# Pick and Place Surveillance Robot

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**Abstract-***Robotics is a vast field used for many purposes. Robots have become peculiar in out daily life. This project is based on robotics and many of similar functions. The main function of this is robotic arm. Robotic arm is a mechanism in which it can lift things and can move in 360 degrees. It has one elbow and one hand like structure to lift things. To move the objects from one place to another we'll use a normal 2 tire and a ball caster mechanism. Theo wheels will be connected to 2 motors. The third function is of object detection. We are using object detection to analyze the obstacles which interrupt the mobility of robot. The range of the device used for object detection is 4 m. The fourth function used is camera surveillance in which using the pi camera we can monitor the movement while moving the robot. All these functions will be controlled by raspberry pi. Raspberry pi is 1.4GHz 64-bit quad-core processor, dual-band wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and Power-over-Ethernet support.*

***key Words*: Arduino NANO, raspberry-pi, robotic arm, Obstacle, USB camera, Ultrasonic sensor**

## 1. INTRODUCTION:

A robot is an electromechanical machine that is controlled by computer program to perform different types of operations. Industrial robots have designed to reduce human efforts and time and improve productivity and to reduce manufacturing cost. Android app can control the motion of the robot from a long-distance using Bluetooth communication to interface controller and android. Arduino NANO ATmega328P can be interfaced to the Bluetooth module though UART protocol and code is written in embedded C language. As per the commands received from android app the motion of the robot and movement of an arm can be controlled. Pick and Place robots can be reprogrammable and they can provide multiple applications. Another function of this robot is camera surveillance. Raspberry Pi 3 is used for camera surveillance. Raspbian OS has to be installed so that the image and videos can be seen to the android phones directly. The purpose of this work is to design and implement an Android Controlled Bluetooth based Robot which can be used for Surveillance, home automation, wheelchairs, military and hostages Rescue applications.

## 2. METHODOLOGY:

### 2.1 Arduino Nano Board:

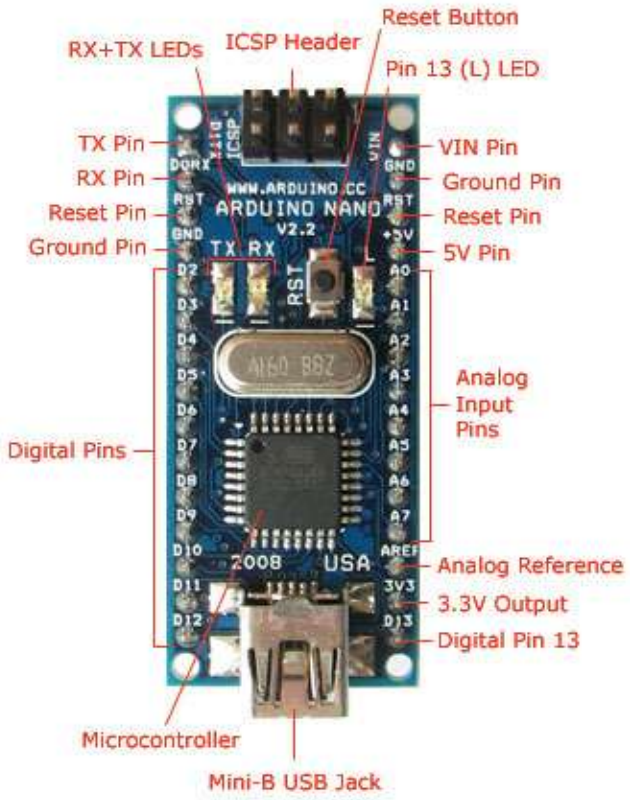


**Fig.-1: Arduino NANO**

Arduino Nano Board is the brain of robot loaded by a program written in embedded c language to do the required functioning and it is interfaced with Bluetooth module. The motor drivers are used to make the system work as required.

### 2.2 DC Motor

**Fig. -2: DC Motor**

HC -05 Bluetooth module D.C. motor is controlled by DC voltages and moves in every direction i.e. forward, backward, left and right according to the polarity of voltage applied. All the mechanical movements which robot performs is accomplished by an electric motor. Electric motor is used to power devices. An example of small motor applications are motors used in automobiles, robot, hand and food blenders.

