Arduino Based Pick and Place Robot with Robotic Arm for Industrial Use

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Abstract

This paper presents an Arduino-based pick and place robotic system for industrial use, featuring a microcontroller (Arduino Mega 2560) and a robotic arm. The system aims to automate various tasks and eliminate human error. Pick and place robots have found applications in industries such as bottle filling, packaging, bomb disposal, etc. Our project utilizes Robo Arduino to implement the pick and place mechanism, controlled by RF signals. The robotic arm, supported by a chassis with four Omni wheels, offers two degrees of freedom. Additional features include line following, wall detection, obstacle avoidance, and sensor integration. The key components include Arduino Mega 2560 as the microcontroller, 6 DOF metal mechanical arm, 4WD smart chassis kit, L298N H-Bridge dual motor driver, MG996R servo motor, PCA9685 servo driver, LM2596 DC-DC step-down power module, 11.1V 1100mAh 3S 30C lithium-ion battery, infrared wireless control kit, and jumper wires for component connections. We believe that our project will have a significant impact on industries in this era of technological revolution.

Keywords: Pick and Place Robot, Robotic arm, Atmega2560, Infrared Wireless Device.

Introduction

Our project is specifically designed for the industrial sector, aiming to enhance production rates by implementing robotic pick-and-place automation. Pick and place robots have become a common sight in modern manufacturing environments, as they excel in performing simple and repetitive tasks. These robots offer several advantages to manufacturers, as they can work with high precision and at a lower cost compared to human labor. While humans possess greater flexibility in switching tasks, robots are specialized for specific work assignments. However, the field of robotics is still in its early stages, and as robots evolve, they will become more versatile and capable of handling a variety of tasks. Building an effective individual robot is challenging, requiring a combination of intelligence, mobility, adaptability, navigation, and purpose. Currently, robots have gained significant importance in society, but there is still more progress to be made before individual robots become as impactful as personal computers.

Working Of Pick and Place Robot

The block diagram of the proposed system is shown in Figure1.It consists of an Atmega2560Micro controller, four DC Motors with driver IC, four Servo Motors with driver IC, IR(Infrared Wireless) remote control device and power supply. The pick and place robotic arm consist of a robotic arm placed on a

moving car. The car can move along any type of direction. It uses four DC motors for the operation and four tire is attached to the car, for the smooth and reliable operation. The pick and place robot uses four DC motors and four servo motors for the operation of the system, four for the operation of moving car and four for the pick and place operation. The pick and place arm consists of an arm assembly with a jaw, which can move in up, down, left, right direction. There are four servo motors are for the arm assembly, two for the up and down motion, one for the left and right and the other for jaw opening and closing. The maximum upward and downward motion is limited by the servo motor angle(180 degrees). For the controlling of motors, motor drivers IC and Atmega2560 microcontroller is used. The input signal or controlling signal is given from an IR remote control device, which is interfaced with the microcontroller by an IR module. L298N H bridge dual motor driver has 3 sets of arrangements where one set has input 1, input 2, input 3 and input 4, other set has output 1, output 2 and other set has output 3 and output 4.

