Arduino Based Pick and Place Robot
Controlling Of Pick and Place Robot Using Wireless Technology

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Abstract— *Needs of people are on rise with every passing day. To complete their needs, industrial sectors have to work for 24*7. No human in this world can work efficiently whole day. And there are various works that cannot be done by humans like lifting heavy objects, reaching to small gaps of machinery, etc. due to this the speed of production of products decreases. In big industries objects need to be placed at particular place and hence it's a to-n-fro motion to complete the procedure .This cannot be achieved by humans, as a time may come when they may get tired or get irritated. But by various innovations and man-build technologies we can achieve accurate and a precise work. One such technology is "ROBOT". Speed, consistency, accuracy, reliability, flexibility, etc. are some of the major features of robot. This work presents the arduino based pick and place robot. The prototype is able to pick and place the objects with the help of electromagnet device. Some of the additional features of this prototype are obstacle sensing and color recognition. With respect to the color recognition, the robot decides to place different objects in their respective places.*

Keywords— *Pick and place, electromagnet, color sensing, obstacle sensing, arduino Uno*

I.   Introduction

A robot is an automatic or virtually perspicacious agent that can carry out tasks robotically or with some supervision, typically with the avail of a remote control. In practice, a robot is customarily an electro-mechanical machine that is guided by denotes of computer and electronic programming. Robots can be autonomous, semi-autonomous or remotely controlled. Robots are utilized within an increasingly wide variety of tasks such as for household appliances like vacuuming floors, mowing lawns, cleaning drains, building cars, in warfare, and in tasks that are too extravagant or too hazardous to be performed through humans such as exploring outer space or at the bottom of the sea. The wireless communication technologies area unit speedily spreading to several new areas, together with the automation and therefore the importance of the utilization of wireless technologies within the information acquisition, building management, watching systems and automation of producing processes can grow. Intelligent mobile robots and cooperative multi agent robotic systems are often terribly economical tools to hurry up search and analysis. The robot arm for this last develop is the revolute sort that about takes after the human arm.

II.   Hardware Description

A.   RF Controller Robot

Radio frequency controlled robotic vehicle is designed using a robotic vehicle that is interfaced with radio frequency remote control. RF transmitter is used by control panel or controlling person and RF receiver is connected to the robotic vehicle that is to be controlled remotely. Radio frequency remote control works over an adequate range (up to 20 meters) by facilitating with proper antenna. The above existing technology is limited distance and requires line of sight. Mobile robot navigation technique using a customized RF reader with two receiving antennas mounted on the robot and a number of standard RF tags attached in the robot's environment to define its path. The paper deals to design for skilled navigation in mobile robotic usually requires solving two problems pertaining to the knowledge of the position of the robot, and to a motion control strategy. When no prior knowledge of the environment is available, the problem becomes even more challenging since the robot has to build a map of its surroundings as it moves. These three tasks ought to be solved in conjunction due to their interdependency. In here, we show that using the RF signal from the RF tags as an analogy feedback signals can be a promising strategy to navigate a mobile robot within an unknown or uncertain indoor environment. The above existing technology is applicable indoor and very short distance between transmitter and receiver.

B. Motor Driver

A motor driver is a little current amplifier; the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor.It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors.

C. Arduino

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Uno board has a resistor pulling 8U2 HWB line to ground, making it easier to put into DFU mode. The board has the following new features:

*   1.0 pin out: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
*   Stronger RESET circuit.
*   Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

D. HT12E

The 2^{12} encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information which consists of N address bits and 12N data bits. Each address/data input can be set to one of the two logic states. The programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The capability to select a TE trigger on the HT12E or a DATA trigger on the HT12A further enhances the application flexibility of the 2^{12} series of encoders. The HT12A additionally provides a 38 kHz carrier for infrared systems.

E. HT12D

The 2 decoders are a series of CMOS LSIs for remote control system applications. They are paired with Holteks 212 series of encoders (refer to the encoder/decoder cross reference table). For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a programmed 2 series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. The 2 series of decoders are capable of decoding information's that consist of N bits of address and 12N bits of data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bits of address information.