### 2.3 Power adaptor:

This is used to give appropriate DC power supply (11 V) to Arduino NANO, Driver IC sensors and other passive components of the Robot.


**Fig. -3: Power adaptor with 11 V battery.**

### 2.4 HC-05 Bluetooth module:

This module is capable of communicating with pc, mobile or any other Bluetooth enabled device. It is interfaced with the Arduino NANO over the serial UART port of micro-controller. Bluetooth is a wireless communications protocol running at 2.4 GHz, with client-server architecture, suitable for forming (PAN) personal area networks. Bluetooth is an integral feature designed for low power devices. Bluetooth is a standardized feature that is available in all Smartphone running on android, laptops and computers. It is very handy as it can be easily fitted with a module to allow Bluetooth based communication.

**Fig. -4 HC 05Blutooth Module**

### 2.5. Ultrasonic sensor HC-SR04: :

The ultrasonic sensor is used for obstacle detection. Ultrasonic sensor transmits the ultrasonic waves from its sensor head and again receives the ultrasonic waves reflected from an object. ultrasonic sensors can be use in instruction alarm system, automatic door openers. The ultrasonic sensor is very compact in size and has a very high performance. It has both the transmitter and receiver. It consists of four pins VCC pin to offer a 5V supply to the sensor, trigger pin gives a TTL pulses and echo pin to get the output from the sensor and ground pin. Ultrasonic sensor HC-SR04 is shown in Fig. 5


**Fig. -5: Ultrasonic sensor HC-SR04**

### 2.5 Raspberry Pi 3B plus:

Raspberry Pi is used for transmitting images or videos from use camera to the monitor or android phone. The surveillance is carry out wirelessly with the help of Wi-Fi or ip Address of a Raspberry Pi. Raspberry pi is connected with the dongle which enables raspberry pi to transmit over the web network. Raspberry Pi uses an SD card for booting and for memory because it doesn't have an inbuilt hard disk for storage. Raspberry Pi require 5 volt supply with minimum of 700- 1000 mA current and it is powered through micro USB cable. ARM11 only requires 3.3 volt of supply which it takes with the help of

the linear regulator. 5 volt is required for the USB ports. It operates at 700M Hz. We use python to write code into the raspberry pi.

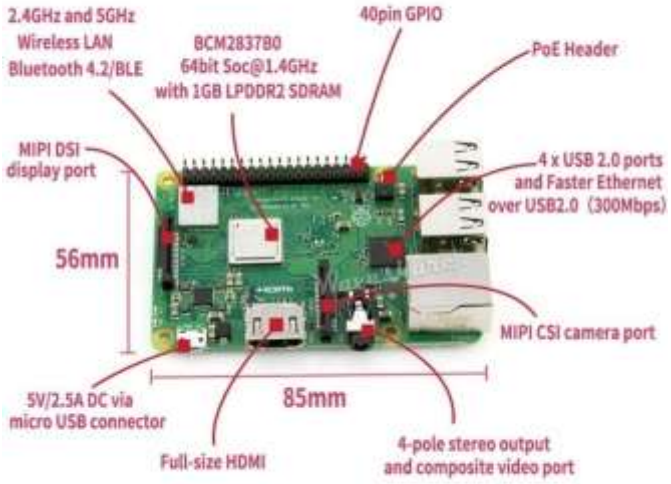


**Fig. -6: Raspberry pi 3B Plus**

### 2.6 Motor Driver IC L298N :

IC L298N can be used with motors which have a voltage range of between 5 and 35V DC. With the help of IC L298N it is quite easy to control one or two DC motors. The L298N module has two screw terminal blocks for the motor A and B, and another screw terminal block for the Ground pin, the VCC for motor and a 5V pin which can either be an input or output.