Figure 1: Circuit Diagram of pick and place robotic
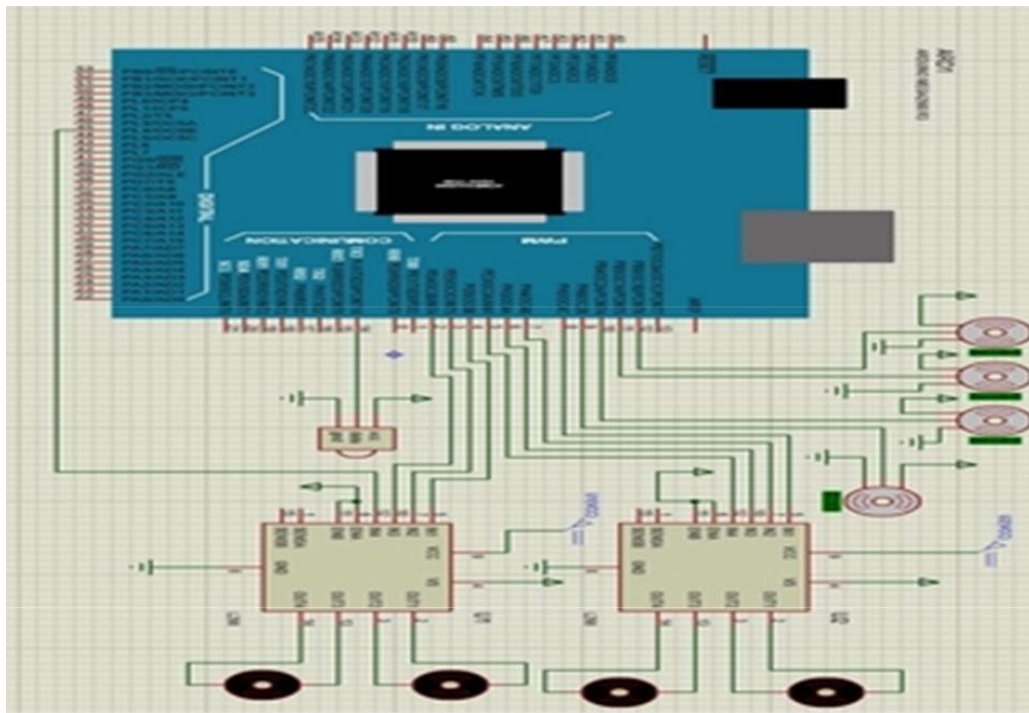
The program sends commands to the motor driver IC, based on the robot's movement requirements as described in the L298N subject. The IR remote control is utilized to send commands for left, right, forward, and backward movement, while the center button is used to stop the robot using its built-in IR (Infrared Wireless) system.

Figure 2: Flow Chart of Pick and Place Robot
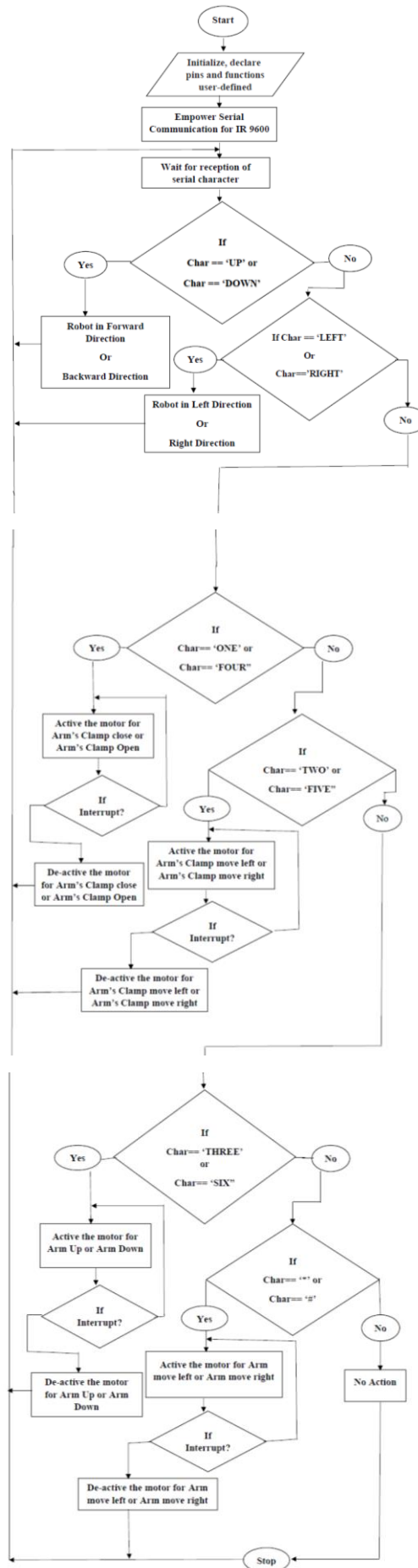
11.1 V battery powers the circuit in series with a motor driver which is connected with a DC-to-DC step down converter module that nearly provides 5v through regulator IC LM2596 for the microcontroller which has standard connections like crystal, reset arrangement indication LED, etc. An IR remote control device is powered from the microcontroller, is interfaced to the microcontroller that after being paired with this IR remote control device for taking appropriate action as per the press button operation made on the remote.

The work uses servo motor driver IC working on similar technology for the arm up and down / open and close/right and left duly interfaced to the microcontroller with duly pulled up resistors. The program is so written that for remote control operation from the remote results in command being sent through the IR module, on 1=close, 4=open, 3=up, 6=down, * =right, # =left number upon microcontroller developing appropriate rotation of the motor.

Plan And Programming

The most components utilized in this work are the Microcontroller (Atmega2560), DC motors , Servo motors and IR remote control device with IR module .

