

Pick and Place Inspecting rover with LDR Automation

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Abstract: The design and construction of a pick and place remote controlled robotic vehicle is reducing the human effort to work comfortably and safely. This rover makes use of robotic arm as well as robotic vehicle which helps not only to enter an area involving high risk but also to pick whatever object it wants to. Robotic arms have become popular in the world of robotics. The essential part of the rover is robotic arm and the rover itself which is programmed using microcontroller Arduino Nano capable of driving basically 7 synchronous DC motors. In this anticipation an automated arm with four degrees of opportunity is composed and can pick the items with a particular weight and place them in a sought area. To encourage the lifting of the items, Synchronous DC motors are utilized. This abstract explains the method of interfacing the robotic arm DC motors with the programmed Arduino NANO based micro controller which are used to control rover operations. A sample rover which can grab, and release small objects is built to demonstrate the method explained. In this project, the main application is control of multiple operations and movement of rover through the use of Arduino. The initial phase of the project focuses on passing the input signals to the micro controller so as to identify the number of different workstations available in the industry which are specified by the user. Automated pick and place a framework comprised of a preparing station, testing station, and sorting station. As well as the project also focuses on security, while it can also be used in the defense sector.

Keywords: Robotic arm, Gripper, Gear motor, Night Vision Camera, Arduino NANO, LDR.

I. INTRODUCTION

The design and construction of a pick and place remote controlled robotic vehicle is reducing the human effort to work comfortably and safely. It may be used without the necessary external assistance or human from a second party due to the concept of the design. This project will be important in medical industries, automotive industries, manufacturing industries etc., where it can be used. Rover can work in environments, so hazardous that an unprotected human would quickly die. The main objective of this project is to build a rover that will be embedded with a robotic arm and can be controlled using a radio frequency (RF) remote. The rover can move to places with the help of remote and do the pick and place action of objects that are dangerous and harmful. The main aim of this project is to design an autonomous rover with a complete system that allows this rover to wander about its environment and interact with certain objects that it's encounter. This rover is very beneficial in areas where there is high risk for humans to enter. This rover makes use of robotic arm as well as robotic vehicle which helps not only to enter an area involving high risk but also to pick whatever object it wants to. The rover also includes a night vision camera which will not only allow viewing of whatever will be recorded in daytime but also during night. The whole system is controlled via RF remote. The rover sends commands to the receiving circuit mounted on the vehicle through push buttons. The receiving circuit involves a microcontroller and a receiver which receives commands sent by the transmitting circuit. First the system is set to control the movement of the vehicle. In order to set the system in a move that operates the arm. Thus, this rover makes use of a camera, robotic arm and robotic vehicle to enter a high risk involving area and to pick, move and drop an object as well as record the place wherever the rover. 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. 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. Robots are 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 labor wages cost and customer's 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. Robotic manipulators resembling the human arm is known as robotic arms. They are constructed by a structure consisting of structurally robust links coupled by either rotational joints or translating joints. A robotic arm is thus a type of mechanically coupled or joined arm, run by programmable commands, with similar functions to a human arm. It may be the sum total of the mechanism links or may be part of a more complex sized robot..

II. MATERIAL SELECTION

The most suitable material to fabricate the structure of the arm has to be light and strong. Otherwise, the servo motor will not be able to pull up the arm and to perform the desired turning degree. Among the materials that can be considered to fabricate the structure are aluminum, Perspex, plastic polymer and carbon fiber. In choosing the fabrication materials, the aspect of availability of the materials, the overall cost and the flexibility to be shaped, should also be taken into consideration. Thus, among the four materials considered, aluminum is the most ideal material to be chosen as fabrication material. For the fabrication of the rover the material that should be used should be tough as well as light weight, for such conditions the material that is used is mild steel and sheet metal for the covering.

III. DESIGN CONSIDERATION

The following were put into consideration in the design process:

- 1) DC motors are chosen instead of hydraulic and pneumatic actuators because of the little power requirement and its light weight which is suitable for this design.
- 2) Materials used for the fabrication were locally sourced from available materials.
- 3) The materials which will be used for the design will be light in weight so as to reduce the weight concentration on the base and the should
- 4) The Arduino Nano has most of the same features (with the exception of a smaller USB port and no DC power jack), but it is better suited for projects using breadboards.
- 5) The torque is fully balanced by the inertia of the electric motors

IV. NEEDS

- 1) Safety in Military operations.
- 2) Inspection in darker place.
- 3) Pick and place objects with a particular weight and size.
- 4) Moving on rough terrain.
- 5) To develop automated robotic handling system in manufacturing plant for multi-tasking application
- 6) To synchronize multi-tasking functions using Arduino NANO.
- 7) To validate the functioning of automated robotic system (qualitative and quantitative analysis)
- 8) To monitor and control the overall functioning of the rover during the operation by connecting it with the camera to the rover.

