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Design and Development of Pick and Place Arm Robot

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ABSTRACT: The present condition in industry is that they are using the crane system to carry the parcels from one place to another place. Sometimes the lifting of big weights may cause the breakage of lifting materials and will cause damage to the parcels too. The Proposed system work is designed to develop a pick and place robotics vehicle with a soft catching gripper that is used to transport the materials from one place to another place in the industry and also designed to avoid extra pressure on the suspected object (like Bombs) for safety reasons. The robotic vehicle is micro controlled remote operation. At the transmitting end using remote controller PLC controls the moment of robot to move in forward and backward, left and right motions. At the receiving end four motors are interfaced to the micro controller where two of them are used for arm and gripper movement of the robot while the other two are for the body movement of the vehicle. The main advantage of this robot is its soft catching arm that is designed to avoid extra pressure on the suspected object for safety reasons. The remote controller controls the arm moment by programmable circuit by using DC motors.

KEYWORDS: Bluetooth Module; ARM7 (LPC2148); Motor Drivers; Soft Gripper

I. INTRODUCTION

A robot is a mechanical device that performs automated tasks and movements, according to either pre-defined program or a set of general guidelines and direct human supervision. These tasks either replace or enhance human work, such as in manufacturing, contraction or manipulation of heavy or hazardous material. Robot is an integral part in automating the flexible manufacturing system that one greatly in demand these days. Robots are now more than a machine, as robots have become the solution of the future as cost labor wages and customers demand. Even though the cost of acquiring robotic system is quite expensive but as today's rapid development and a very high demand in quality with ISO standards, human are no longer capable of such demands. Research and development of future robots is moving at a very rapid pace due to the constantly improving and upgrading of the quality standards of products. In this project we are going to perform three main actions the robot is going to pick operation to place operation and to filled the quantity of liquid according to user.

II. LITERATURE SURVEY

A robot may appear like a human being or an animal or a simple electro-mechanical device. A robot may act under the direct control of a human (e.g., the robotic arm of the space shuttle) or autonomously under the control of a programmed computer. Robots may be used to perform tasks that are too dangerous or difficult for humans to implement directly (e.g., nuclear waste cleanup) or may be used to automate repetitive tasks that can be performed more cheaply by a robot than by the employment of a human (e.g., automobile production) or may be used to automate

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mindless repetitive tasks that should be performed with more precision by a robot than by a human (material handling, material transfer applications, machine loading and unloading, processing operations, assembly and inspection). The last two decades have witnessed a significant advance in the field of robots application. Many more applications are expected to appear in space exploration, battlefield and in various activities of daily life in the coming years.