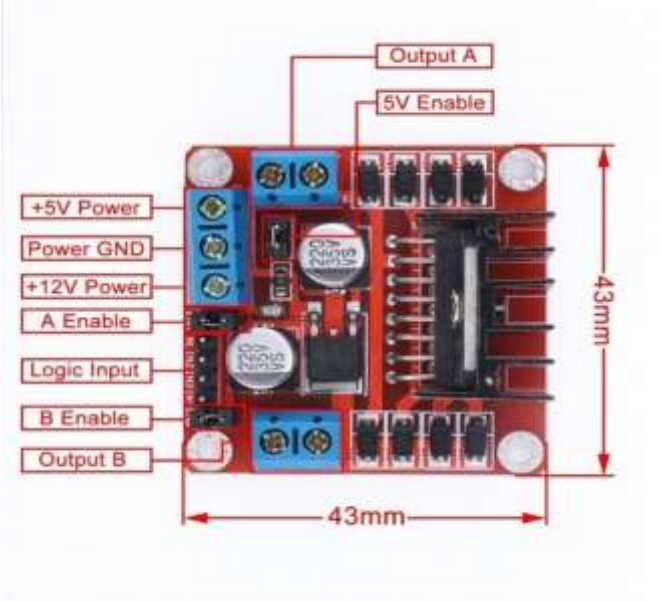


**Fig. -7: Motor Driver IC L298N**

## 3. SYSTEM ARCHITECTURE:

### 3.1 Pick and Place arm and Robot:

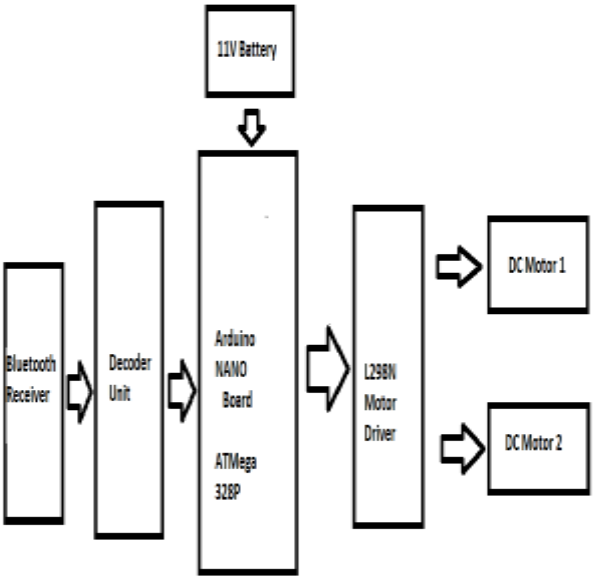


**Fig. -8: Block diagram of proposed system**

A robot can be controlled using Bluetooth module HC-05 and Arduino Nano Board with android Smartphone device. The data receive by the Bluetooth module from android smart phone is fed input to the controller. The controller acts accordingly on the DC motor of the robot. The robot can move in all the four directions using the android phone. Android smart phone can connect to the nano board with the help of Bluetooth.

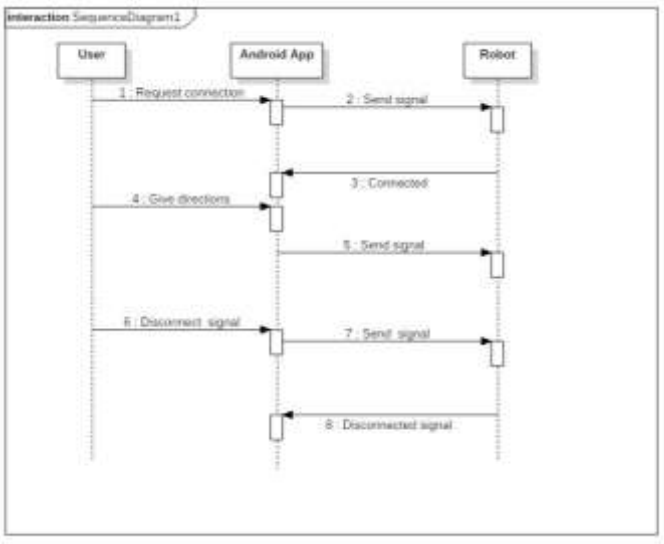


**Fig.9 -: Sequence Diagram1**

In above Fig 9 an interaction of a user with the robot has been shown. A user can interact with robot with the help of application. In this project we made an app named "Roboarm" on MIT Inventor. User can install this app on their android Smartphone and can control the movements of arm or give the directions to the robot.

