ZigBee controlled Pick and Place Robot

Overview

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Introduction

- Pick and Place robot is used for industrial automation.

- It is used to pick an object and place it in the desired location.

- It can be controlled by controlling the movement of its arm for pick and place.

- Wireless communication is used to control the robot.

- ZigBee is the protocol used.

Block Diagram
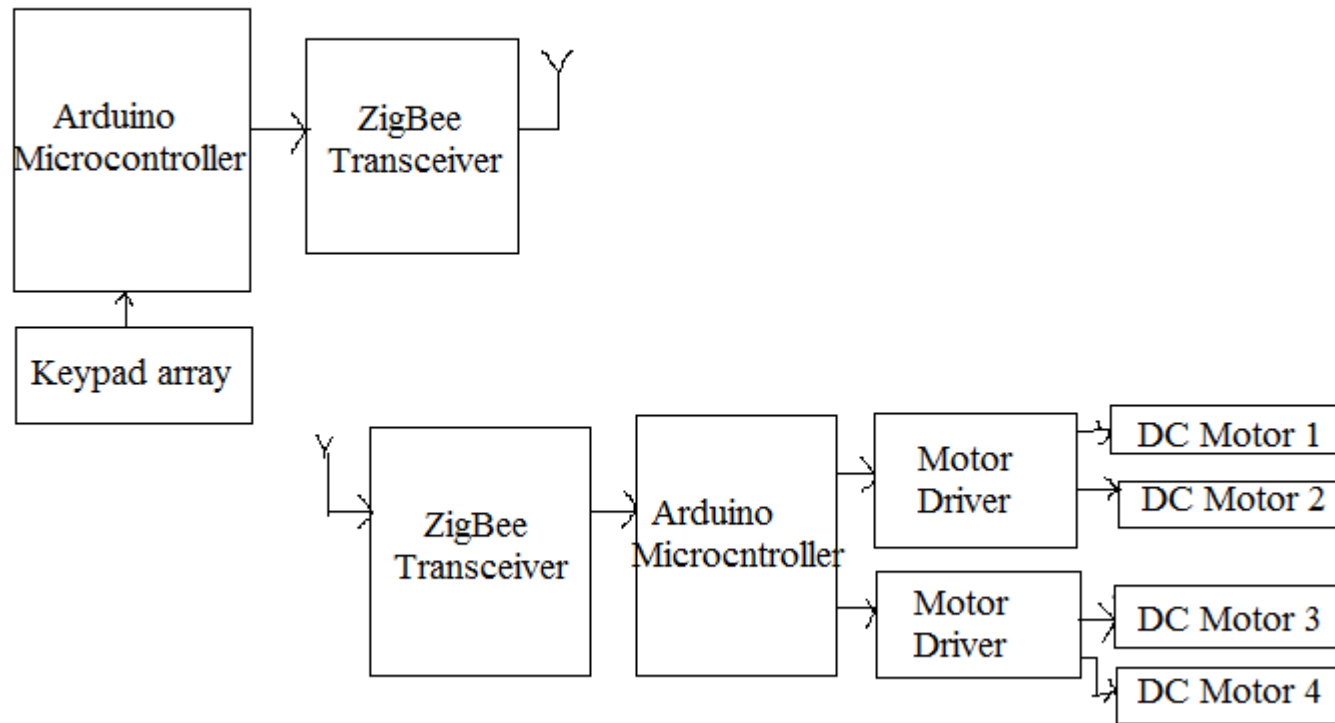
ZigBee Protocol

- Technological Standard Created for Control and Sensor Networks
- Based on the IEEE 802.15.4 Standard
- Operates at ISM 2.4GHz frequency
- Low data rate
- Low power consumption
- Small packet devices

Hardware requirements

- Microcontroller board – Arduino Uno

- ZigBee transceiver – XBee S1

- Motor driver IC

- DC Motor

- Power Supply

Arduino Uno Features

- ATmega328P microcontroller
- Input voltage - 7-12V
- 14 Digital I/O Pins (6 PWM outputs)
- 6 Analog Inputs
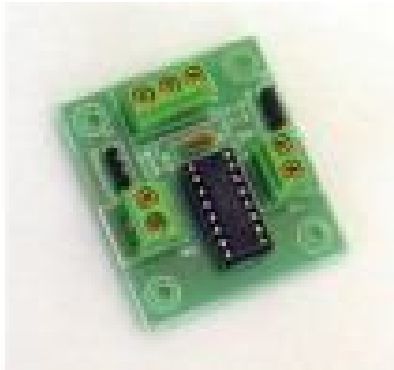- 32k Flash Memory
- 16Mhz Clock Speed

ATmega328P

- 8-bit microcontroller
- 8KB ROM
- 256 bytes RAM
- 3 timers
- 32 I/O pins
- 1 serial port
- 8 interrupt sources

