

Robot Controlled By Matlab GUI Using Rf Wireless Technology

SRUJANA CHINNAM¹, THATHA VEDASREE², TENALI SRAVYA³, VEDURUPARTHI RANJITHA⁴

^{1,2,3,4} UG Students, Electronics and Communication Engineering, Vasireddy Venkatadri Institute of Technology, Guntur

Abstract -- The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure. With the advent of technology there are a variety of options available in the market for the security of our houses. The cost of such security systems is also very high. In order to secure our houses at a reasonable price, we can use the help of Raspberry Pi which is nothing but a mini computer.

We integrate the Raspberry Pi with Web Camera and PIR Motion sensor which captures the image of the intruder who enters our door step. In addition to the image capture, there is also a buzzer which alerts the neighbors about the intruder. The WIFI present in the Raspberry Pi sends the image captured by Web Camera to our Email. The house owner can then access the image of the person standing at the door using the Email. As a result, we can ensure that, our houses are safe and secure in our absence and can thus prevent our homes from burglary attacks using the smart phone. Hence we can control the restrict unauthorized access to our doors using Raspberry Pi.

Index Terms- Electromagnetic Door Lock, Internet of Things (IoT), Pi Camera Module, PIR Motion Sensor.

I. INTRODUCTION

Radio Frequency (RF) is a frequency or a rate of oscillation within the range of about 3Hz to 300Hz. This range corresponds to frequency of alternating current electrical signals used to produce and detect radio waves.

RF transmitter and receiver modules are used to send 4 bit parallel data wirelessly to receiver end from which we can read the data by using microcontroller. Here we have used 433MHz RF transmitter and receiver.

GUI is known as Graphical User Interface. GUI is a MATLAB based tool which supports the operators in order to establish and evolve an integrate code and works efficiently. GUI is a most attractive and user helpful interface. Moreover, MATALB offers an atmosphere and device known as GUIDE. GUIDE is an environment for the development of graphical user interface. It also permits GUIs to be generated or any type of modification intractably from fig. files. In order to start GUI, we need to write GUIDE on command window of MATLAB. Then a dialog box appears, select a blank page and click "OK" for further processing and to use GUI. GUI has two files namely: fig file and m file.*.fig file-This file includes the full elaboration of the figure in GUI and also contains a constituents of the GUI based.*.m file-This file includes the coding part on which GUI depends and performs the desired task. Using m file editor, the user can do coding on callbacks in this particular file.

II. IDENTIFICATION AND RESEARCH

In the wired robot control there are few disadvantages like the limited range, loss of energy due to the resistance of the wire, decrease in the amplitude of the signal with the increase in distance, interferences and reflection problems due to high data rates, high costs etc.,. So as a thought to reduce these disadvantages we came up with wireless robot control which is comparatively cheap and reliable, easy to interface with less number of components and has a wide range of operations.

Some of the existing methods that use wireless technology to control a robot vehicle are as follows:

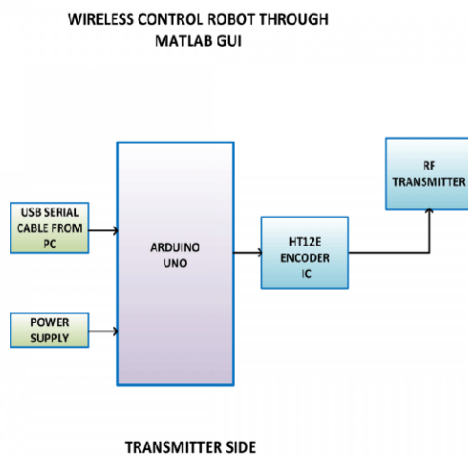
- GSM mobile controlled robot using 8051 Microcontroller.
- Robot controlled through Bluetooth technology.
- Robot controlled through Wi-Fi.

- Wireless gesture controlled robot.

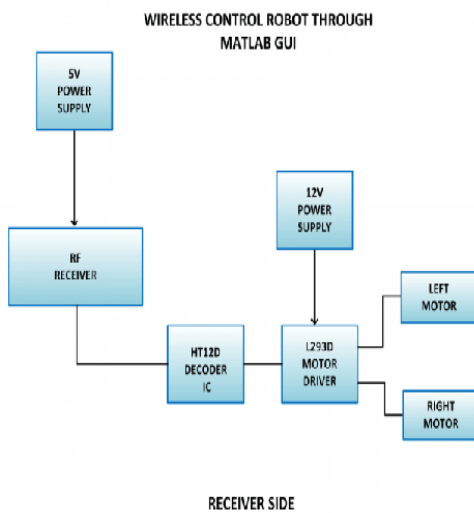
III. BLOCK DIAGRAM OF THE MODEL USED

There are two circuits designed in this robotic project- one is the transmitter circuit which is basically a controller based RF transmitter connected to a PC through serial interface and other is the receiver circuit mounted on the robot which controls the motor driver IC.

