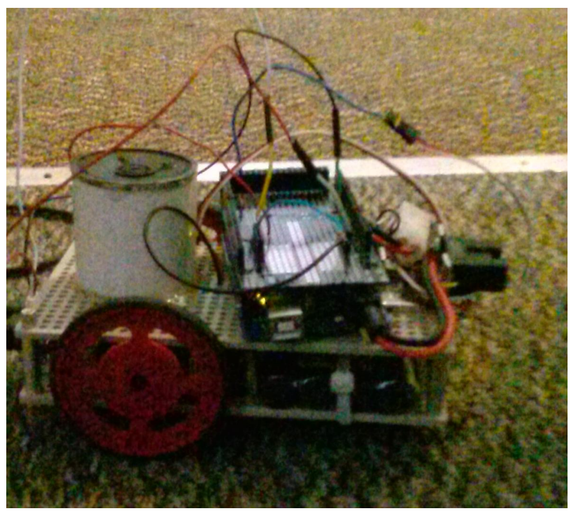

Figure 1: Side view

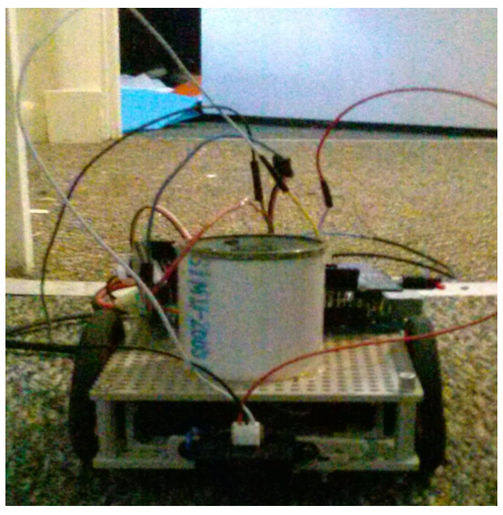

Figure 2: Front View

Figures 6 – 7 show two images of the components that are responsible for the robots movements. The image on the left is the motor that will move the robot forward, backwards, left and right. The images on the right is the distance sensor that I will use to detect the object and depending on what the sensor detects the robot will move accordingly

Navigation

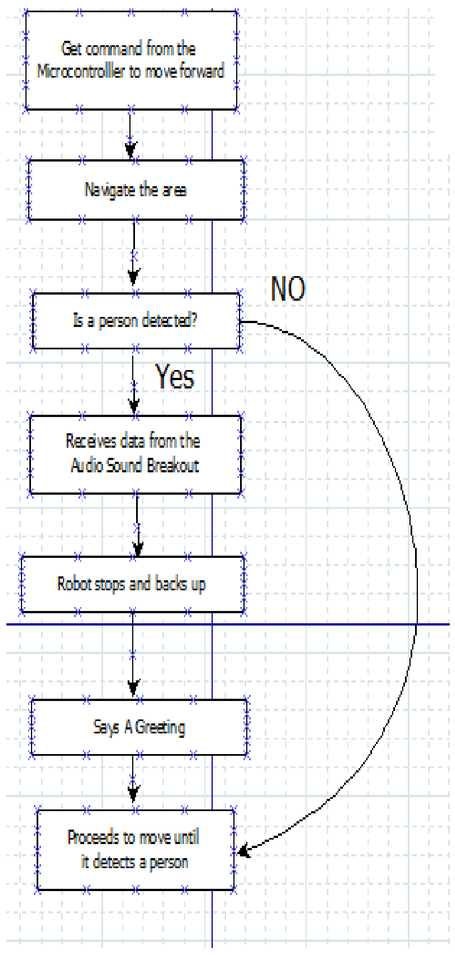

Figure 3: Control Flow Diagram

The robot navigates it surroundings and using a remote the robot will avoid obstacles such as walls and tables. The front distance sensor is waiting to detect an person so the greeting can be sent out.

The robot avoid walls and tables and anything like that in front of it using a remote that will make the robot stop, go forward, turn left or turn right. With the help of the sharp long distance sensor on the back it will not back into any walls or other such things on its own. If the robot gets closer to the wall when it backs ups it will go forward and make a turn. If the front distance sensor detects a person then it will backup a little, stop and say a greeting to the person

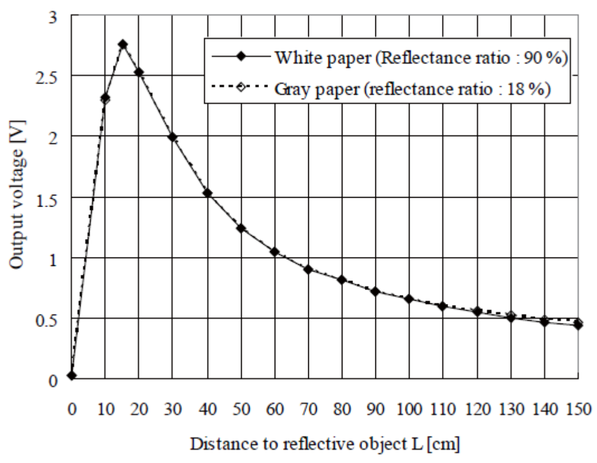

Figure 8: Output Voltage vs Range of distance

The distance sensor range goes from 20cm to a 150 cm but as you can see the further away from the minimum the less the output of voltage is. A more reliable way to detect a person would be to use a heat sensor to detect body heat. Only a living thing can have body heat so if the sensor detect s something then it would have to be a person

Person Recognition

As the robot moves along in the room their will be people and other obstacles like tables and chairs. Since the robot is not fully autonomous but only semi a remote will be used to avoid the chairs and tables for the front distance sensor but not the back distance sensor. The distance sensor in the front will have differentiate between a person and a object which is what the remote is for. Once the person is detect the MCU will send a signal to the audio breakout to send a audio file.

Future Work

Potential future enhancements to this project include:

- Designing a bigger version of the Robot
- Making the Robot fully autonomous by using a heat sensor to detect a person.
- Using different motors for more accuracy.
- Add a camera to the robot

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