V. METHODOLOGY

This project is designed with, Hardware Requirements:

- 1) Arduino NANO

- 2) DC geared motors.
- 3) Motor Driver.
- 4) Battery(12V).
- 5) NRF Sensor
- 6) LDR.
- 7) Power Supply.
- 8) Night Vision Camera.

VI. COMPONENT USED

Arduino NANO:

The Arduino Nano is a small, breadboard-friendly board based on the ATmega328P microcontroller. It has similar functionality to the Arduino Uno, but with a smaller form factor and a lower cost. The Nano is compatible with the Arduino IDE and can be programmed using C++ code. It has 14 digital input/output pins, 8 analog input pins, and a micro-USB connector for power and data communication. It also includes a 16 MHz crystal oscillator and a mini-USB connector for programming. One of the key features of the Nano is its small size, which makes it easy to use in projects where space is limited. It can be powered by a USB connection, or by an external power source connected to the Vin pin. The Nano also has a built-in voltage regulator, allowing it to be powered by a range of voltages between 7 and 12 volts.



Fig `1

NRF SENSOR:

Having two or more Arduinos able to communicate with each other wireless opens up a world of possibilities, such as remotely monitoring sensor data, controlling robots, home automation, and so on. And when it comes to a low-cost but reliable 2-way RF solution, nothing beats Nordic Semiconductor's nRF24L01+ transceiver module. The nRF24L01+ module is available for less than two dollars online, making it one of the most affordable data communication options available. The module's operating voltage ranges from 1.9 to 3.9V. Please keep in mind that powering the module with 5V will most likely damage your nRF24L01+ module. Despite the fact that the module operates at 1.9V to 3.6V, the logic pins are 5-volt tolerant, so you do not need a logic level translator. The output power of the module can be programmed to be 0 dBm, -6 dBm, -12 dBm, or -18 dBm. At 0 dBm, the module consumes only 12 mA during transmission, which is less than the consumption of a single LED.

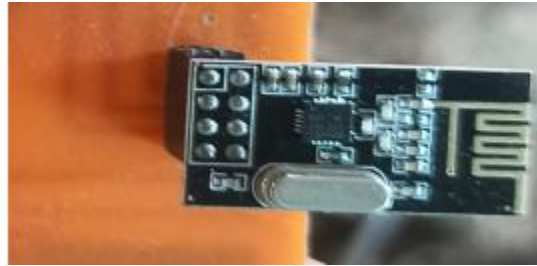


Fig:2

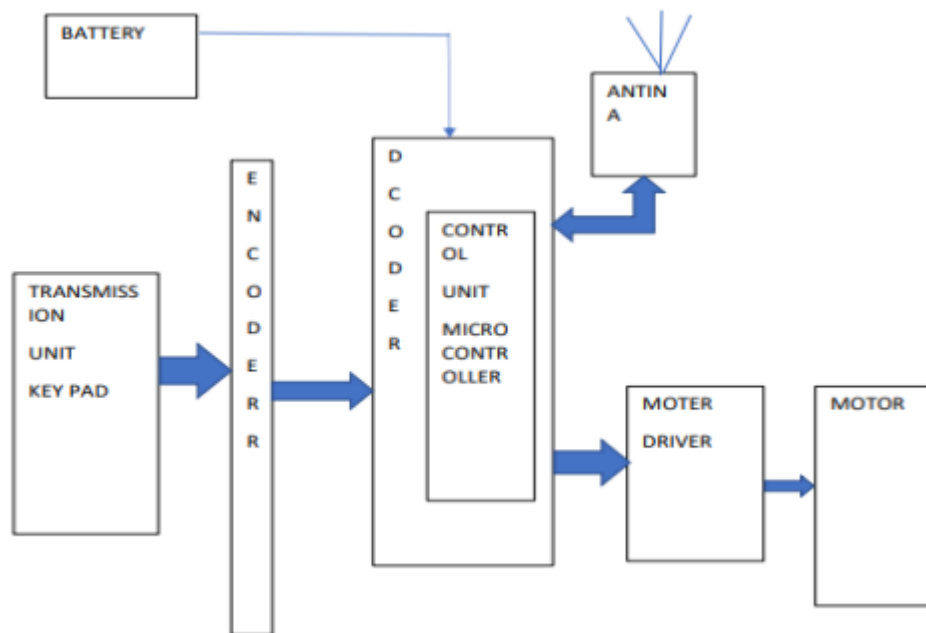
VII. BLOCK DIAGRAM

Fig:3

VIII. RESULT

This work can successfully accomplish the defined functionality. This prototype which can rotate, magnetize an object, lower and raise its arm, by being controlled by Arduino NANO is built successfully. The Arduino Nano development board is soldered, and it uses the required procedure for the correct operation of the controller. The Arduino NANO board has been interfaced to the DC motors through motor drive IC and the anthropomorphic like structure can be controlled from the buttons on the remote controller. There are four buttons on the right side of the remote control to control the robotic arm. And other six buttons on the right side of the remote are used to control the rover to move.