III. PROPOSED METHODOLOGY AND DISCUSSION

III A. Block Diagram

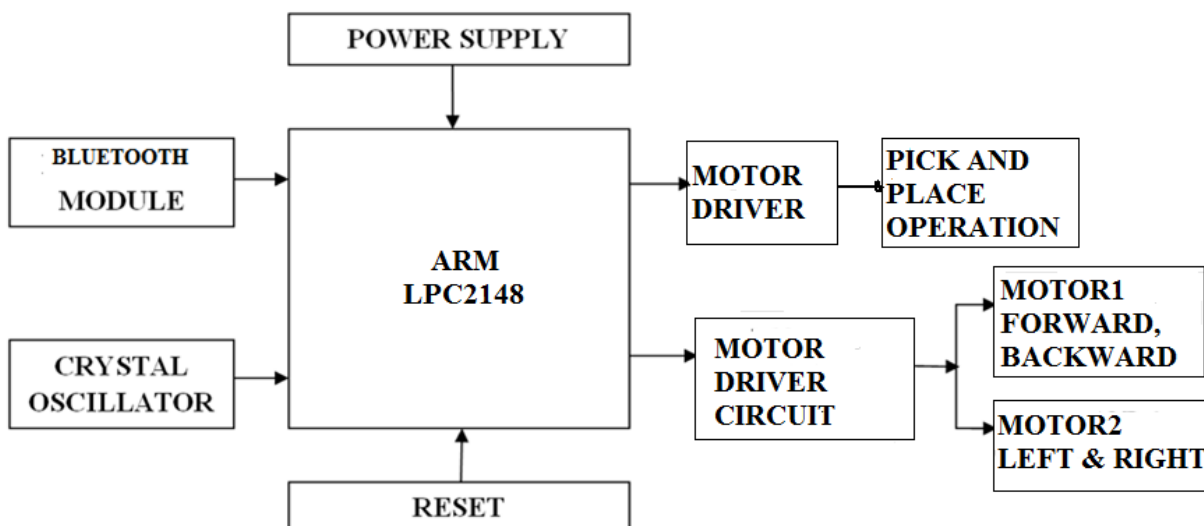


Fig. 3.1. Block Diagram of the Project

The proposed system is implemented using the ARM7 (LPC2148) microcontroller. It has two input/ output ports and these are termed as P0 & P1. The operating voltage of mega microcontroller is 5v. The Bluetooth module and four motors are interfaced with the microcontroller. Motor driver L293D receive 12V from power supply and drive the motors. Each DC motor is connected to the IN1, IN2 and IN3, IN4 of the driver IC. Movement of the robotic vehicle and arm is based on the direction of rotation of motors. By giving digital high or low values to the motor pins we can rotate it to any direction.

III. B Algorithm for programming robot

1. As the character is declared in Bluetooth module, it transmits character.
2. As the receiver module, it receives we designed the code for each instruction
3. It enables the pin of ARM7 (LPC2148).
4. Assign delay of 300ms.
5. It follows the instruction given to robot.

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The flowchart in fig 2.2 gives the description of robot control programming. The system is operated at 12V. As the system started it will receive the signal from user that is from GUI programming through Bluetooth module. The characters are assigned in above algorithm. There are condition blocks for F B L R S, T W D C.

F= Forward

B = Reverse

R= Right

L= Left

S=Stop

D= Arm up

T= Arm down

W= Wide(Gripper open)

C= Close(Gripper close)

The F is assigned to robot moves forward if user gives character F then robot moves in forward direction otherwise it follows next iteration.

III C. Flowchart of the System

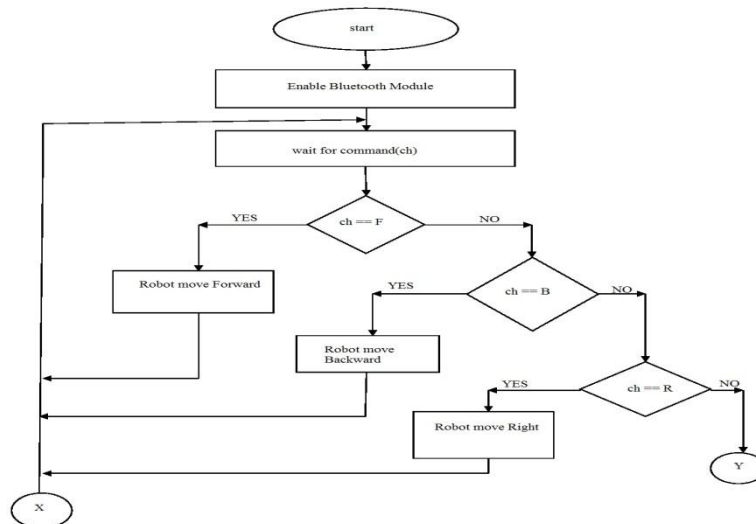


Fig. 3.2(a) Flowchart for robot control programming system

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When the condition $ch==B$ is executed the character B is assigned to robot move reverse, otherwise it goes toward next loop. In that loop if $ch==R$ is given then robot moves right side. The no action is denoted by Y. From the figure 2.2(b), X is conditional block, if the character $ch==T$ is received, the robot arm up. When $ch==D$ is received then arm of robot down.

