

ASCEND CLIMBING POLE ROBOT

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**This report is submitted in partial fulfillment of the requirements for the
award of Bachelor of Electronic Engineering (Industrial Electronics) With
Honours**

Faculty of Electronic and Computer Engineering

Universiti Teknikal Malaysia Melaka

APRIL 2010



UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : ASCEND CLIMBING POLE ROBOT

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For my lovely mum and dad, thanks for your sacrifice towards my success.

For my supervisor, Mr. Ridza Azri Bin Ramlee, thanks for all your supports.

To my friends who's helped me lots, I'll appreciate very much

ACKNOWLEDGEMENT

First and foremost, I would like to give Thanks to ALLAH SWT, for helping me. I would like to express my appreciation to my supervisor, Mr. Ridza Azri Bin Ramlee for his support and guidance throughout this whole project.

To my beloved parents who always give me support and never tired of convincing me in order to achieve my determination and finishing my study without any delay. They always support me and understand me while giving me opportunity in completing all my projects.

Besides that, I am also thankful to all the lecturers that also giving me some ideas and knowledge that can be used to accomplish the PSM project. Not forgotten to my friends who had also helped me in giving their thought, pro and contra of each of the research and result that I had obtained.

Once again for the last time, I would like to express my gratitude to those people that already mentioned above as well as the BENE's student Faculty of Electronic and Computer Engineering who provide many suggestions, information, and criticism and sustain in this report.

ABSTRAK

Projek ini adalah untuk mencipta sebuah robot pemanjat tiang yang akan membantu manusia dalam melakukan kerja-kerja sukar dan berbahaya yang melibatkan memanjat tiang. Salah satu contohnya adalah suatu kerja seperti membersihkan tiang lampu jalan raya. Melakukan kerja secara manual ini sangat berbahaya dan boleh mengganggu lalulintas. Oleh kerana itu, *Ascend Climbing Pole Robot* dibangunkan. Sistem pergerakan robot ini direka dengan mempunyai ciri-ciri mekanikal, elektronik dan bahagian kawalan robot.

Tujuan utama robot dengan sistem beroda dicipta ini adalah untuk cengkaman tiang dan memanjat tiang menegak dengan penggunaan tenaga yang minimum. Namun, robot ini dapat melakukan banyak aplikasi dan kegunaan lain jika ditambah dengan peralatan tambahan seperti lengan robot yang boleh dilakukan seperti ambil dan letak, pematerian, pengecatan, dan operasi lain. Oleh sebab itu, projek akhir ini akan fokus pada bahagian utama robot yang hanya boleh naik dan turun.

ABSTRACT

This project is to develop in design the climbing pole robot that will assist human beings in performing a set of difficult and dangerous tasks that involves climbing vertical surfaces. One of an example tasks is cleaning highway lamppost. Performing this task manually is very dangerous and is traffic disturbing. Therefore, the Ascend Climbing Pole Robot is developed. This ascend climbing robot is designed with the mechanical, electrical and part controlling of robot.

The robot's general purpose wheeled design to grip the pole and climb up the vertical pole with the minimal energy consumption. However, this can do many application and jobs if add with the additional accessories like robot arm could do such as pick and place, welding, painting, and other operation. Therefore, my final year project will focus on doing the main body of the robot that only can climb up and down.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Availability of robots having the ability to move vertical surfaces would simplify many human tasks. Generally regardless of what these robots have done, wide ranges of goals are anticipated for them that are of great interest to researchers.

Climbing robots have various applications such as industrial environments, inspections of high chimneys, large reservoirs, high towers and furnaces. The inspections should be carried out in regular period of times to ensure correctness of set performance and grantee the quality. The mentioned tasks are too difficult and in most cases dangerous for human workers. Regarding this and with respect to the wide area of the structures, automation is essential and economical. Moreover working in dangerous circumstances and deficiency detection such as nuclear plants, poisonous chemical environments, high voltage towers surrounding without application of robots are very difficult though not impossible [1,2].

