

TKFR2: A Multifunction Robot

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Abstract

TKFR2 multifunction robot's main goal is to design and implement a robot that will have features that provide assistance to people in different ways. It is activated and controlled through real-time voice commands, a remote control and by using a smart mobile phone. It is capable of speaking and sensing things in its environment. It informs the user (by talking and LCD display) about the temperature, humidity, presence of fire, presence of obstacles and it can detect movements. It will also play music if asked to, turn on a light if instructed to do so, and move around in different ways using a remote-control, voice activation or smart mobile phone.

The robot project uses Arduino and 1Sheeld boards as its main electronic parts. A number of electronic shields or sensor modules compatible with Arduino was also used in order to do the environment sensing needed in the project. It uses a smart mobile phone in order to interface 1Sheeld board to the Arduino board.

Other Arduino shields virtually available in the smart mobile phone were used. Bluetooth Wireless technology is used and the programs were encoded within Arduino through the Arduino Integrated Development Environment (IDE) software and MIT App Inventor.

Keywords (12 font)

robot
arduino
1Sheeld
bluetooth
voice

1. Background

One of the greatest accomplishments of mankind is in the field of robotics. Robotics is one of their major attempt to create an artificial being. Robots are now becoming more available to the public because many manufacturers have been producing them.

Robots are so popular that even here in Saudi Arabia, a robot named Sophia, was given a Saudi citizenship last Oct. 25, 2017, because of its advanced human-like appearance, movement and show of feelings or emotions with artificial intelligence technology.

2. Objectives

To design and implement a multifunction and interactive robot that can talk to its user, sense its environment (temperature, humidity, motion, obstacle, fire), move around, be controlled by infrared, mobile application and voice commands, giving assistance, information, and sense of security.

3. Methodology

TKFR2: A Multifunction Robot, has two main parts, the Face part and the Car part, which are being controlled by two microcontrollers found in Arduino Mega and Arduino Uno. 1Sheeld board and Bluetooth technology makes it possible to have wireless communication between the different electronic parts and sensors like Temperature and Humidity sensors, PIR, Ultrasonic sensor, Fire sensor, LCD, LED, DC motors, 8x8 LED matrices, Speakers, DC motor driver, Infrared (IR) transmitters / controller, Infrared (IR) receiver, and a smart mobile phone.

4. Results and Analysis

The robot was tested and tables were prepared in order to gather data, determine the validity of the sensor readings, make the robot car movement smoothly, and see whether all of the electronic parts and programs were functioning properly. The data taken were then analyzed for errors and necessary modifications of the prototype robot were made especially in making sure that the sensors (for temperature, humidity, PIR, ultrasonic and flame) are calibrated correctly. At present, it can now perform all of the functions that it was designed to do.

5. Conclusion

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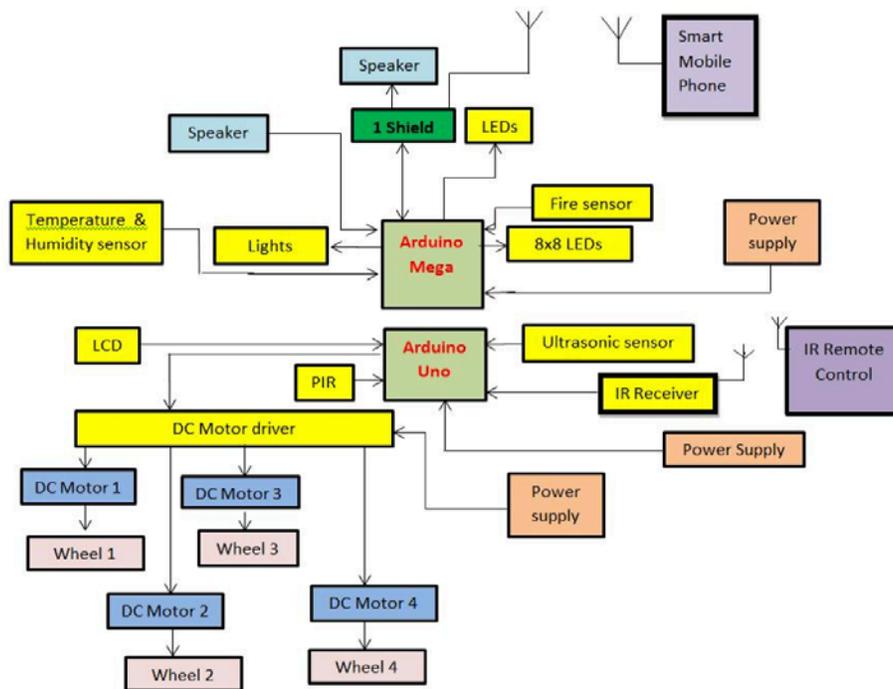


Figure 1. TKFR2: A Multifunction Robot Block Diagram



Figure 2. TKFR2: A Multifunction Robot (Face part, Robot part, IR/Mobile App/Voice Command Controls)

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References

Nussey, J, Arduino for Dummies, John Wiley and Sons Ltd, England, 2013

Boxall, J, Arduino Workshop, William Pollock, USA, 2013

Margolis, M, Arduino Cookbook, O'Reilly Media Inc., Canada, 2011

Mert Arduino and Tech, Arduino Tutorial - The Arduino talking! How is it? Connect speaker and play audio file, Available: <https://www.youtube.com/watch?v=gi9mqIha8nQ>, July 2017

Arduino, What is Arduino?, Available: <https://www.arduino.cc/en/Guide/Introduction>, November 2017

Wikipedia, Robotics, Available: <https://en.wikipedia.org/wiki/Robotics>, October 2017

Arduino Shields, Available: <https://www.arduino.cc/en/Main/ArduinoShields>, September 2017

ISheeld, ISheeld Turns Your SmartPhone Into 40 Arduino Shields, Available: <https://1sheeld.com/>, October 2017

Fritzing, Fritzing electronics Made Easy, Available: <http://fritzing.org/home/>, November 2017

Instructables, How to Use the L298 Motor Driver Module, Available: <http://www.instructables.com/id/How-to-use-the-L298-Motor-Driver-Module-Arduino-Tu/>, December 2017

Wikipedia, Remote Control, Available: https://en.wikipedia.org/wiki/Remote_control, December 2017

Sparkfun, How to use a breadboard, Available: <https://learn.sparkfun.com/tutorials/how-to-use-a-breadboard>, January 2016

Wikipedia, Voice command device, Available: https://en.wikipedia.org/wiki/Voice_command_device, December 2017

Wikipedia, Dot Matrix, Available: https://en.wikipedia.org/wiki/Dot_matrix, September 2017

Simplebotics, Andbot, Available: <http://www.simplebotics.com/2016/06/andbot-is-like-a-pepper-humanoid-robot-for-your-home.html>, June 15, 2016

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