

A SMART – AGRI ROBOT IN AGRICULTURE SECTOR

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ABSTRACT

This project provides the opportunity for the researcher to have a deeper understanding on the robot that used in agriculture industry. The project will come out a small prototype car with a tank that can store a liquid like fertilizer or pesticides. This project also will focus on the software and hardware design.

On the first chapter of the thesis, I will introduce about the smart- agri robot in agriculture industry. In this chapter, it have consist of several sub- title which have include the problem statement, objective, scope of work, motivation of the work and will ending with project methodology. For the chapter 2, it is consist of literature review. For this chapter, it will covered on the control circuit and theoretical that I will use in this project. Besides that, it also have include some theoretical of the main components such as PIC microcontroller 16F877A, IR sensor and some technical knowledge which will covered into this chapter.

All of this technical knowledge such as the important of protective diodes and interfacing relay to microcontroller for protecting the circuit. The next chapter which is chapter 3, it is covered about the methodology for designing the project. For the following chapter of this project will be chapter 4. In this chapter, I will explain more on the operation and processes that will undertake in this project. The final chapter for this report will be the project recommendation and conclusion of the project.

ABSTRAK

Projek ini adalah memberi kesempatan bagi penyelidik untuk mendalami pemahaman yang lebih luas atas robot yang boleh digunakan dalam sektor pertanian. Projek ini juga akan dicipta dengan kereta prototaip ya kecil serta tangki yang boleh menyimpan air ataupun cecair seperti baja dan racun serangga. Projek ini akan menfokuskan pada perisian software dan juga hardware. Ia terbahagi kepada lima bab secara keseluruhannya dan diakhiri dengan cadangan untuk projek dan kesimpulan. Pada bab 1, ia akan memperkenalkan tentang fungsi robot pintar di sektor pertanian. Dalam bab ini, ia terdiri daripada beberapa sub-tajuk yang meliputi laporan masalah, tujuan, ruanglingkup kerja, motivasi kerja dan akan berakhir dengan metodologi projek. Untuk bahagian bab 2, ia terdiri daripada kajian literatur. Dan ia akan diterangkan dalam bahagian litar kawalan dan teori yang akan saya gunakan dalam projek ini. Selain itu, ia juga telah merangkumi beberapa teori pada komponen utama seperti mikrokontroler PIC 16F877A, sensor IR dan beberapa pengetahuan teknikal yang akan diterangkan dalam bab ini. Pengetahuan teknikal seperti penting dari dioda pelindung dan relay interfacing ke mikrokontroler bagi melindungi litar-litar projek. Pada bahagian seterusnya akan disambung dengan bab 3, ditutupi tentang metodologi untuk mendesain projek. Bagi bab berikutnya, iaitu bab 4, ia akan menerangkan dengan lebih jelas mengenai operasi dan proses yang akan mengambil tindakan dalam projek ini. Untuk bab terakhir untuk laporan ini, saya akan memberi cadangan projek untuk penambahbaikan pada projek tersebut dan diakhiri dengan kesimpulan.

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LIST OF AMBREVIATIVES

A/D	-	Analog To Digital
DC	-	Direct Current
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
Emf	-	Electromotive Force
GND	-	Ground
I/O	-	Input/Output
I2C	-	Inter-Integrated Circuit
IC	-	Integrated Circuit
ICSP	-	In Circuit Serial Programming
IR	-	Infrared Radiation
LCD	-	Liquid crystal display
LED	-	Light Emitting Diode
LIN	-	Local Interconnect Network
NC	-	Normally Close
NO	-	Normally Open

PCB	-	Printed Circuit Board
PIC	-	Programmable Integrated Circuit
PSP	-	Parallel Slave Port
PWM	-	Pulse Width Modulation
SPI	-	Serial Peripheral Interface
SSP	-	Synchronous Serial Port
TTL	-	Transistor- transistor Logic
USART	-	Universal asynchronous receiver/transmitter

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CHAPTER I

Introduction

The inspiration of this project came from the fully functional insects that needed to be eliminating in agriculture sector. Nowadays, robotics is one of the fastest growing in engineering fields. The robots are design to remove the human factor from labor intensive or dangerous work. The microcontroller is the brain of the robot that will receives data from various sources to control the movement of the robot in order to accomplish a task. This Smart-Agri robot is used in agricultural industry. Therefore, for applying this concept, I will design a prototype vehicle that can replace humans in the process of poison plants on a large scale.

This Smart- Agri robot will operates automatically to locate the plant and the amount of spray needed to boost the quantity and proportional to the needs of the crop. Besides that, it also can reduce the cost of agriculture such as labor, the use of chemicals, pollution and health issues are key agenda for the construction of this robot prototype.

1.1 Problem statement

The agriculture culture is an important field in Malaysia, it was essence of development movement in Malaysia, without agriculture industry perhaps Malaysia are going to face famine crisis. If we still reliance Malaysia on external agriculture industry, we will in trouble to produce more output in this sector. This is also to avoid the basic supply of necessities lack in the market. However, the frequent on industrial development will face some problem like the shortage of labor, highest labor salary, weather imbalance, and technology usage restriction in agriculture sector. As such modern technology, it usage are necessary to extend more agricultural products in a wide range. It also can realize the desire of the government to be success in agriculture's sector. Therefore, the application of sophisticated technology must be use to maximize the agricultural products in this country. It also can realize the government's desire to develop modern sector agriculture in this country.

1.2 Objective

The objectives of this Smart- Agri robot is to reduce the burden of farmers or consumer in agriculture sector. Besides that, this project will create the talent of student to apply their knowledge in this final year project. The objectives and goals of this project are:

- i. To improve the efficiency of the logistics system, this is because all fertilization process will spray out with schedule and the Agri-robot could determine the rate of the fertilization that needed by the plant.
- ii. Due to all the workplaces are implicated with phytocide and insect, it also can mitigate the accident's rate at the workplaces.
- iii. To increase the crop yield. With the consistent of the process poisoning and fertilization, it can produce the crop yield to the maximum level.