1.1 Objectives

The main objective of this project is :

1. To reduce fall down accident when someone climbing top pole without safety equipment.
2. To develop a multifunction product.
3. To developing a new product in global market.
4. To encourage the student which ability to innovative thinking based on electronic and mechanical that can contribute to society.
5. To easier human work.

1.2 Problem Statement

The goal in this study is to climb up lamppost to clean the bulbs. The conventional method for cleaning bulbs using lifting machines causes many problems. The mechanism for washing the bulbs is not studied in this paper and the focus is on climbing. Since the existing lampposts are so various, a typical cylindrical pole which has a step change in its diameter and is used in many local highways is chosen. It is assumed here that the diameter of the pole is 15centimeter until 20 centimetres range. Another assumption is that there aren't any obstacles on the pole surface. According this problem, the following requirements were set for design.

1. The performance should be independent of pole material.
2. A relatively optimal speed
3. High security
4. Simplicity
5. Having minimum weight
6. Acceptable stability

1.3 Scope Of Work

This scope of this project is to design the robot which has the capability to climb up and down the pole with using the remote control. This project can be divided into two parts. There are mechanical and electronic. Mechanical part consists of constructing design of climbing pole robot using an aluminium. The entire of the mechanical construction will be made by using aluminium due to its lightweight. The appropriate is important because it will affect the performance of gearmotor.

Electronic part consists of the control circuit to control the rotation of the gear motor forward or reverse direction. A H-bridge circuit is used to control this gear motor. It is very simple and low cost circuit to design and make it.

Other than that, this project used the radio frequency (RF) two channel to control the robot using wireless connection. The signal is activated by the push button on the transmitter circuit then, the receiver circuit will receive the signal. Relay circuit is connected from receiver to activate the relay and gearmotor.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter will explain in detail about the research literature. Some concept of a project is described. This is because an understanding of the work will assist in preparing project end of this year.

Literature study phase is to describe all processes that occur in doing a project such as search, data collection and analysis of what has been found. All processes will be done through the resources available from books, journals, technical reports, forums, websites and others. Its main purpose is to acquire knowledge and ideas about topics that have been issued and knows the strength and weaknesses of a study of the literature.

2.1 Rf Transmitter Module

These RF Transmitter Modules are very small in dimension and have a wide operating voltage range (3V-12V). The low cost RF Transmitter can be used to transmit signal up to 100 meters (the antenna design, working environment and supply voltage will seriously impact the effective distance). It is good for short distance, battery power device development. Cytron Technologies provides 2 types of RF Transmitter Modules at either 315MHz or 433MHz for user:

Product Code	Description
RF_TX_315	RF Transmitter 315MHz
RF_TX_433	RF Transmitter 433MHz

Table 2.1: Type TX 315/433Mhz

The application includes:

- Industrial remote control, telemetry and remote sensing.
- Alarm systems and wireless transmission for various types of low-rate digital signal.
- Remote control for various types of household appliances and electronics projects.

2.1.1 Product Specification

The Specifications of RF Transmitter Module

Except for the frequency and antenna length, RF_TX_315 and RF_TX_433 share the same product specifications as shown in table below:

No.	Specifications	RF Transmitter Module
1	Operating Voltage	3V to 12 V
2	Operating Current	Max \leq 40mA (12V), Min \leq 9mA (3V)
3	Oscillator	SAW (Surface Acoustic Wave) oscillator
4	Frequency	315MHz ~ 433.92MHz
5	Frequency error	\pm 150kHz(max)
6	Modulation	ASK/OOK
7	Transfer Rate	\leq 10Kbps
8	Transmitting power	25mW (315MHz@12V)
9	Antenna Length	24cm (315MHz), 18cm (433.92MHz)

Table 2.2: RF_TX_315 and RF_TX_433 specifications

2.1.2 Antenna

- User may use any soft or hard wire (likes Drawbars antenna) as antenna. The frequency is determined by the length of antenna. If a soft wire is used, please make sure it is fully extended.
- If the transmitter module is molded in a metal casing, please use an external antenna. For better result, use A 50 Ohm coaxial cable can be used as antenna to the module.

