

# WIRELESS HAND GESTURE ROBOT USING DIGITAL IMAGE PROCESSING

Muhammad Iqbal Khan Khalil, Wajid Ali, Ismail Khan, Imtiaz Ali,

Department of Electrical Engineering, Sarhad University of Science & IT, Peshawar.

E.mail: [iqbal.ee@suit.edu.pk](mailto:iqbal.ee@suit.edu.pk)

## Abstract

*To build RF based hand gesture robot which can be controlled through RF technology, where the decision of the gesture will be taken on behalf of image processing in MATLAB. To control the motion of the robot i.e. moving forward, moving backward, moving left and moving right. Moreover the information regarding direction will also be displayed on the transmitter end. In this system microcontroller is used as a central part to control the movement and direction of the Robot. The movement of the robot is controlled by hand gesture, the robot moves at a particular direction where hand gives a gesture. In this system for the detection of hand movement, DIP(digital image processing) tool is used which detect the hand and give information to the microcontroller which gives command to the transmitter. The transmitter transmits the desire signal to receiver side. The receiver gives command to microcontroller on the receiver side and the robot moves toward the desire place or direction.*

**Key words:** DIP, Gesture, RF technology, Microcontroller and H-bridge.

## Introduction

Robot is an electromechanical device, which automatically work in different applications such as military application, Industrial Power Plant [3] etc. There are two type of robots categorized on the basis of its control mechanism, one is Autonomous robots and other is non-autonomous.

**Autonomous Robot:** such type of robots which have capability to take decision on behalf of human. They don't need any human assessment.

**Non-Autonomous Robot:** In such types of robots programming is done to complete the required task. Such robots are controlled by controller i-e human.

As we see today's technology robot play an important roles in all human aspects, from factory automation to services application to medical care and entertainment. The basic goal of HRI[2](human robot interaction) is to define the principles and algorithms for robotic systems to make it capable of direct, safe and effective interaction with humans. Rf-based wireless hand gesture robot using digital image processing in matlab [4],execute the raising applications of the RF technology. By using RF frequencies, a control system has been suggested that will act as an embedded system through which different appliances can be controlled and also other devices by using built-in input and output components. The main concept of this project is to receive command from the pc and processing on it to do several operations. The principle on which the project is based is very simple. Firstly, the information sent is stored and polled from the receiver RF side and then the required control signal is generated and sent to the microcontroller on receiver side which gives command to h-bridge which drives the motor in that particular direction. There are several terminologies that are used extensively throughout this project report. I.e. RF (radio frequency), RF module, H-bridge, microcontroller etc

This system sends four different types of codes to the receiving end these codes will be used to move the robot in either direction (left, right, forward and backward).

### **Gesture**

It is a type of non-verbal communication in which visible body actions communicates a particular message instead of speech. Gesture includes shaking of head, hand or other parts of the body.



Figure 1 Describe different hand gesture.

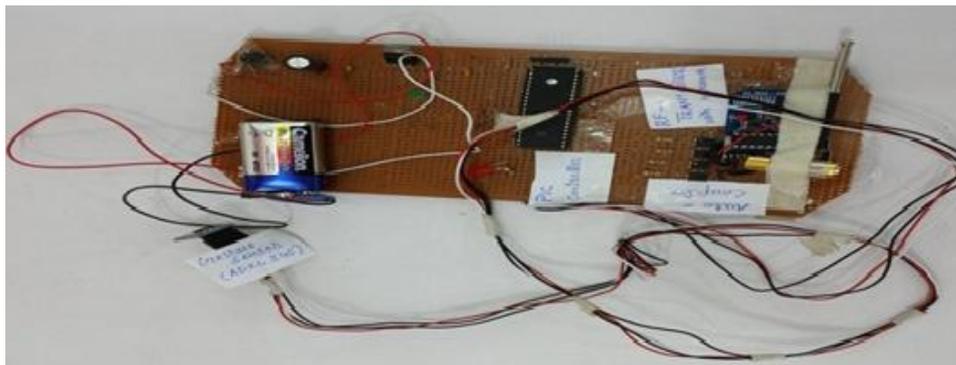
### **Results and Discussions**

#### ***Matlab***

We use matlab as a programming tool for digital image processing[5]. In matlab different commands are written as the taken picture by camera is compare with the pre-written code in matlab if any desire gesture is found it will send the command to microcontroller on receiver side.

#### **Transmitter side**

The transmitter side is connected to PC through DB-9 connector which will send the data serially to microcontroller through max-232. As the data match with pre-written code in microcontroller the data encoded transmitted to receiver side.



*Figure1* Different component of transmitter side, consist of max 232, microcontroller, relay, relay driver, LCD screen and RF-transmitter.

