

MINI SOLAR POWERED ROBOTFARM FOR PLANT SEEDING WITH SMS
NOTIFICATION

AMIR SYARIFAH HARAHARA BINTI AMIR ALWI

This Report Is Submitted In Partial Fulfillment of Requirement for the Bachelor
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Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

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DECLARATION

“I declare that this report “Mini Solar Powered Robot Farm for Plant Seeding with SMS Notification” is the result of my own research except as cited in the references”.

Signature :

Author : AMIR SYARIFAH HARAHARA
BINTI AMIR ALWI

Date :

“I hereby declare that I have read this report, entitled “Mini Solar Powered Robot Farm for Plant Seeding with SMS Notification” and it fulfills the requirements of the scope and quality for the Bachelor of Electronic Engineering (Industrial Electronic) with Honours.”

Signature :

Supervisor’s Name : ENGR. NAJMIAH RADIAH BINTI MOHAMAD

Date :

Special dedicate:

I dedicated in thankful appreciation for support, encouragement and understanding to my beloved family, supervisors and friends.

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ABSTRACT

The robotfarm is a new solution for the farmers to increase their agricultural production. In Malaysia, most of current robotfarms were used the rechargeable batteries as the power supplied to the robot. The farmer needs to recharge the battery at least once per day. Therefore, in this project the Mini Solar Powered Robotfarm for Plant Seeding with SMS Notification was produce to decrease the cost and make the farmers work easier. This robotfarm was designed with solar on the top to capture the solar energy and convert it into direct current brape A? berape V? electricity. The rechargeable batteries are still available in case it is raining day. This Robotfarm is moving on the land by following the track in black colour. After the robot finish seedling the seed, and detect the last line follower that has been set, the robot farm will send the short messaging system (SMS) to the farmer. From the result, the distance between the seeds to seedling is at 50 cm. The depth of hole is measured by getting the 1 to 2 cm depth. The total number of seedling is around 2 and 3 seeds. As the conclusion Robot farm can decrease the cost and can help accelerate the work of the farmer.

dIm abstract tambah method, guna motor, PIC, GSM

ABSTRAK

Robot Pertanian adalah satu produk yang dihasilkan khas untuk menyelesaikan masalah petani untuk meningkatkan hasil pertanian mereka. Di Malaysia, Robot pertanian adalah teknologi terbaru dan ia sangat susah untuk dijumpai di pasaran. Kebanyakan Robot Pertanian yang dijumpai menggunakan bateri yang boleh dicas sebagai tenaga untuk menggerakkan robot itu. Petani perlu mengecas bateri sekurang-kurangnya sekali sehari. Oleh itu, Robot Pertanian yang menggunakan tenaga solar digunakan untuk pertanian dilengkapi dengan pesanan SMS telah dihasilkan untuk mengurangkan kos dan membuat kerja pertanian menjadi lebih mudah. Robot ini dibina dengan meletakkan kepingan solar pada bahagian atas untuk mengumpul cahaya matahari kemudian menukarkannya kepada tenaga elektrik. Bateri yang boleh dicas itu masih berguna ketika hari hujan. Robot pertanian yang menggunakan tenaga solar digunakan untuk pertanian dilengkapi dengan pesanan SMS bergerak dengan berpandukan laluan yang dibina di dalam kebun. Selepas robot siap menanam dan mengesan laluan terakhir robot akan menghantar pesanan ringkas (SMS) kepada petani. Jarak diantara setiap biji benih yang ditanam ialah 50 cm. Kedalaman lubang yang dikorek ialah 1 hingga 2 cm. Bilangan biji benih yang boleh ditanam pada satu masa ialah 2 hingga 3 biji. Sebagai kesimpulan Robot Pertanian yang menggunakan tenaga solar digunakan untuk pertanian dilengkapi dengan pesanan SMS boleh mengurangkan kos dan boleh mempercepatkan kerja petani.

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LIST OF ABBREVIATIONS

COM	-	Common
GSM	-	Global system for mobile communication
NC	-	Normally Close
NO	-	Normally Open
PIC	-	Peripheral interface controller
SIM	-	Subscriber Identity Module
SMS	-	Short Message Service
SMSC	-	Short Message Service Center
DC	-	Direct Current

CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

Nowadays, there is many type of robotfarms **have been developed** to increase the performance in agriculture sector. The definition of robotfarm is a robot which has develops for agriculture purpose. The technology of robotfarm was introduce 2800 BCE which the Mesopotamians was started learned how to make bronze tools [1]. Between 1750 -1900, the Agricultural Revolution **was occurred**. **At the moment,** **most people lived** and worked in villages producing foods and **it was** necessary to increase the amount of **foods** grown. As the demand **of food increment**, people began to make improvement in farming machines **technology**. The first new invention is seed drill and threshing machines [2]. **In 1918, the company which became Deere and Company in 1868 began making tractor [3].x faham** Today there is many automatic robotfarm was produce for make the farming task more easily.

