

“Pole Climbing Robot For Connecting Distribution Lines”

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Abstract

This project is to create electrical pole climbing robot which can be used to reduce risk of electrician to connect the distribution lines for supplying purposes. Pole climbing robot, nowadays, is very common and interesting idea, which mainly works by connecting the distribution lines according to the directions given to it. In this modern era robots are being developed for various purposes to accomplish many tasks which seem to be complex and life endangering for humans. Benefits of using robots have been immense in terms of risk-free, speed and efficiency of doing required tasks compared to that of humans. The main objective of this work is to save human lives. Considering on that issue, a pole climbing robot has been designed. However, further modifications of this work might be able to perform the wiring and repairing tasks instead of an electrician. The developed robot works on the principle of linear motor, which is partially autonomous. With the installation of this project, risk of human injuries and death can be minimized while working in the distribution lines which is the main consideration of this project.

Keywords—component; formatting; style; styling; insert (key words)

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1. Introduction

In this project it is proposed to implement Pole Climbing Robot. Here we are developing a Wi-Fi based pole climbing robot that will overcome the traditional method in which electricians are present on the electric poles thereby risking their lives. Electricity is the most desired energy source in this modern civilization which made people's life a lot simpler and easier. For supplying electricity from the power station transformers and poles are required. To give a new connection or may be to connect any loosen wire, workers climb the pole keeping their life at risk. The aim of this work is to make such a climbing robot that can climb the electrical pole which might be used to perform those worker's tasks. For many years working labors have been losing their lives or sustaining injuries performing risky jobs. Deaths and injuries from monotonous jobs in dangerous environments have been very common in developing countries. It has been observed that electrical injuries caused significant numbers of death in every year. The main causes for the numerous numbers of such accidents are due to lack of safety precautions, lack of proper training to the workers and dangerous working environments. Pole climbing robot, nowadays, is a very common and interesting idea to the people. Investigations over a pole climbing robot have been going on for the last 20 years due to different purposes such as inspections, cleaning and maintenance of high rises, nuclear experiment, pipes and so on Pole climbing robot is a multifunctional robot which can serve several purposes according to our demand. The main objective of pole climbing robot is to reduce the risk of the people who work in the distribution line [1-2].

2. LITERATURE SURVEY

ZaharBakhtiarkhalid[1] his paper proposes a pole climbing robot that has an ability to climb pipes. The novelty of the design is that it uses no motors to climb on the pole. Till now many robots have been fabricated with the ability to climb pipes but most of them solely depend on DC motors. The use of DC motor induces the risk of loosening the grip of the robot in case of power failure that may lead to disastrous situations if robot is working on high altitudes. This could be easily avoidable by the use of electro-pneumatics and by using self-locking circuits. We used two pairs of pneumatic cylinders as linear actuators for gripping the pole i.e. one pair for one claw.

T. Mahmoud[2] presents the application prospect of the climbing rod robot in the high-altitude Pole Climbing Robot for Connecting Distribution Lines field has been widely concerned. In recent years, it has gradually become one of the research hotspots in the field of robots at home and abroad. However, there are often some obstacles on some poles. The robot has two bionic mechanical arms, each of which is composed of a crawling guiding mechanism, a self-locking driving mechanism, a rotating disengagement mechanism, a transmission mechanism, and the like, and can adapt to guide rods of different diameters within a certain range. The working principle and characteristics of various components of the robot are expounded, and the design results and implementation methods are given.

Salataren R[3] his paper explains having the windmill main components at the top of its high tower made its maintenance a very risky job for workers, and with an increase of use of wind turbines, the risk of accidents occurring is proportionally increasing too. For this, engineers started working on climbing robots and mechanisms to replace risking human lives. This research works on adding to this research topic, by proposing a full study of a new mechanism enhanced with calculations and modeling for it to be applicable and reliable. The proposed robot mechanism can circumference the tower of the wind mill and climb upwards through means of rubber chains.

M. Prieto[4] explains the design of climbing tower robot is mainly consisted of two parts, including structure and control system. The mechanical structure is composed of two underactuated gripper and a linear moving body. Based on the tower environment, the structure of gripper is designed. Further analyzing the stress of climbing gripper and optimizing the structure, the climbing gripper based on under actuated gripper is developed. The control system includes a control box and the robot body, the two communicate via WIFI. Finally the testing is doing in the condition of tower. The experimental results show that the design principle of the prototype is reasonable, and the structure of gripper is feasible and the control system is simple and easy to operate.

3. METHODOLOGY

IN THIS WORK, METHODOLOGY IS SEPARATED FROM DIFFERENT SECTIONS, WHICH ARE MECHANICAL DESIGN, EMBEDDED SYSTEM AND TESTING.

