Pick and Place Arm and Robot Movement Control by using Android

Naga Sudheer Ravela[1], Sainath Somisetty[1], Nagaraju Urlagunta[1], SambaSiva Rao Kopanaty[2]

B.Tech. Student, Department of ECE, Bapatla Engineering College, Bapatla, Andhra Pradesh, India[1]

Associate Professor, Department of ECE, Bapatla Engineering College, Bapatla, Andhra Pradesh, India[2]

Abstract: The paper describes the design and implementation of pick and place arm Robot and its movement Control by realization of the mobile application for the Android operating system which is focused on using wireless Bluetooth technology. Prototype of a mobile robot is necessary for the development of the application. In this paper, Graphical user Interface based touch screen operation in the Android Application acts as a transmitter and sends commands to the receiver to control the movement of the robot either to move forward, backward and left or right. We can also operate the Robotic arm like holding, releasing an object and movement of robot hand upwards and downwards etc. Here also in this application we have a interfaced an android phone as a prototype for wireless camera so that the person controlling it can view operation of the arm and gripper remotely. Four motors are interfaced to the microcontroller where two motors are used for arm and gripper movement of the robot while the other two motors are used for the body movement. The receiver end Bluetooth device is fed to the Arduino to drive DC motors via motor driver IC.

Keywords: Android, Arduino, Pick and Place arm, Robot; RF Jammer.

I. INTRODUCTION

The controlling of the Robot[5] movement and pick and place operation is done wirelessly through Android smart phone using the Bluetooth feature present in it. Here in the project the Android smart phone is used as a remote control for operating the Robot. The controlling device of the whole system is done through ATmega328 Microcontroller present in Arduino UNO Board . Microcontroller acts as an interface to the Motors, Bluetooth and Android mobile which has an Bluetooth present in the mobile. Bluetooth module receives data from Android smart phone and it feds that data as input to the controller. The controller acts accordingly on the DC motors of the Robot. In achieving the task the controller is loaded with a program written using Arduino IDE Software.

In this paper, firstly related work is explained followed by hardware design and software design. Experimental results and conclusion is explained in the end of this paper.

II. RELATED WORK

Robots have their historical past though they came into existences in 1961. A. Che Soh, S.A. Ahmad, A.J. Ishak and K. N. Abdul Latif introduced a paper, "Development of an Adjustable Gripper for Robotic Picking and Placing Operation" in which adjustable gripper for robotic system is designed to identify the shape and size of an object which is needed in many applications especially for picking and placing operation [2]. The main objective is to design a robust gripper that can perform easier and faster picking and placing operation for multiple shapes and sizes objects. This adjustable gripper for robotic system can to improve the picking and placing operation in manufacturing field in producing more outputs without the needs to. P.S.Ramaiah, M.Venkateswara Rao, Raghu and

G.V.Satyanarayana presented a system entitled "A Microcontroller Based Four Fingered Robotic Hand". In this paper, design and development of a Four Fingered Robotic Hand (FFRH) using 8-bit microcontroller, sensors and wireless feedback is explained. The design of the system is based on a simple, flexible and minimal control strategy.

This system has 14 independent commands for all the four fingers open and close, wrist up and down, base clockwise and counters clockwise, Pick and Place and Home position to move the fingers. The tendering system of the double revolute joint mechanism and wireless feedback network provide the hand with the ability to confirm to object topology and therefore providing the advantage of using a simple control algorithm. Finally, the results of the experimental work for pick and place application is enumerated. Author Girish Patel, and Devendra Chauhan introduced a paper entitled "SIFT Based Approach: Object Recognition and Localization for Pick-and-Place System".

In this paper, the system typically employs machine vision to analyze the scene, identify and locate the specified object and provide feedback to the robot arm for subsequent operations. For successful picking, the vision system needs to recognize the position and the orientation of the objects, the Scale Invariant Feature Transform (SIFT) is used for this purpose.

III. HARDWARE IMPLEMENTATION

The hardware implementation of pick and place arm system consists of Arduino Uno, DC motor, Bluetooth, Motor Driver, Android application device and power supply. The block diagram of proposed method is shown in Fig 1.
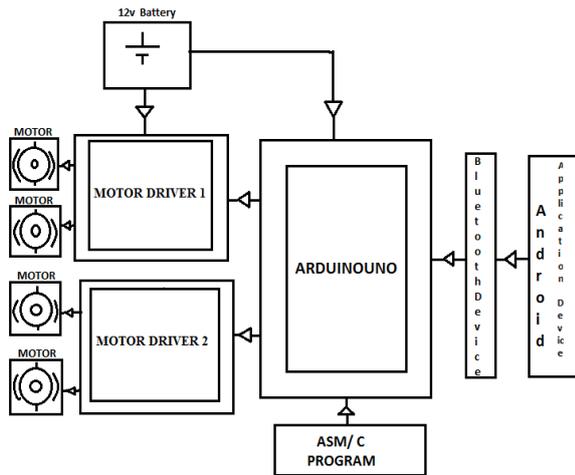
FIG. 1.BLOCK DIAGRAM OF PROPOSED ROBOT