According to Malaysia Meteorological Department, on average, Malaysia receives about 6 hours of sunlight a day. This means, in one day, Malaysia receives enough energy from the Sun to generate 11 years worth of electricity. It is suitable to generate solar power at Malaysia. Solar Power Systems are complete, fully integrated solar power supplies designed for site loads requiring 12, 24 or 48 volts DC. Each solar power system provides safe power to environment and can be renewable.

Solar energy can reduce your electric and heating bill by an incredible amount leaving you with the savings to enjoy life a little and save for the future. Solar energy is about a technology that converts the sun energy into electric current with the help of solar panels. Figure 1.1 shows the operation of solar energy. The mechanics behind solar energy is the work of the all mighty God; the sun's incredible energy is produced thanks to the help of hydrogen through nuclear fusion that travels directly to the earth. The receiving solar panels convert the rays into electric current that are stored in batteries [4].

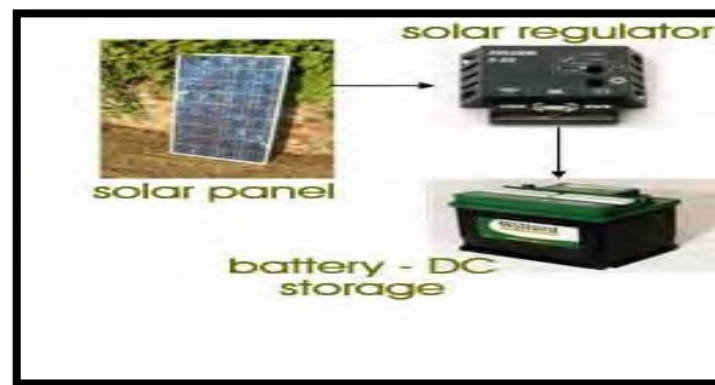


Figure 1.1 Operation of Solar System

1.2 PROBLEM STATEMENTS

The Mini Solar Powered robotFarm for Plant Seeding is used to help the farmers who still using older equipment or tools in traditional farming. Most of the farmers in Malaysia live in poverty, then this make it difficult for them to purchase high technology equipment because most of the farm machines on the market are expensive [5]. So that, this Robot Farm has produced to increase the agricultural productivity besides increase the farmer's income. One of the Robot Farm which is available at the market is MF-Scamp Robot. This robot has many applications but expensive.

The target group is for agriculture technology there in Malaysia. Even a farmer has a vast piece of land they have some inhibition to manage their land because of they have limited of manpower. It's somewhat more costly to hire workers to move a machine [6]. So this Mini Solar Powered Robot Farm for Plant Seeding with SMS

Notification is designed to relieve the burden of the farmer because it can plant the seeds without the need to control. The cost of the fuel utilization is high so, this robot becomes more efficient as the hot day because it is use solar power. The farmer can save money to buy the battery or fuel.

1.3 OBJECTIVE

The objectives of this project are:

- i. To design a Robotfarm that can operate automatically in agriculture.
- ii. To design a solar system as the second alternative for power supply on the Robotfarm to save the cost.
- iii. To create the SMS system that is the major communication medium for efficient works.

1.4 SCOPE OF PROJECT

This project is focusing on vegetable seeds such as beans. It is a combination of mechanical part, electrical part and assisted by CCS Compiler software. So that, Mini the Solar Powered robotfarm for Plant Seeding with SMS Notification is capable of doing the basic thing such making the holes in the land and sown the seeds. This process to the overall for this robot is controlled and setting by the PIC 16F877A.

For the design of the robot, it has four wheels on the front and back for ease of movement on the ground without the help of a DC motor (Gear – Box) 12 V mounted on both wheels at the back. In the middle of this robot has an iron rod. This rod will move up and down with the help of gearbox motor has been designed together and will stop automatically using limit switches. There is also a solar plated on top of the robot which is transferring energy to the robot in the hot day.

This project also used the SMS system to mention the farmer that the process of sowing is done. An SMS will be sent by the robotfarm to the Famer’s phone by showing the text “OK”. Thus, the farmers can do another works while waiting the plant seeding done by this robotfarm.

CHAPTER II

LITERATURE REVIEW

2.1 DESIGN ROBOTFARM

2.1.1 Renewable Energy Based Agricultural Robot

Based on R.Krishna et al. a Renewable Energy Based Agricultural Robot was design. This robot was designed to do all these jobs in an efficient as well as marketable manner such that it helps farmers from hectic workforce for example for vegetable crops.

This robot was used the renewable energy which is solar to move .A solar panel is placed at a height from base cliffs along with a manual tracker system. The solar panel is capable of producing 30 V and output of the panel is used to charge a lead acid battery placed inside the robot. This is also used to run other appliances inside. The tracker can be placed in three positions manually they are 45° towards south, 180°, 45° towards north [7]. Figure 2.1 was show the design for Renewable Agricultural Robot.