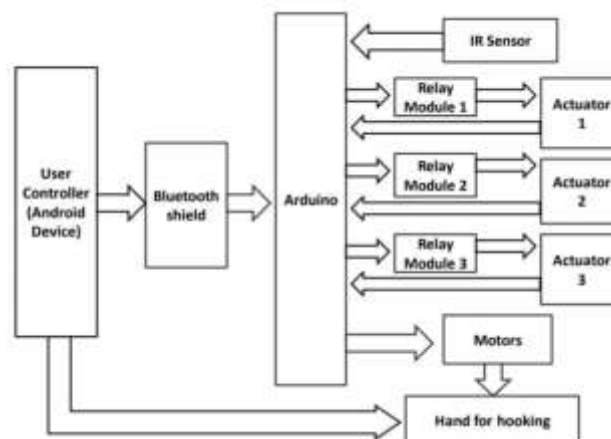
MECHANICAL DESIGN

IN THIS MECHANICAL DESIGN, IT INCLUDES THE CONCEPTUAL DESIGN OF THE ROBOT, FABRICATION AND FINALLY ASSEMBLY PROCESS.

ROBOT MODEL

FIGURE. 1 IS GOING TO SHOW THE PART OF ROBOT CREATED. THIS ROBOT STRUCTURE IS MADE OF ALUMINUM. THIS ROBOT CONSIST OF THREE DC MOTOR THAT HAVE LESS RPM BUT HIGHER TORQUE, WHICH IS ENOUGH FOR GRIPPING THE POLES OR PIPES, FIGURE. 2 IS SHOWING THE ACTUAL DESIGN AND FIGURE 3. IS SHOWING THE TESTING OF THE ROBOT.

4. BLOCK DIAGRAM OF SYSTEM



Block Diagram actually how the control circuit has been implemented for EPDRO to serve its purpose. Bluetooth controller is used to give the robot instructions when to start climbing or when to break. As soon as

the controller gives a signal to the bluetooth shield, connected to the arduino, gives signal to the arduino for running the climbing program. Actuators work according to the arduino command where actuators give a measurement of pressure as a feedback to the arduino[5]. Depending on that feedback arduino continues working. Actuators are actually connected through relays. Relays give signals to the actuator when to extend or contract. An IR sensor is connected to the robot. This sensor detects the black mark drawn before on the pole by the user in order to determine at what distance the robot needs to stop climbing.

5. HARDWARE AND SOFTWARE REQUIREMENT

The Hardware Components are:

- 1 Bluetooth Shield with arduino
- 2 Power
- 3 Relay module
- 4 IR Sensor
- 5 Actuator
- 6 Gripper
- 7 FSR
- 8 Arms for Climbing
- 9 External Hand and Hooking

SOFTWARE SPECIFICATION

Arduino IDE

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment. The program or code written in the Arduino IDE is often called as sketching. We need to connect the Genuino and Arduino board with the IDE to upload the sketch written in the Arduino IDE software. The sketch is saved with the extension '.ino.' Pole Climbing Robot for Connecting Distribution Lines.

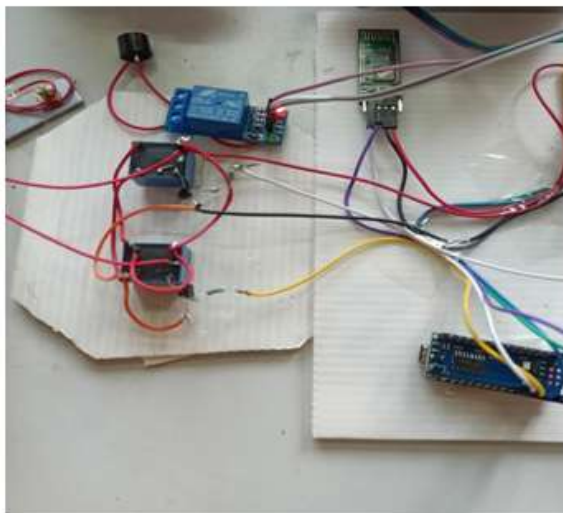
6. RESULTS AND PLAN OF ACTION

EXPECTED RESULTS

The expected outcomes of Pole Climbing Robot For Connecting Distribution Lines are :

- The robot will be able to climb up and down sensing the pressure and connect the distribution lines according to the instruction given to the robot through bluetooth.
- This project reduces the risk of the people, and it also create awareness about the precautionary methods





7. CONCLUSION

This robot is very helpful to the society in terms of reducing the number and risk of accidents that usually happen to electricians while connecting wires. Robot will climb on the pole and do the work of phase and fault detection with the help of arms connected to the DC motors. Also it is to be controlled by Mobile using blue tooth Long control range due to usage of blue tooth devices: Can be controlled up to distance of 400m in open area.

8. REFERENCES

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