The block diagram for the transmitter side is as shown below:

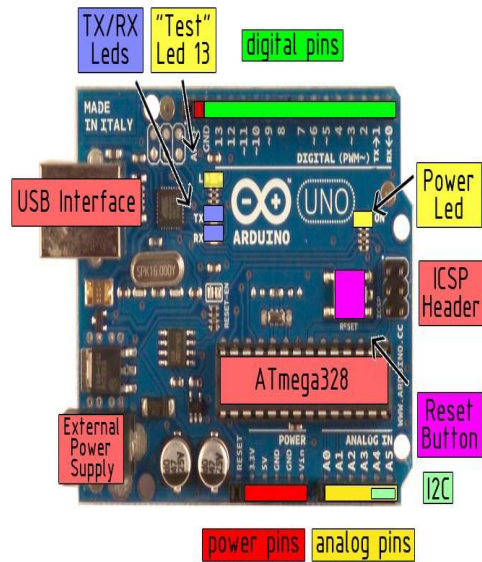


While the block diagram for the receiver side is as follows:



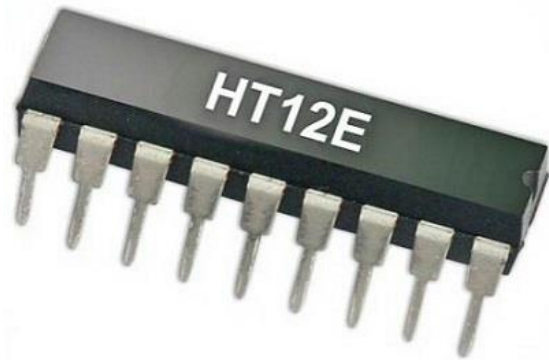
Arduino UNO:

Arduino UNO is one of the most popular prototyping boards. It is used frequently in robotic applications as it is small in size and packed with rich features. The board comes with built-in arduino boot loader. It is an Atmega 328 based controller board which has 14 GPIO pins, 6 PWM pins, 6 Analog inputs and on board UART, SPI and TWI interfaces, a power jack, an ICSP header and a reset button. It is operated with a 16MHz crystal oscillator. In this project the arduino board is connected to a PC via USB port and 4 GPIO pins are utilized to interface HT12E RF encoder IC with it.



HT12E:

HT12E is a Holtek's encoder CMOS IC with working voltage ranging from 2.4V to 12V. Encoder HT12E has eight address and another four address/data lines. The data set on these twelve lines (address and address/data lines) is serially transmitted when transmit-enable pin TE is taken low. The data output appears serially on DOUT pin. It permanently enabled for transmission by connecting its TE pin to ground.



HT12D:

HT12D is a Holteks' decoder CMOOS IC with working voltage ranging from 2.4V to 12V. The signal detected from the RF receiver is passed to the HT12D decoder. HT12D is capable of decoding 12 bits, out of them 8 are address bits and 4 are data bits. The 4-bit data is of latch type and when passed to the output data pins it remains unchanged until the new data is received. The serial data received from the RF receiver is parallel output from its data pins as it is. The data pins of the decoder IC are interfaced with the input pins of the L293D motor driver IC. So the digital logic at the data pins of the decoder control the rotation of the DC motors.



RF Transmitter and Receiver Module:

The RF transmitter is used to transmit the input signals for the motor control. The RF transmitter module is a small PCB sub assembly. The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30KHz and 300GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude

Shift Keying(ASK). The RF module operates over 433MHz frequency and uses ASK modulation technique. The RF receiver detects the radio signal carrying the motor control signals. The RF receiver module has 8 pins.

The RF transmitter module that operates over 433MHz is shown below:

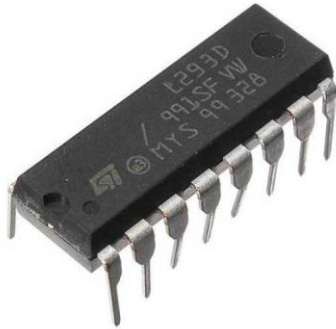


The RF receiver module that operates over 433Mhz is as follows:



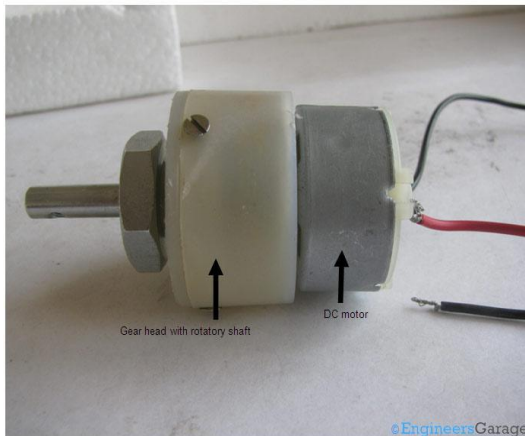
L293D Motor Driver IC:

H-bridge Motor driver IC(L293D) is a device which is used to control bidirectional motion of DC motor of higher voltage(4.5v-3.6v) from low voltage microcontroller control signal. It can drive two DC motors simultaneously. Moreover it can control the speed of either motor connected with it using its inbuilt enable PWM pins.