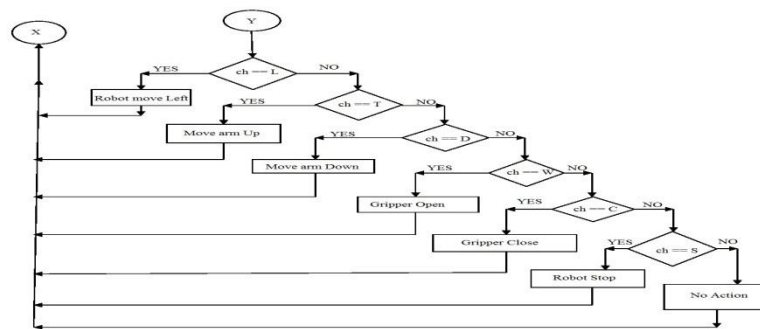


Fig. 3.2(b) Flowchart for robot control programming system

The program $ch == W$ is received, the Gripper is ON. When $ch == C$ is received, the Gripper is Close. When $ch==S$ is received, if yes then the robot Stops otherwise No action.

IV. EXPERIMENTAL RESULTS

Pick and place robot in industrial application consists of base, arm, gripper. The robot is a moving vehicle it can pick the materials and placed in desired location as per the user choice.

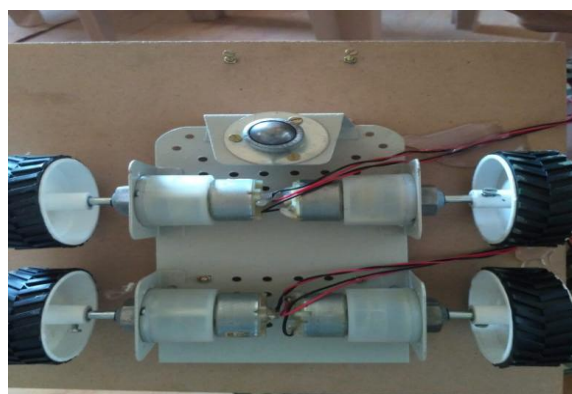


Fig. 4.1 Bottom View of the Robot

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User will give the input through Bluetooth module. The gripper is connected to robotic arm that pick the objects according to programming of ARM7 and placed in desired location. Once the work completed ready to do another work as per the commands given by the user.

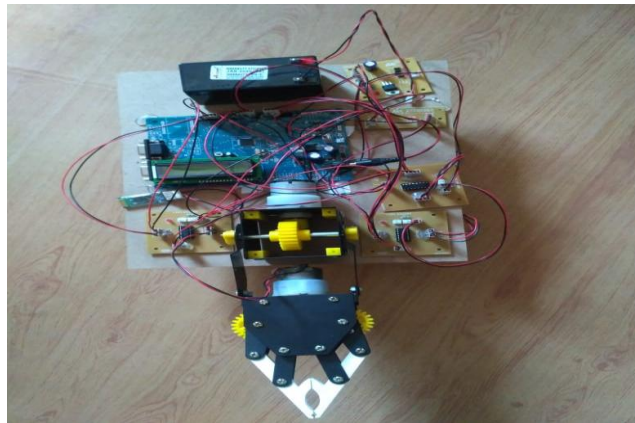


Fig. 4.2 Top view of the Robot

Fig 4.2 shows top view of the robot. In this dc motor and battery of 12V is placed. The entire components placed on wooden chassis. The dc motors from each side are connected in series and opposite side are connected in parallel. On the top of robot system the ARM7 (LPC2148)circuit and motor controlled driver is assembled. The system provides so many functions to the user. There are many key which operate motion of robot that is left, right, forward, stop and reverse. For pick and place the things we are Gripper ON & OFF and arm Up & arm Down Buttons are used. The relay is on for respective amount of time.

V. CONCLUSION

The design and development of Pick and Place gesture recognition robot is implemented. By using Bluetooth module the motion of robot is controlled. Entire system is controlled by ARM. Motor driver circuit and stepper motor plays important role in entire system. A prototype was confirmed functional working of robot system. This system would make it easier for human beings to pick and place the risk of handling suspicious objects, which could be hazardous in its present environment and workplace. Complex and complicated duties can be achieved faster and more accurately with this design. A robotic arm is implemented using ARM (LPC2148) in pick and place objects more safely without incurring much damage. The robotic arm used here contains a soft catching gripper, which safely handles the object. In the future, time and man power are major constraints for the completion of a task. By the use of this product, the industrial activities and hazardous operations can be done easily and safely in a short span of time

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