### Receiver side

After receiving signal from the transmitter side the signal is decoded and pass it to microcontroller where it is compare to the pre-written code if the desire command found then it gives command to the h-bridge which drives the motor at the desire direction. Below is the snapshot of receiver side.

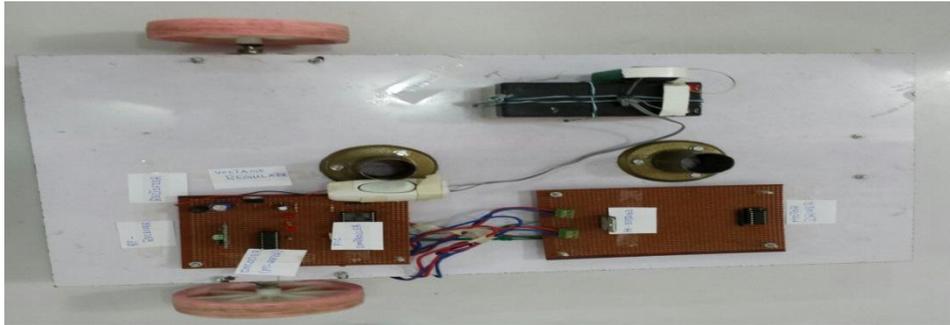


Figure 3 Different parts of receiver side that are R F receiver H-bridge, surge diodes, decoder, and regulator. Here H-bridge is used to drive the robot motors in desired direction, H-bridge is basically the combination of 4 relays (mean we can use H-Bridge instead of 4 Relays).the connection of each components is shown in circuit diagram.

### Simulation result of receiver side

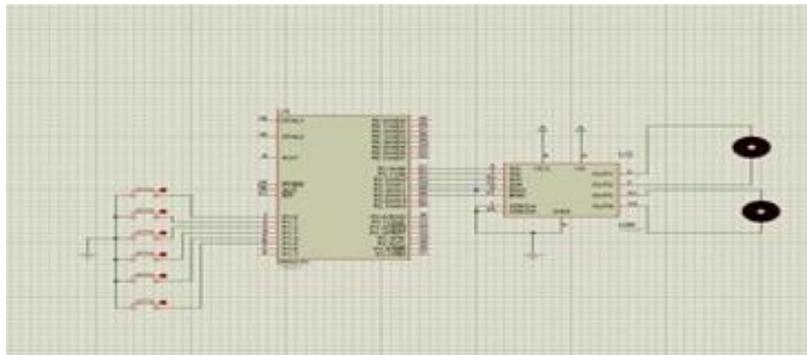


Figure 4. Simulation result of receiver side to see our command are working. This figure is the output of proteus.

### Matlab result

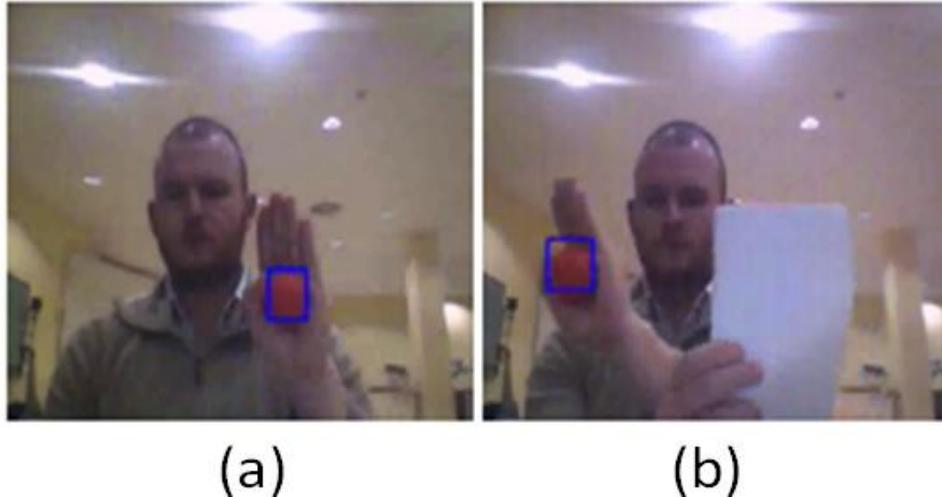


Figure 5. (a) Snapshot of hand for the forward direction and (b) snapshot of hand for left direction.

### Conclusion

We presented an oval method for continuous gesture recognition that should support a natural and flexible human-robot social interaction.

In the end we are able to get our objective of controlling robot by using RF technology. Our hardware is capable to respond the signal sent by user, and according to the need of user robot moves in either direction. This robot is completing the project objective as the robot moves according to the movement of hand. More over the robot is simple and reliable; this robot is also capable to show real time video of the subjective results. So the cost on this project is extremely low when comparing with other robots.

### References

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