A. .ATMEGA328P

ATMega328[3] is the ATMEL Microcontroller on which Arduino UNO is based. The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughputs approaching 1 MIPS
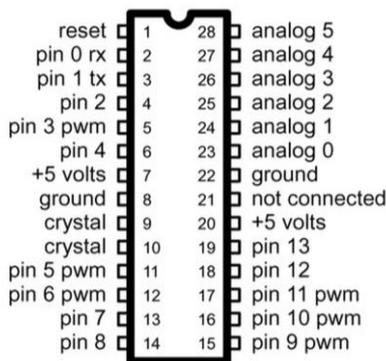

Fig. 2.Pin Diagram of ATMEGA328

B. DC Motor

Custom gripper tooling stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct relationships to these applied input to these applied input pluses. The sequence of the applied pulses is directly related to the direction related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied.

C. RF Jammer

The Bomb Jammer or IED(Improved Explosive Device) Jammer can neutralize / prevent deadly criminal acts such as radio controlled Car Bombs, roadside bombs, ambush by remote IED attacks, assassinations, and remote controlled terrorist events.

A Radio Frequency (RF) Jammer is a device used to disrupt or prevent communication via a broadcasted RF signal.

RF Jammer can be directional i.e., focus energy where the user intends to jam, directing RF Jamming signals on areas of concern.
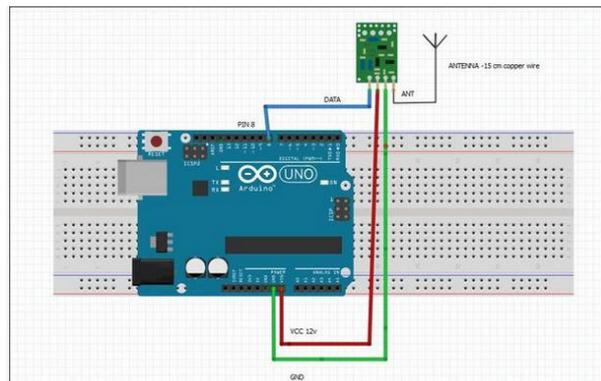

Fig. 3. Circuit diagram of RF jammer

D. Motor Driver

A motor driver can drive two motor simultaneously. L293 D IC is a dual H-bridge motor driver IC. One H-bridge is capable to drive a dc motor in bidirectional. L293D IC is a current enhancing IC as the output from the sensor is not able to drive motors itself so L293D is used for this purpose. L293D is a 16 pin IC having two enables pins which should always be remain high to enable both the H-bridges.

When an enable input is high,the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.
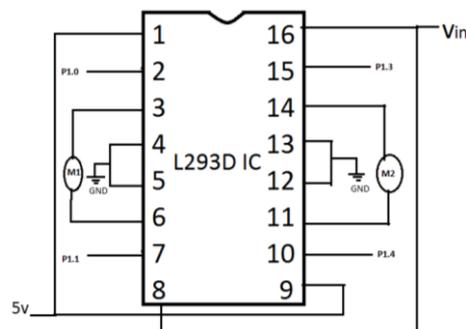

Fig. 4. Circuit diagram of Motor Driver interfacing Arduino

E. Bluetooth Module

Bluetooth[4] is a wireless protocol utilizing short-range communications technology facilitating data transmission

over short distances from fixed and/or mobile devices, creating wireless personal area networks (PANs). The intent behind the development of Bluetooth was the creation of a single digital wireless protocol, capable of connecting multiple devices and overcoming issues arising from synchronization of these devices. Bluetooth uses a very robust radio technology called frequency hopping spread spectrum. It chops up the data being sent and transmits chunks of it on up to 75 different frequencies. In its basic mode, the modulation is Gaussian frequency shift keying (GFSK). It can achieve a gross data rate of 1 Mb/s. Bluetooth provides a way to connect and exchange information between devices such as mobile phones, telephones, laptops, personal computers, printers, GPS receivers, digital cameras, and video game consoles over a secure, globally unlicensed Industrial, Scientific, and Medical (ISM) 2.4 GHz short-range radio frequency bandwidth. The Bluetooth specifications[6] are developed and licensed by the Bluetooth Special Interest Group (SIG). The Bluetooth SIG consists of companies in the areas of telecommunication, computing, networking, and consumer electronics.