Atmega2560 microcontroller

Arduino Mega 2560 is utilized to as a microcontroller for the entire undertaking. The Arduino Mega 2560 is a microcontroller board dependent on the ATmega2560. It has 54 computerized input/yield pins (of which 15 can be utilized as PWM yields), 16 simple sources of info, 4 UARTs (equipment sequential ports), a 16 MHz precious stone oscillator, a USB association, a power jack, an ICSP header, and a reset catch.

DC motors

DC motors with worked in outfitting Course of action is utilized in this work. It is on the grounds that it is simple to control. To utilize DC motors, we require motor driver IC L298N H-Bridge. To drive the motor fair, relate the one wire to one of the driver terminals and the other-to-other terminal.

Servo Motors

The servo motor is most regularly utilized for tall advancement contraptions within the present-day application like computerization development. It is a free electrical contraption, that rotate parcels of a machine with tall efficiency and unimaginable precision. The abdicate shaft of this motor can be moved to a particular point. To utilize servo motors , we require servo driver IC PCA9685.

IR (Infrared Wireless) remote control device with IR module

The Infrared IR Remote Inaccessible Control Module Unit for Arduino comprises of ultra-meager infrared inaccessible control and 38KHz infrared collector module. This littler than anticipated lean infrared farther control with 20 capacity keys. Its transmit isolates up to 8 meters. Culminate for managing with an combination of adapt interior. IR beneficiary module can get a standard 38KHz change inaccessible control flag. We will decipher the inaccessible control flag through Arduino programming. We will structure a grouping of inaccessible control robots and cleverly works.

Arduino Programming

Arduino is an open-source PC gear and programming organization, work and user community that plans and makes units for building computerized contraptions and interactive objects that can distinguish and control the physical world. Arduino loads up may be purchased preassembled, or as do-it-without anybody else's offer assistance packs; at the same time, the hardware structure information is available for the people who might need to store up an Arduino without any planning. The devices are computerized and simple I / O sticks that can act as interfaces for different development boards and other circuits. The sheets illustrate successive interfaces for stacking programs from machines, which list USB on several versions. The Arduino Arrangement includes an improved improvement environment (IDE) in the programming of thematic controls for performing tasks, together with support for C and C++ dialects.

Figure 3: Pick and Place Robot
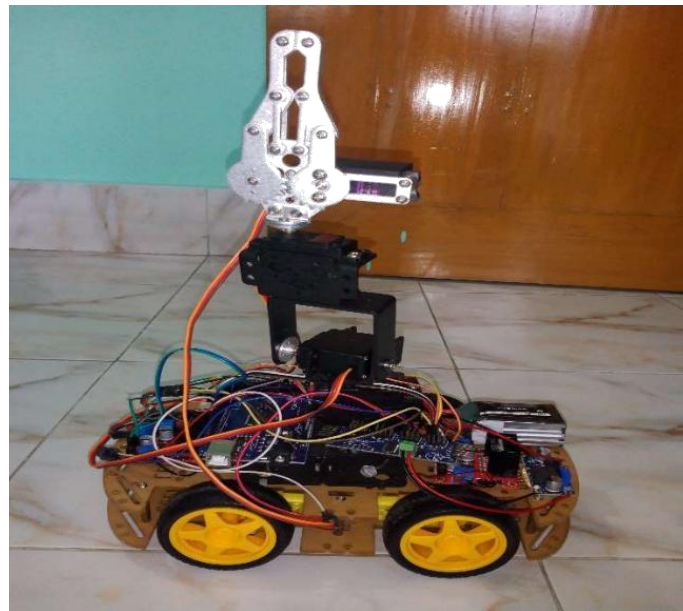
Conclusion

The point of this work is the advancement of remote control of a pick and Place robot utilizing IR remote control .It is Controlled by an IR gadget and remote which is interconnected with one another. The miniaturized scale controller utilized is an Atmega2560 and Arduino programming is utilized to program it. Number of joints on the arm decides the sort of item it can deal with. The principle highlight of this is the delicate getting arm. We realize that when taking care of the touchy things like bomb it will be dealt with easily. Exorbitant weight will cause blast. The most extreme weight that can be conveyed by this model is relies upon the limit of DC motors utilized. Useful and fascinating can be made by interfacing the Pick and Place Robot with dangerous identifiers, metal locators, remote cameras, night vision cameras...Etc. for finding the bombs and appropriate visual help.

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