2.1.3 Product Layout

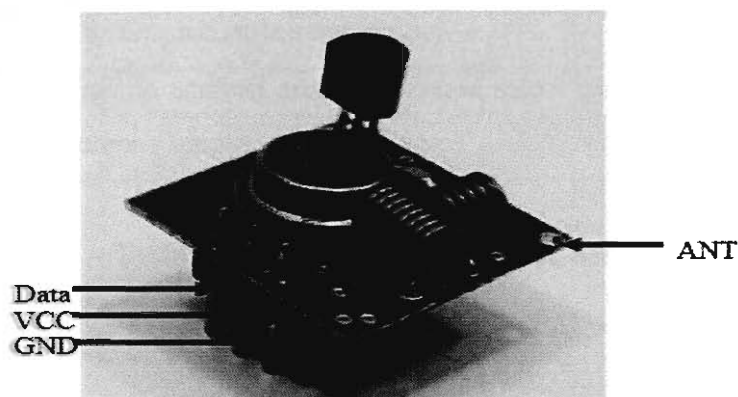


Figure2.1: RF_TX_315MHz Type1

Label	Description
Data	The Data pin of the transmitter
VCC	The power supply to the transmitter.
GND	The Ground of the transmitter.
ANT	The hole to solder and connect antenna. (Please select the correct antenna length, which is 24cm)

Table2.3: RF_TX_315MHz Type description

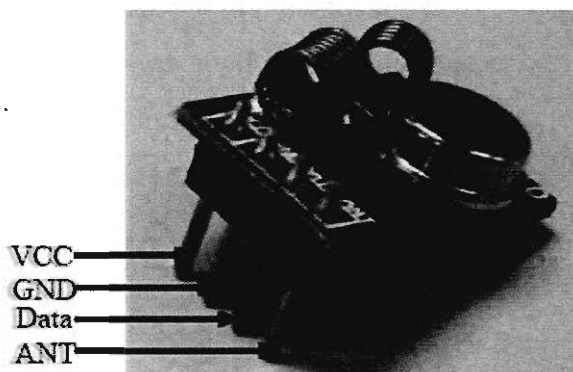


Figure2.2: RF_TX_315MHz Type2

Label	Description
Data	The Data pin of the transmitter.
VCC	The power supply to the transmitter.
GND	The Ground of the transmitter.
ANT	The pin connect antenna. (Please select the correct antenna length, which is 24cm)

Table2.4: RF_TX_315MHz Type2 description

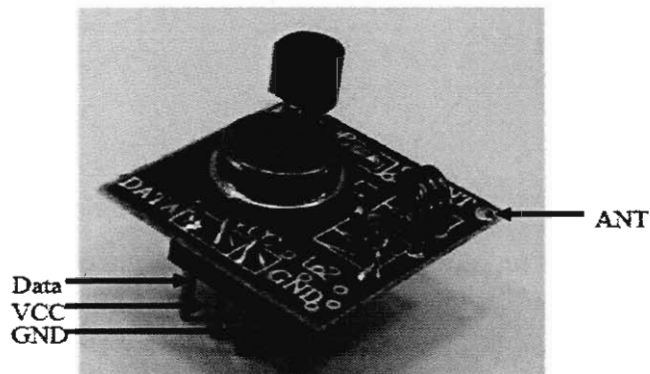


Figure2.3: RF_TX_433MHz Type2

Label	Description
Data	The Data pin of the transmitter.
VCC	The power supply to the transmitter.
GND	The Ground of the transmitter.
ANT	The hole to solder and connect antenna. (Please select the correct antenna length, which is 18cm)

Table2.5: RF_TX_433MHz Type2 description