E. Electromagnet

Electromagnet is used as a lifting magnet. It is one of the powerfull and compact device for the prototype. It has got smooth and flat surface. It is reliable and ha low consumption rate. It is widely applied in automations i.e assembly line, sorting machine, mechanical arm, experimental facility , etc. it has input voltage of 12 V DC and current rating of 0.25 A .
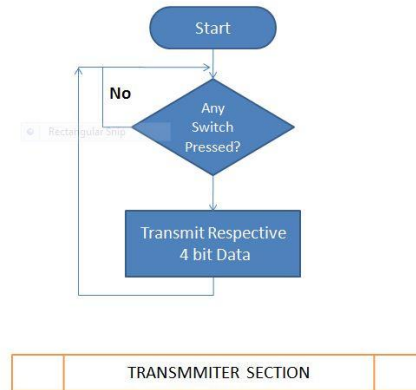
F. Regulator Ic 7805

−   Output current in excess of 1A
−   No External components required
−   Internal short circuit current limiting

- Internal thermal overload protection;
- To put transistor safe-area compensation
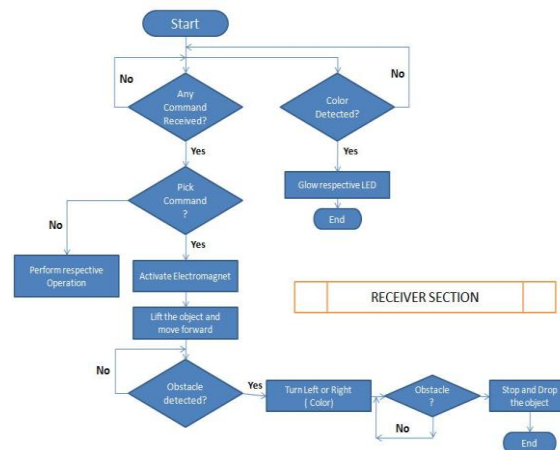- Output voltage offered in 4% tolerance

III. FLOWCHART

1. Transmitter Section

TRANSMMITER SECTION

This is the required flowchart of transmitter region. When any button is pressed then the respective command is encoded and is send through the RF-transmitter module.

2. Receiver Section

RECEIVER SECTION

This is the required flowchart of RF-receiver section. Command from the transmitter section is decoded here. It has got a color and an obstacle sensor. Color sensor is used to detect the color of the object and obstacle sensor is used to detect the obstacle in the path of the robot. And the combination of both is used to place the object in its respective position with the help of arduino programming.
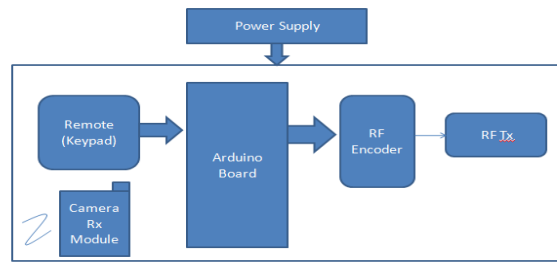
IV. BLOCK DIAGRAM

Block diagram consist of two sections-
- Control section
- Robotic section

Control Section:-

It consist of the remote which is used to control the robot. The remote section consist of push buttons, RF-transmitter module, arduino Uno chipset, LM7805 IC, HT12E IC.
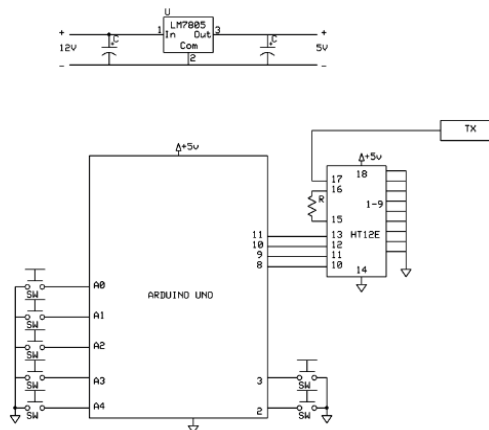
Transmitter Section

Robotic section:-

It consist of RF-receiver module, Arduino Uno chipset, DC motors, driver IC, color sensor, Obstacle sensor, L293D driver IC, HT12D IC, LM7805 IC.
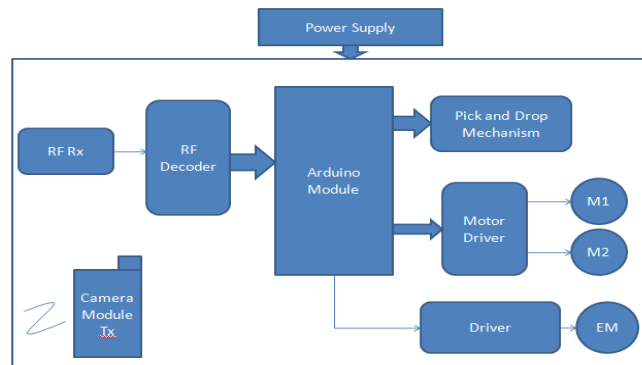

Receiver Section

G. Circuit Diagram

i.

