

ROPE CLIMBING BOT

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ABSTRACT

Many bots have been designed in recent years but this is interesting as it is a rope climbing bot. The main objective of the bot is to climb the rope in vertical direction for surveillance purposes and for delivering help in disaster situations, inspection of cable suspension in bridges and in mines, power plant chimneys, and cooling towers. This consists of two DC motors and a micro controller. The wheels fixed with DC motors are used for the vertical motion of the bot. The bot is weightless, low cost, easy to design and it can be controlled with a Smartphone via Bluetooth.

Keywords: rope climbing bot, DC motor, control via smart phone.

INTRODUCTION

Mobile bot is the movement based on two separately driven wheels placed on opposite side of the bot. This bot is capable of moving in terrains, cliffs etc. This bot can move both in horizontal and vertical directions. It can move in all inclination angles. This was designed to reduce the risk involved in mountain trekking, high tower based tasks etc. This bot has grippers so that it can hold itself on a rope without falling. It is highly secure way for motion in ropes, cables etc. Wheel based rope climbing bots are simple in design and have been successfully field tested.

Methodology

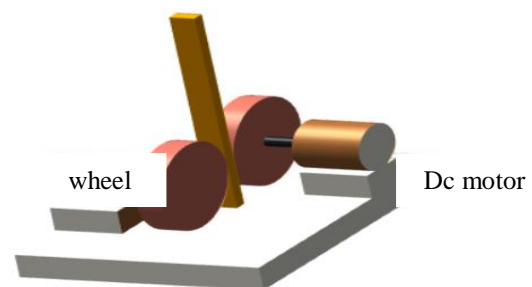
The Methodology used here is of 2 parts, Mechanical design and Embedded system.

Mechanical design

The design of the bot which is based on box- shaped compartment. Two dc motors are screwed on the acrylic sheet where the motors are facing each other. The two dc motors are fixed with wheels. The motion of the bot is based on the rotation of the wheels. If both wheels rotates in the anti-clockwise direction it moves vertically upward and if both wheels rotates in clockwise direction the bot moves vertically downward. Dc motors are only used for movements of the bot. The rope fixed between two dc motor wheels which are facing opposite to each other. To prevent the motor from slipping the clampers are used.

Motors

The movement of the bot depends on the 2 Dc motors used here. DC motors have stall torque and has a great pulling power over the ropes. It also overcome the frictions caused due to movement in ropes. The grippers used here is rotary, so at any angle of inclination it can clamp the bot and avoid slippage from ropes. The Dc motors have high rpm which reduces the time.



S.no	Rotation of Wheel 1	Rotation of Wheel 2	Direction
1	Anti-clock wise	Anti-clock wise	Upward
2	Clock wise	Clock wise	Downward

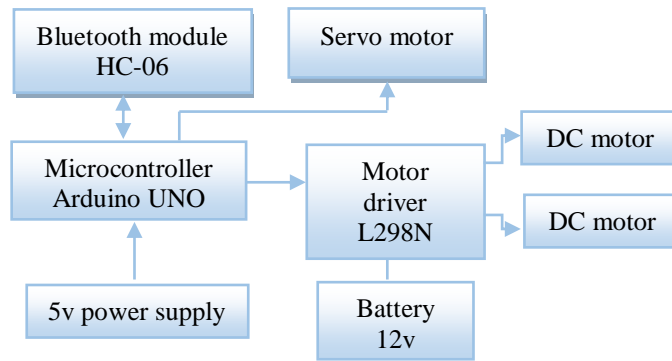
Embedded system

The Bot function not only depends on the mechanical design, it also requires an embedded system to initialize and control the bot. The software developed will be able to control and perform some initial functions in the bot.