XBee S1

- operate with Zigbee protocol

- operate within the ISM 2.4 GHz frequency band

- used in low cost low power wireless sensor networks
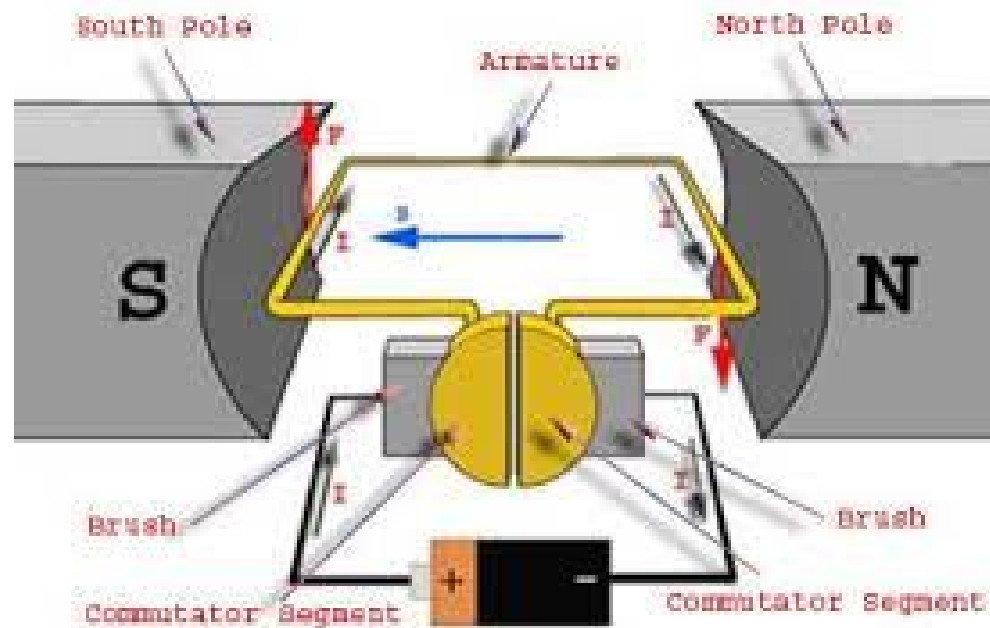
Motor Driver IC

- This Motor Driver Board is designed to Work with L293D IC.

- This can control 2 DC Motors, their direction using control lines and their speed using PWM.
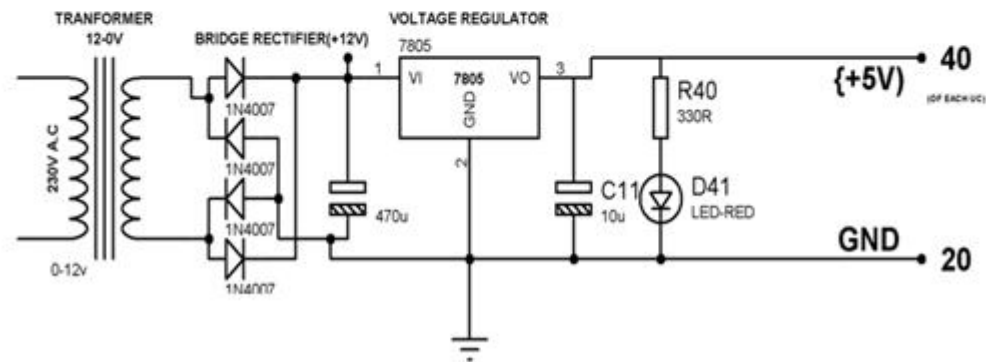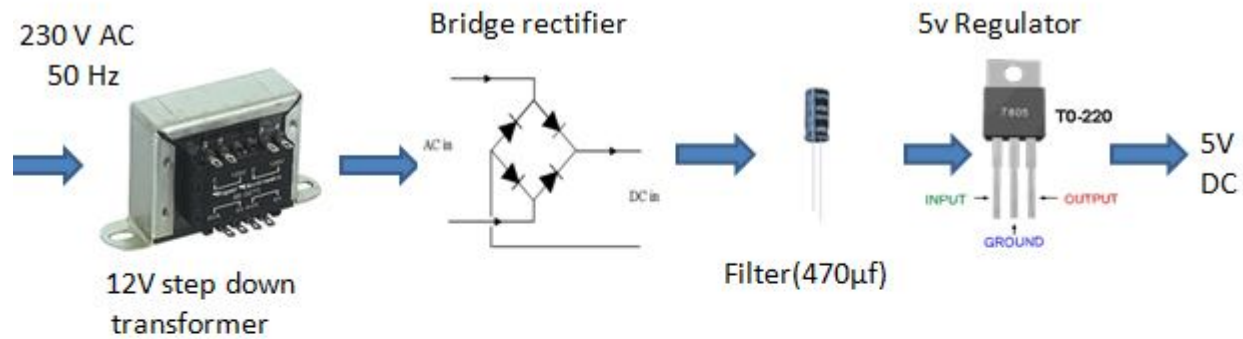
DC Motor

- Converts direct current electrical power into mechanical power

- The very basic construction of a dc motor contains a current carrying armature which is connected to the supply end through commutator segments and brushes are placed within the north south poles of a permanent or an electro-magnet

DC Motor - Construction

Power Supply

230 V AC
50 Hz

12V step down
transformer

Bridge rectifier

AC in

DC in

Filter(470µf)

5v Regulator

7805   TO-220

INPUT →   ← OUTPUT

GROUND

5V
DC

TRANFORMER
12-0V

BRIDGE RECTIFIER(+12V)

VOLTAGE REGULATOR
7805

230V A.C

0-12v

1N4007

1N4007

1N4007

1N4007

470u

1   VI   7805   VO   3

GND

2

C11
10u

R40
330R

D41
LED-RED

40   {+5V}

(OF EACH UC)

GND   20

Software requirements

- Tool

  Arduino IDE

- Programming languages used

  Embedded C/C++

Advantages

- Code compatibility and expandability across different Arduino boards

- Cost is less as Arduino is open source

- The schematic of Arduino is open source. So for future enhancement of the project the board can be extended to add more hardware features

- Low Power consumption

- ZigBee has 255 subchannels. Allows simultaneous connectivity to multiple hardware devices

Future Work

- Pick and Place robotic system can be equipped with RFID and colour sensor to pick different types of products used in industries.

- The robotic system can also be integrated with a programmable logic controller (PLC) to customize the process of industrial automation.

Conclusion

- ZigBee based pick and place robot is designed and developed

- The robot can be used for loading and unloading of products

References

- www.elementzonline.com

- www.engineersgarage.com

- www.engineerprojects.info

- www.wikipedia.org