Geared DC Motor:

Geared DC motor can be defined as an extension of the DC motor. The geared DC motor has a gear assembly attached to the motor. The speed of the motor is counted in terms of the rotations per shaft per minute and is termed as RPM. The gear assembly helps in increasing the torque and reducing the speed.



A. Software used:

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS, and Linux based operating systems. It is a replacement for the Eclipse Andeoid Development Tools (ADT) as primary IDE for native Android application development.

MATLAB (matrix laboratory) is a multi-paradigm numerical computing environment. A proprietary programming language developed by MathWorks, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including c, c++, c#, java, Fortran and Python.

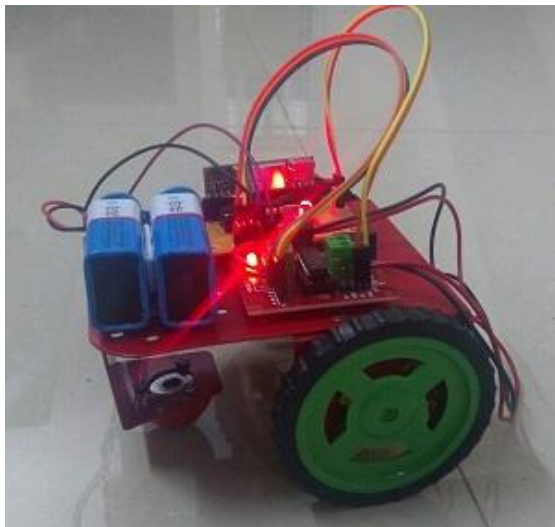
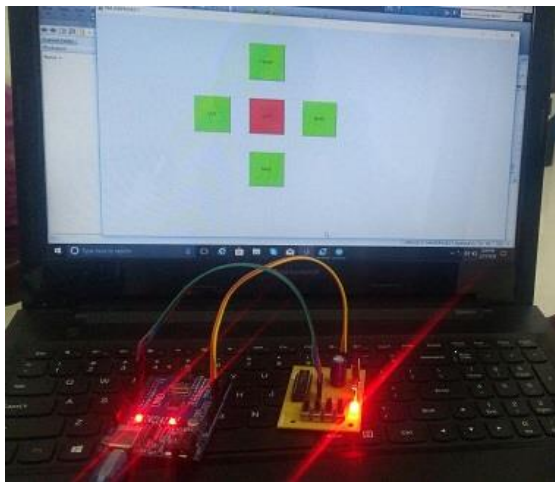
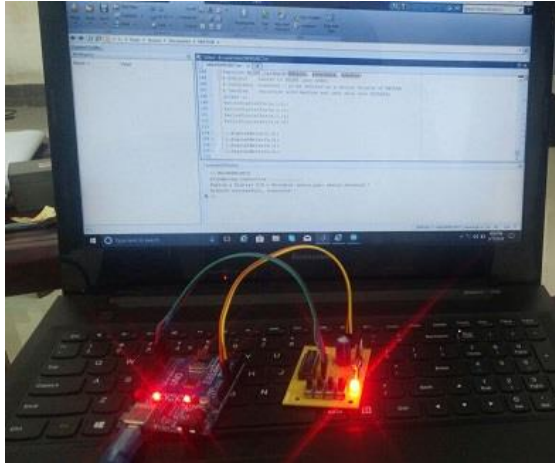
Although MATALB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing abilities. An additional package, Simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems.

MATLAB supports developing applications with graphical user interface (GUI) features. MATLAB includes GUIDE (GUI development environment) for graphically designing GUIs. It also has tightly integrated graph-plotting systems.

The graphical user interface (GUI) is a type of user interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notations, instead of text-based user interfaces, typed command labels or text navigation. The actions in a GUI are usually performed through direct manipulation of the graphical elements.

IV. CONCLUSION

In order to operate this ROBOT users should use this GUI as shown in the figures given below. This particular project is implemented by MATLAB interfaced with Arduino and using GUI. When we click the buttons of the GUI the Robot moves accordingly. The objective or aim of this project is to create a virtualized environment. Moreover, we are analyzing movement of Robot for further applications in field of science and technology. The further enhancement of this project can be such as to have a spy scene, we can also attach a webcam to our Robot.



REFERENCES

- [1] GUI (2014, July). Robot Software level1 GUI [Online] Available: <http://rdmp.org/robot/robot--software--level-1--gui.html>
- [2] Dunbabin M (2012) Robotics for Environmental Monitoring: Significant Advancements and Applications. IEEE Robotics and Automation Magazine 19:24-39.
- [3] Gesture Recognition (2014, July). Gesture Recognition Technology [Online] Available: embeddedrobotics.blogspot.com/2012/05/gesture
- [4] N. M. Noor, J. C. Than, O. M. Rijal, R. M. Kassim, A. Yunus, A. A. Zeki, et al., wireless communication Using Control Feedback System: Morphology and Texture Paradigm,” Journal of Medical systems, vol. 39, pp. 1-18, 2015.
- [5] http://engineering.nyu.edu/mechatronics/projects/papers/BS2Matlab_2Column.pdf
- [6] Mathlabs, Creating Graphical User Interfaces, Matlab 7.14, 2012.