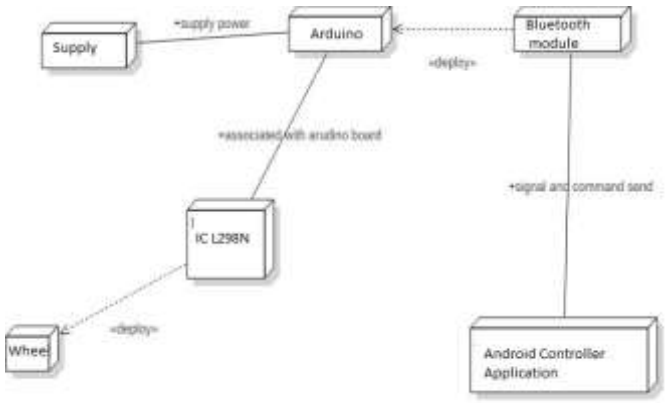


**Fig. -10: Deployment Diagram**

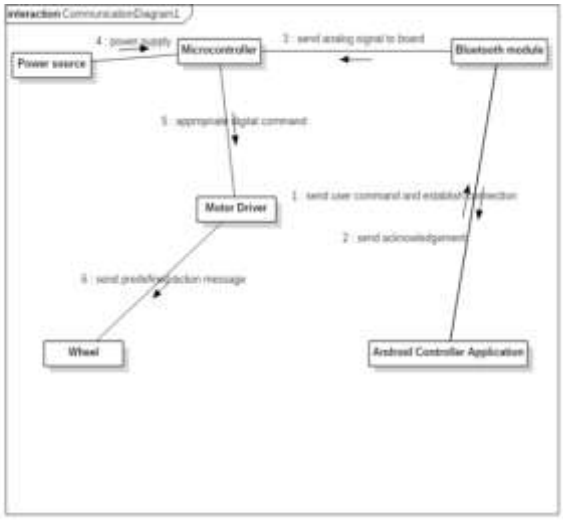


**Fig. -11: Communication Diagram**

### 3.2 Camera Surveillance:

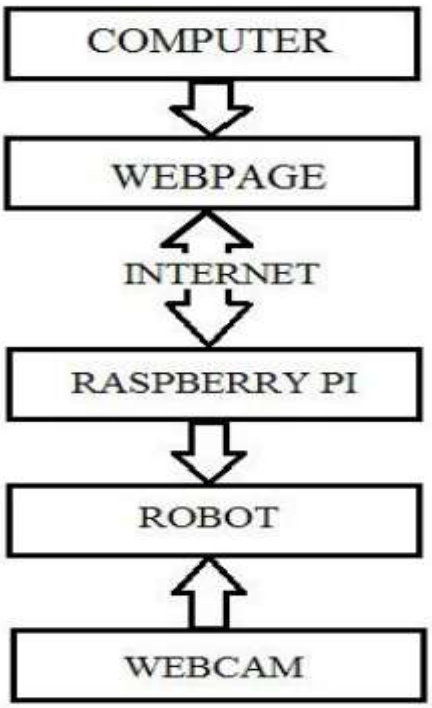


**Fig.12: Flow Chart of the working**

## 4 Software Implementation:

### 4.1 MIT App Inventor:

App Inventor for Android is an open-source web application provided by Google and now maintained by the Massachusetts Institute of Technology. It allows computer program to create software applications for the Android operating system. MIT App Inventor is an innovative beginner's introduction to programming and app creation that transforms the complex language of text-based coding into visual, drag-and-drop building blocks. The simple graphical interface grants even an inexperienced person to create a basic, fully functional app within an hour.