At transmitter side we use 7 push buttons as a input to the arduino. When push button is pressed the respective date is send to the arduino board. Arduino module act as interface between keypad andHT12E i.e. encoder. HT12E will send the command in the suitable form for RF transmitter. RF-transmitter will send the command to the receiver side. For working of ICs we used LM7805 regulator IC for sending 5V.

ii.
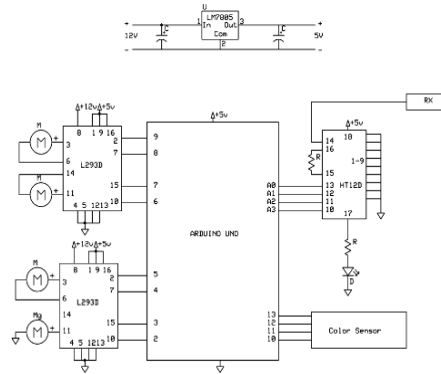
Commands transmitted from transmitter side are first received by RF receiver and then send to the decoder HT12D. HT12D will decode the signal receive from RF-receiver and amplify it then it is given to Arduino board where it is checked and amplify it. Respective action is taken by using drivers. We use L293D driver IC for functioning of motors used for various reasons.
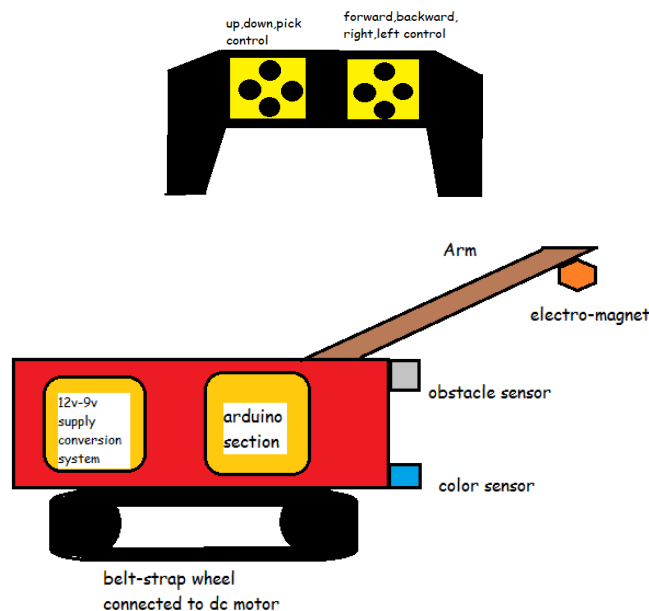
Truth Table-

Sr.No	Command	Binary Code
1.	Forward	1 0 1 0
2.	Backward	0 1 0 1
3.	Right	1 0 0 1
4.	Left	0 1 1 0
5.	Up	1 0 0 0
6.	Down	0 1 0 0
7.	Pick	0 0 1 0

Respective binary codes are assigned for the following operation.

V.PROTOTYPE DESIGN

The plot of the robot is shaon as bellow-

Working:-

As we are using RF module for the pick and place function.

First we place the bot in front of the object with the help of color sensor. Color is detected that is RED or GREEN with the help of pick button the electromagnet is energies and object weighing less than 3 kg gets picked up. With respect to programming feeded in aurdino module the bot carries the

object and with the help of obstacle sensor bot takes prototype or bot takes turn(right or left) with respect the color. The bot will travel until the obstacle comes after detecting the obstacle the bot will inside the container by de energizing the electromagnet.

Working principle:-

Simple pick and place robot can be controlled by controlling the moment of its arm and color sensor, however the most effective way is using motors to provide the required moment to the machine the basic function of pick and place robot is done by its joints. Joints are analogous to human joints and are use to joint the two reconsecutive rigid bodies in the robot. They can be rotary joints or linear joints. To add joint of any link of a robot. We need to know about the degree of freedom and degree of movement or that body part. Pick and place consists of two rigid bodies on a moving base connected

together with rotary joint. A rotary joint is which provides in 180 degree around any one of the axis.

On a whole pick and place robot work as follows:

1. The wheels underneath the base help to move the robot to the desired location.
2. The rigid body supporting the end effectors bends or straightens up to reach the position where the object is placed.
3 .A color sensor is placed at the end effectors which decides to pick up a particular color and place it to its desired location.
4. The end effectors pick up the object with the help of strong

Electromagnet which can carry up to 3 kg load.

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