- iv. To reduce the mistake in process of poisoning and fertilization, because this Smart- Agri robot did not have the emotional like human.

1.3 Scope of works

This project will focus on hardware and software for this smart robot. In this project, I will design it with a tank which can store a liquid like fertilizer or pesticides the plant. It has been designed with the combination of the five main controller circuit. These five main components that I am using in this project which are includes:

- the programmable integrated circuit (PIC16F877A) which function as main brain of the project,
- H-Bridge motor driver (L298N) is used as the motion control of the smart robot is control,
- Infrared Radiation sensor circuit used to detect the track of the Smart- Agri robot and position of the plants.
- Relay controller circuit which is used to control the voltage of the water dispenser
- Finally, by using this smart robot, all the process of fertilizing and pesticides will work effectively.

1.4 Motivation of the works

- To reduce the burden of farmer and settle up the problem of farmer in agriculture sector.
- To reduce the foreign labour in this country.
- Go for modern technology in agriculture industry.

1.5 Project methodology

In this part, I have cover three main things to finish my project which are project planning, literature review and finishing part of the project. The below will be the main topic and sub topics that will be further elaborated in the report.

1.5.1 Project planning

- Understanding the concept and theory of the project
- Prepare Gantt Chart for guidelines and progress of the project

1.5.2 Literature review

- Search some suitable and practical circuits
- List down and identify the suitable components that using in the project.
- Design a prototype circuit boards and assembling
- Test and do analysis to the circuits

1.5.3 Finishing

- Testing of final assembly circuit in operation, application record the results
- Presentation of the project
- Finishing the technical report of the project

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

The idea to create "Agri-Mobile" is the result of our study on the problems faced by farmers today, which is about the poison work that are not done properly. Therefore, I have do some research on several books of the electronic circuit books, websites, e-books and journals from the internet. After that, I start to plan the work on how to integrate the circuits in this project.

Before starting this project, I have done the literature on the project processing, this is to ensure that my project can be implementing and work properly. The control circuit that used in this project shall be accordance with the operational control of an electronic circuit. As a result, I have to do some research for the functional circuit that I am going to use in this project. I also have done some modification on several existing control circuit, this is to make sure that the functional of the circuit is suitable for the project. All of this circuit modification is changes based on the guidance from reference material.

2.2 Control circuit

Control circuit is the most important part in this project, this is to make sure that the project can be function well as the planned. In this project, I have chosen some control circuit such as, Microcontroller, speed controller and motor driver circuit. All of this control circuit are use to make sure that the circuit can operate and perform well in future.

2.3 Components and equipment

Electronic components are the most important appliance in an electronic circuit. Components or circuit findings are create and defined by performance characteristics of a component. Components are produced with its own functions and operated in accordance with the resolution made. The components that will use in this project are the microprocessor, resistor, capacitor, relay etc. There are also a variety of tools used such as soldering iron, suckers, and others.

2.3.1 Relay

A relay is functioning as an electrically operated switch. The current flowing through the coil of the relay will create a magnetic field, which attracts a lever and changes the switch contacts. The relay's switch connections are usually label as NC (normally close), NO (normally open) and COM (Common). The current will flows through a switch and an electromagnetic coil to the ground.

When the current from the power source are supply, the current will flows to an armature, this situation can be attracted by the magnetic force on the relay coil. When the control circuit switch is open, that means no current flows to the relay and the coil is

in de-energized position. When the control circuit switch is closed, the current flows to the relay and energized the coil.

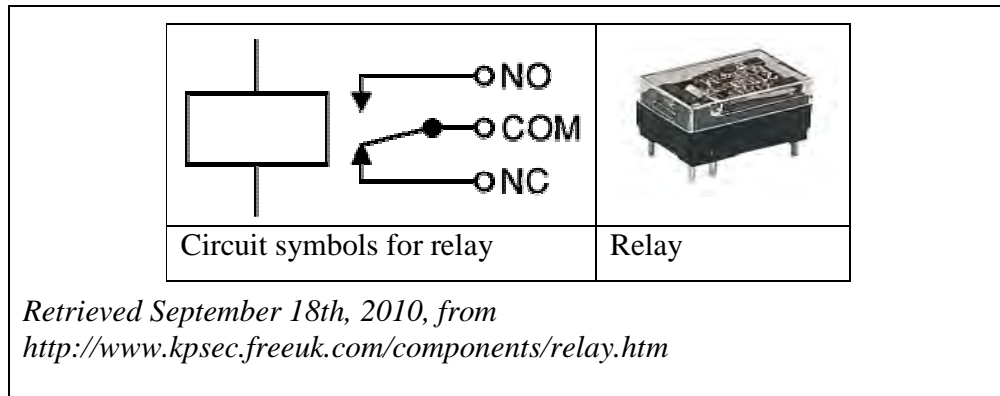


Figure 2.1: The relay circuit symbol and mechanical structure of relay.

2.3.1.1 Protection diodes for relays

Transistors and ICs must be protected from the brief high voltage produced when a relay coil is switched off. To protect the relay to be burn up, it need to add up a diode to connected 'backwards' across the relay coil. Current flowing through a relay coil creates a magnetic field which collapses suddenly when the current is switched off. The suddenly collapse of the magnetic field induces a brief high voltage across the relay coil which is very likely to damage transistors and ICs. The protection diode allows the induced voltage to drive a brief current through the coil (and diode) so the magnetic field dies away quickly rather than instantly. This prevents the induced voltage becoming high enough to cause damage to transistors and ICs