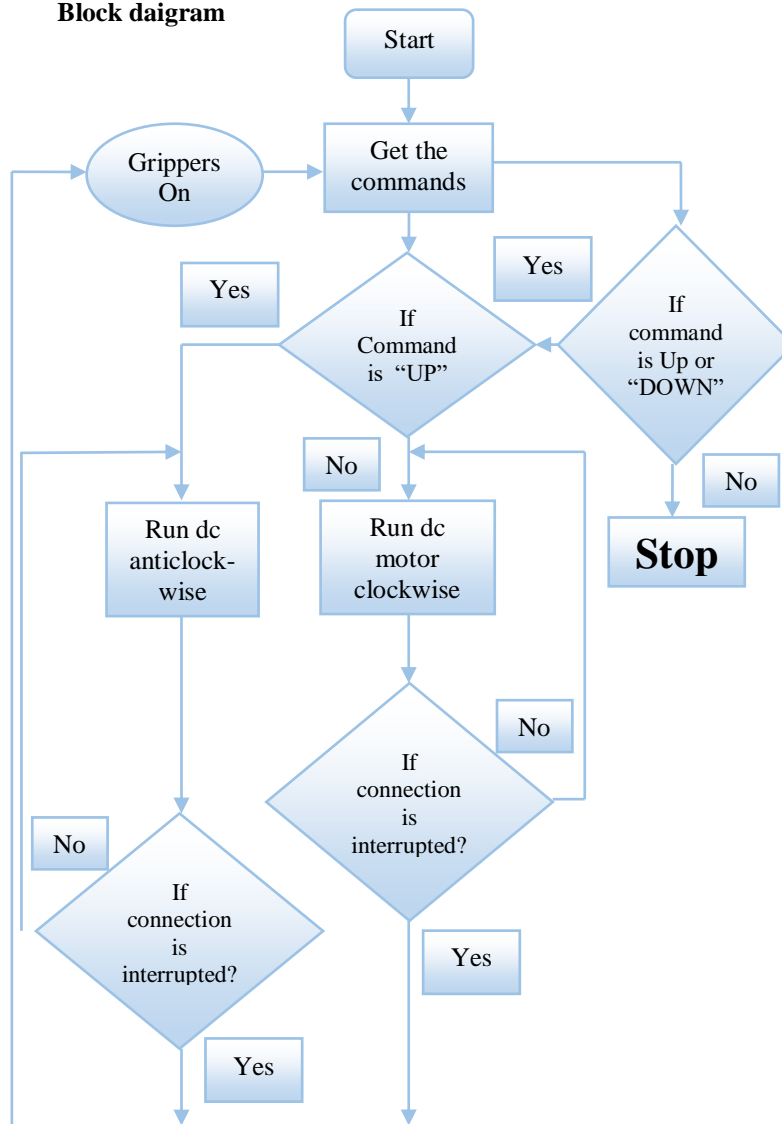
System Architecture

The architecture consist of design microcontroller, motor driver and 12v lithium battery. The microcontroller such as Arduino UNO, which is small in size, low cost and a single Arduino can control both the motors simultaneously. The L298N H-bridge module motor driver which has four inputs and four outputs pins .A Lithium-Polymer Rechargeable battery is used to provide a 12V dc power supply to the Dc motors and a regulated 5V voltage supply is used to provide power supply to the UNO board. The bot is completely controlled using smart phone application via Bluetooth module .The module used is HC-06,

which can transmit commands to Arduino for the controlled by the Arduino. movement of the bot. The servo motor is also



Block daigram



Software Description

A C code was developed to control the forward and reverse movement of the bot in vertical direction. The source code can be separated into three tasks. The first task is to move in upward direction and the second task is downward direction. Finally the third is to stop the bot whenever it is necessary. The command such as up, back and stop is sent to the Arduino via the smart-phone application. The Arduino and the smart-phones are connected via Bluetooth module.

Result And Conclusion

This wheel based bot is simple to construct and it can be mainly used for surveillance purpose. It is cost efficient and compact, since it is weightless it can travel in rope easily. The motor control is completely in the hands of the user. The motor can run at the speed of 255 rpm.

Future Works

The system developed is easy to build and has many application in real world. As an application the wiper mechanism can be mounted on this bot which can be used to clean the chimney, to inspect amp post in the airport and telephone towers. In future, further modification can be made to increase the stability of the device and system.

Literature Survey

Piston mechanism based rope climbing robot

This robot is made of dc motor and two servo motors for the climbing operations. This rope climbing robot can be applied to transport goods in a factory but the robot can move only in vertical direction.

Design and analysis of string based climbing robot

The rope climbing robot uses wheels powered up by the dc motors for climbing the vertical rope and it can transverse horizontal rope as well. The springs attached to the wheel is used for passive clinging of the robot to the rope. The main advantage of this robot is spring loaded assembly at self locking system.

Designing a modular rope climbing bot

This bot is made up of two dc motors facing opposite to each other. The main purpose of the bot is to move in vertical direction.

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