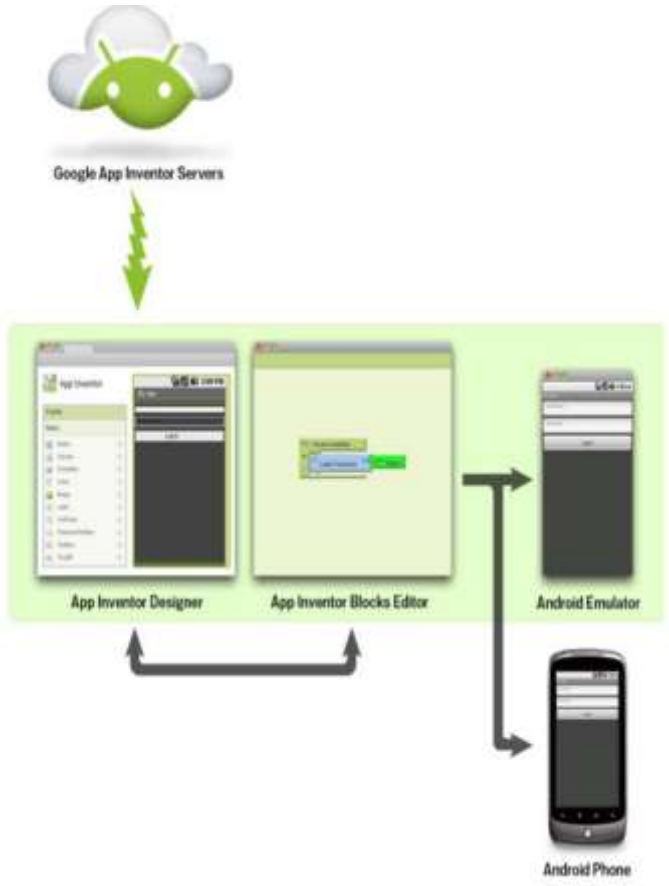


**Fig. -13: Working of MIT APP Inventor**

App Inventor involves three steps :
(i) App inventor designer,
(ii) App Inventor Blocks editor,
(iii) An emulator or Android Phone.

The set-up process for the software is very easy. Also the system requirements are very basic. It is compatible with Windows and Linux Operating systems. Browsers required for the software are Mozilla Firefox 3.6 or higher, Apple Safari 5.0 or higher, Google Chrome 4.0 or higher.

### 4.2 App Inventor Designer

The first phase of an application design passes through App Inventor Designer. The design is accessible through the web page and all the ingredients for the app are available on the left side of the window. An ingredient contains elements like a screen for the app, buttons for tapping, text boxes, images, labels, animations and many more. The extreme right side of the designer allows users to view the screen and components added to the screen. The properties section of the window allows users to modify the properties of components. Adding the components to the screen is drag and drop process. The alignment of the components can be selected through alignment options. Several non-visible components are also added to the screen, which can be explored later in the block's editor. On the left of the screen is a list of the components which can be dragged and dropped onto the Android screen.