F. Android Application

We have designed an Android application[7] [8]using MIT app Inventor 2 and by using this application we can interface both movement of robot, arm and gripper by using inbuilt Bluetooth module in the android.
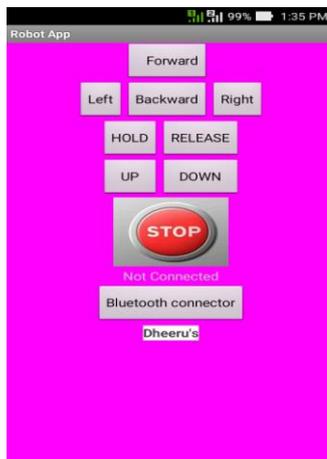

Fig. 5. Android Application

The Bluetooth in the mobile is connected to Bluetooth in the robot. After proper connection is established the commands in the application are sent to the robot through the graphical user interface in the application.

IV.EXPERMENTAL RESULTS

When Arduino in the robot is connected to Bluetooth, the movement of robot can be controlled by sending commands through Android application. We have controlled the gripper movement i.e., If "Hold" is clicked in the application the gripper will be closed. If "Release" is clicked in the application the gripper will be opened. Arm movement is controlled If "UP" is clicked through the application the arm will moved up. If "Down" is clicked through the application the arm will be moved down.

Robot moves forward if "Forward" is clicked in the application, moves Backward if " Backward" is clicked, moves left if "Left" is clicked and moves right "Right" is clicked.
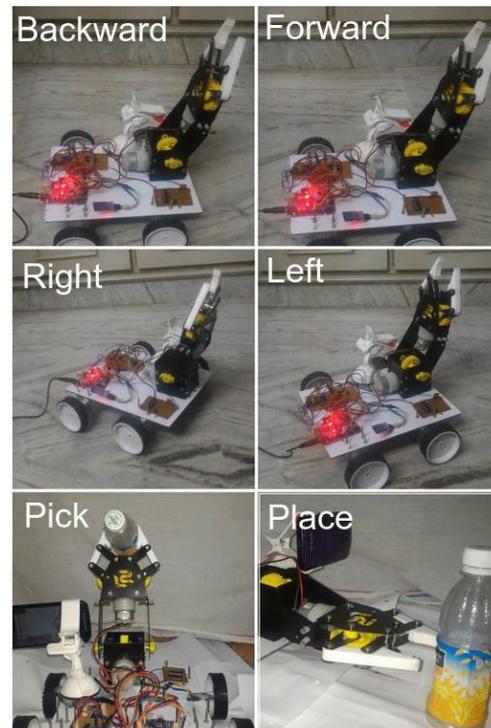

Fig. 6. Experimental Results

V. CONCLUSION

This paper presents working of Robot using Android technology for Pick and place operations Implementation of jammer to block RF communication in war field and have capability to transmit live video. Our project mostly useful for defense operations like bomb diffusion. Even though bomb is detected it is not easy to defuse by staying nearby. Our project is very useful in such that it can defuse the bomb by staying at safe distance. This system can further be developed by enhancing the performance and by adding more features.

REFERENCES

[1]. Jegede Olawale, Awodele Oludele, Ajayi Ayodele, "Development of a Microcontroller Based Robotic Arm", In Proceedings of the 2007 Computer Science and IT Education Conference pg: 549-557.
[2]. "Robotic Arm" - www.NASAexplores.com from Teacher Sheets pg: 1-2
[3]. Datasheet of AT328P Microcontroller
[4]. Datasheet of Bluetooth Module
[5]. "Robot software" from Wikipedia, the free encyclopedia on 04-3-2012 [6] Andren, Gerald B., "Robot Design Handbook, SRI International, Mitsubishi Electric Company 1998.
[6]. Picking up Operation of Thin Objects by Robot Arm with Two-Fingered Parallel Soft Gripper , Takashi Yoshimi, Naoyuki Iwata, Makoto Mizukawa and Yoshinobu Ando Proceedings of the 2012 IEEE International Workshop on Advanced Robotics and its Social Impacts, Technische Universität München, Munich, Germany, May 21 - 23, 2012
[7]. Yeon-Gyunkim et.al. "Smartphone-controlled user calling system for a mobile robot." Robotics (ISR), 2013 44th International Symposium on. IEEE, 2013
[8]. Jegede Olawale, Awodele Oludele, Ajayi Ayodele, "Development of a Microcontroller Based Robotic Arm", In Proceedings of the 2007 Computer Science and IT Education Conference pg: 549-557