IX. ADVANTAGES AND APPLICATIONS

Advantages :

- 1) Accuracy and Pick and Place Robots: Robots are outfitted with wide reaches and slim arms, steady repeatability and precise tooling-all of which allows them to be extremely accurate. This high precision capability makes them a good match for pick and place applications.
- 2) Flexible Pick and Place: One of the main advantages of robotics is flexibility. Pick and place robots are easily programmable. They are able to accommodate multiple changes in product shape and type. In addition, robots provide a high level of movement flexibility.

3) Increase Consistency with Pick and Place: Pick and place robot systems have the ability to improve product quality and cycle time. Robotic movements are regulated, so the results are always the same. Quality is improved because of this regularity. Furthermore, this consistency allows the processes to take place.

4) Robots are Space-Efficient: Because they are designed with compact bases, pick and place robots are ideal if you are looking to conserve floor space. Robots can be programmed to move within strict work envelope limits-leading to even better use of space.

5) Robots Maximize Safety: Pick and place applications can be physically demanding. They are labor-intensive, repetitive, and monotonous. Depending on the weight and size of a part, moving it from one place to another can be very demanding work. Pick and place robots are unaffected by the stresses of the application. They are able to work without taking breaks or making mistakes.

6) Save with Pick and Place Robots: Incorporating pick and place robots can effectively cut your costs. Robotic precision and reliability allow for less wasted material and more efficient use of time. Plus, the initial investment in robots is quickly recouped-making pick and place robots an extremely cost-effective solution.

Applications:

- 1) Material Handling
- 2) Industrial Robotic Application
- 3) Welding
- 4) Spraying
- 5) Trimming and Sealing
- 6) Coal Mining
- 7) Military Operations

X. CONCLUSION

From our work, we deduced that in comparison to humans, our prototype can be much stronger and are therefore with the help of arm it can lift objects. Moreover, this prototype improves quality control by inspecting objects for defects or abnormalities. Additionally, the machine's flexibility allows it to perform different tasks depending on the requirements. They can be very precise in their movements, reduce labor costs, improve working conditions, reduce material wastage This is why they're very important in industries and other sectors. Robots or rovers can work effectively in conditions where there is a bit of difficulty for a human to work.

XI.IMAGES OF PROJECT

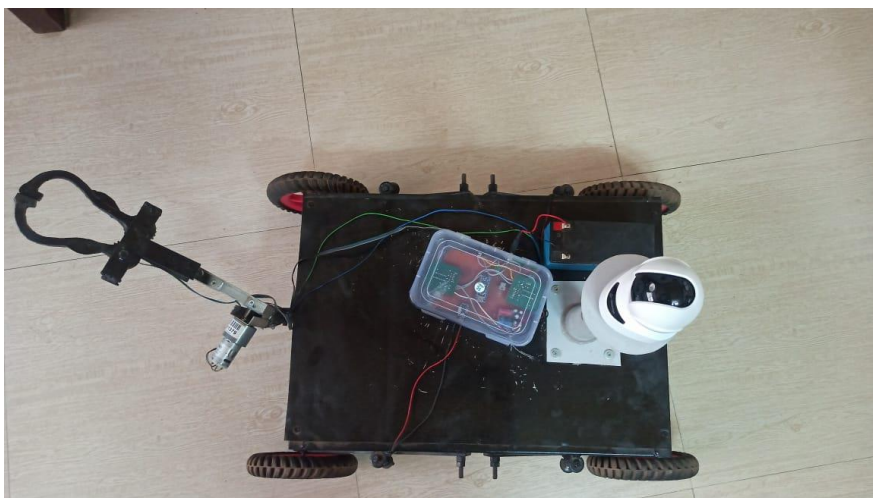


Fig: 4



Fig: 5

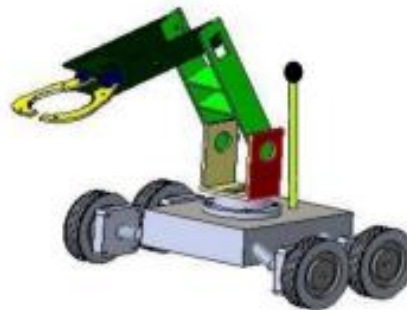


Fig: 6

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