**Fig. -14: App inventor Designer(Robot)**

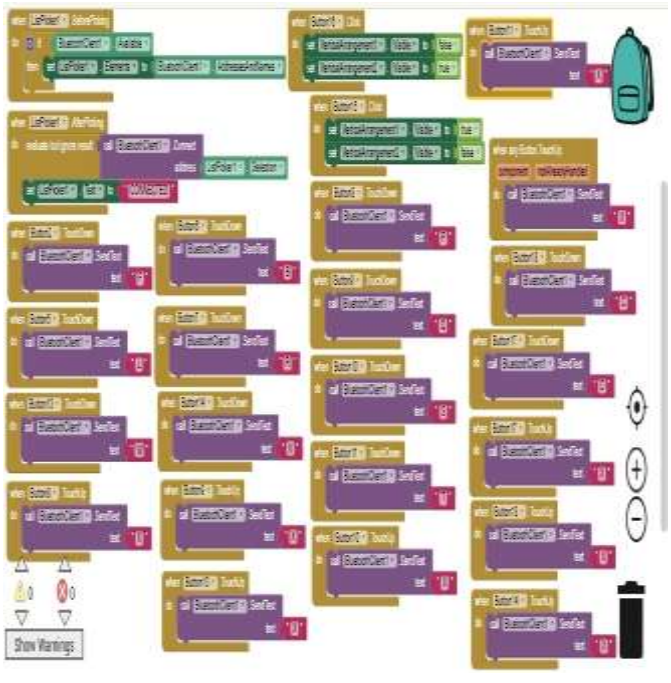


**Fig. -15: Inventor App inventor Block Editor**

### 4.3 An emulator or Android phone:

The last part of the application design is testing the application App Inventor gives the option of testing the application in an emulator which is very similar to the real device but with some limitations. The user can

connect the application to the emulator via the connect option and test how the application functions in real world. Also the user can directly connect the android phone to the computer via USB connecter and test the application. Real time testing is the best option for monitoring the application function.

### 4.4. Android Application:

Roboarm is the name of the android application designed for this project. It was designed through App Inventor. The basic function of the application is to control the robot & to control the movement of the pick and place arm. It has different buttons integrated to it. Each button has different functions.

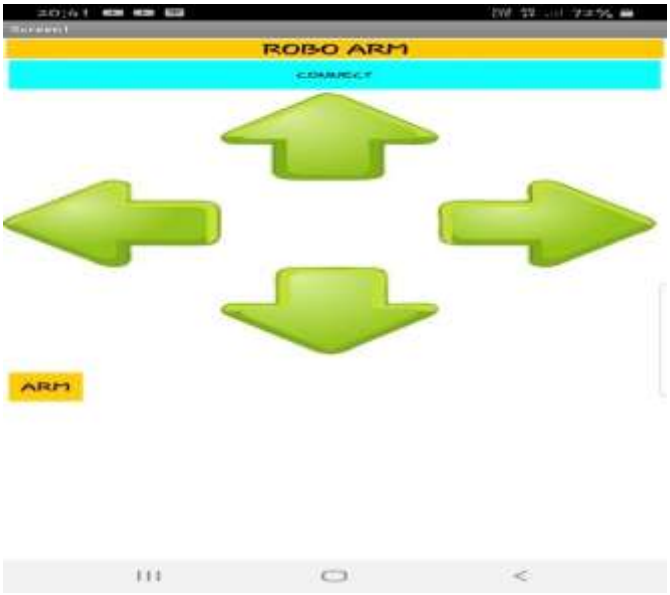


**Fig. -16: Inventor App on mobile (Robot)**

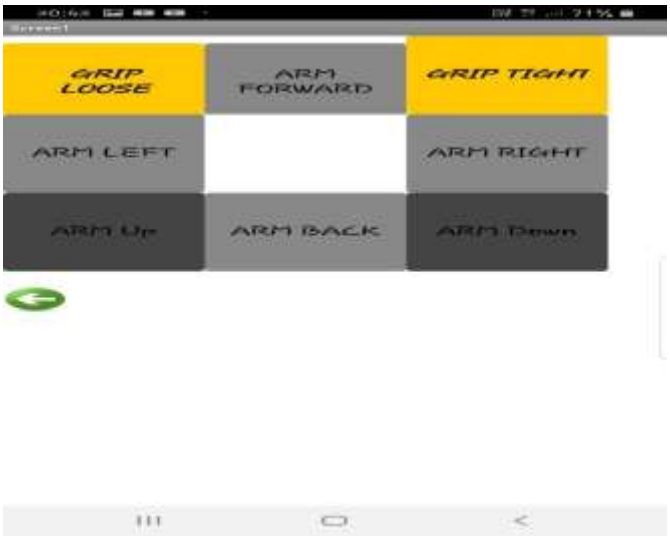


**Fig. -17: Inventor App on mobile (Arm)**

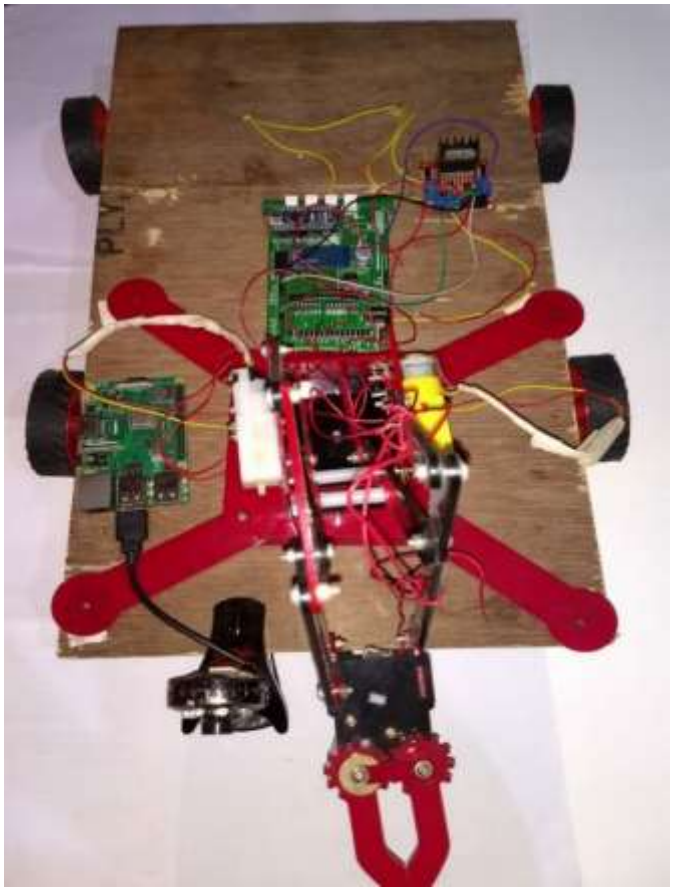

**Fig.18 -: Android phone-controlled robot**

### 7. Applications:

- This project can be used at homes for many purposes like picking up and placing some objects from one to other.
- Since spying on someone is a sensitive task instead of humans this robot can help in spying operations.
- Making video surveillance of any disaster affected area where human beings cannot go.
- This pick and place surveillance robot can be use as a prototype in various industries as well as in military .

### 8. Conclusions:

An operating system of smart phone is android which can develop effective remote control program. This program uses blue-tooth module to communicate with robot. It has proven to allow for meaningful two-way communication between the Android phone and the robot which would allow a non-expert to interact with and adjust the functionality of a system which uses ATmega328P controller intended to make the

application of interactive objects or environments more accessible.

Also, the ultrasonic sensor was studied and the HcSR-04 ultrasonic sensor was selected to sense the obstacle and avoidance them.

In this project we used raspberry pi 3B+ which is working on Raspbian OS. As the communication is done with the help of internet so limitation of range of operation does not arise and thus we can monitor any remote areas. One can easily monitor as well as control the activity of the robotic unit wirelessly with the help of raspberry pi. The surveillance is always has been a quite sensitive task and it includes so many risks. So, it's better to use robot for this job instead of people to reduce human efforts and risks. And if you are able to control the robots with efficiency and accuracy then you can guarantee yourself with good results and success. This system is a good step for secure surveillance using robots.

## 9. References:

[1] Arpit Sharma1, Reetesh Varma2, Saurabh Gupta3 and Sukhdeep Bhatia4, "Android Phone Controlled Robot Using Bluetooth" IJEEE ISSN 0974-2174, Volume 7, Number 5 (2014, pp. 443-448)

[2] "Design and Implementation of Multi Handling Pick and Place Robotic Arm", Mohd Ashiq Kamaril, Yusuff, Reza Ezucin Samin, Babul Salam.

[3] Anusha S, Sandhya G.S "Obstacle detection and their movement for Automobiles", International journal of innovative technology and Research volume-4, Issue-6, October 2016

[4] https://create.arduino.cc/projecthub/albertoz/obstacle-avoiding-robot-fb30e4

[5] www.circuitdigest.com/webcontrolled robotic surveillance car