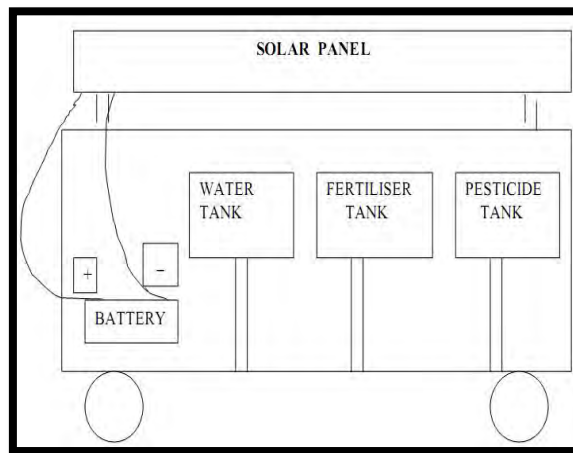


Figure 2.1: Design for Renewable Agriculture Robot

2.1.2 Mechanical Design Development of an Electric Mobile Robot for Agriculture Task in Greenhouse

J.Sanchez –Hermosilla et al. was producing Electrical Mobile Robot for Agricultural Task in Greenhouse [8]. This autonomous vehicles moves through the crop lines of the greenhouse and performs tasks that can help the farmer. However this robot only include equipped for spraying, lifting platform to reach the top and trailer to transport the fruit, plant and crop waste . It does not design for seeding.

The mobile robot has no fixed axles. Both axles are pivoted for the steering system. This arrangement enables a tighter turning radius and more accurate tracking than 2-wheel steer models. Each axle is attached to the vehicle frame with a slew bearing that is driven by a DC electric motor. The slew bearing has 300 mm pitch diameter, 120 teeth and module of 2.5. However this robot only include equipped for spraying, lifting platform to reach the top and trailer to transport the fruit, plant and crop waste. It does not design for seeding. Figure 2.2 show the Mobile Robot for Agriculture Task in Greenhouse.



Figure 2.2: Mobile Robot for Agriculture Task in Greenhouse

2.1.3 Robotic Weeding of a Maize Field Based on Navigation Data of the Tractor That Performed the Seeding

Tijmen Bakker et al. were present robotic weeding of maize based on navigation of the tractor that performed the seeding [9]. The availability of tractors equipped with RTK-DGPS based automatic guidance potentially enables robots to perform subsequent tasks in the same field. In an experiment a tractor guidance system generated a route for sowing based on an initial path consisting of two logged positions (A-B line) and then planned the subsequent paths parallel to the initial path one working width apart. After sowing the maize, the A-B line was transferred to the Intelligent Autonomous Weedier (IAW) of Wageningen University.

The row width was 75 cm and the width of the hoes mounted on the robot was 50 cm. During sowing of the parallel paths the tractor was steered automatically by the guidance system. The results show that it is possible to perform robot weeding at field level with high accuracy based on navigation data of the tractor that performed the sowing. However, Turning at the headland need to performed by the driver. However the weeding of maze Robotfarm above have their own lack was design in large size. So, it will give trouble for farmer to keep it. Figure 2.3 show The Robotic Weeding of Maze.



Figure 2.3: Robotic Weeding of Maze

2.1.4 Zeus

Konstantin TRESSOS et al. have produced the robot ZEUS. ZEUS is a Supportive Autonomous Vehicle for Agriculture (SAVAGE) and corresponds with the development of a low cost fully autonomous vehicle designed to perform specific tasks within the limits of a field [10].

The main objective of this project is the implementation of a mass use, low-cost and highly flexible robotic platform specially designed to accomplish a variety of trivial agricultural cares and tasks such as weed detection, humidity measurements, etc. However, this robot just uses the battery to move the motor. So, it does not durable to do the task. Figure 2.4 show The Design of ZEUS Robot.



Figure 2.4: ZEUS

2.2 SMS DESIGN CIRCUIT

Sending SMS from mobile phones to recipients, who have been programmed in the PIC Microcontroller, is same as like GSM modem transmission to the receiver. There are several types of circuits that can be applied as a GSM system.

2.2.1 GSM based Car Security System

Ruchita.J.Shah et al. was design a GSM Based Car Security System [11]. The aim of this system is to save the car. The GSM Based Car Security System will function when someone try to steal the our car immediately this security system be alert and send SMS on your mobile through GSM modem and buzzer will also make sound ,so you getting the information immediately and you can save your car.

The features of the GSM Based Car Security are as follows: This device will take a maximum current of 4 amps and 230 V, AC LCD Display, AT89S52 microcontroller, Vibration detector, Optical detector, Revolution detector and relay.

This concept can be used to Mini solar Powered Robot farm for Plant Seeding with SMS Notification. However, this system is high cost because GSM is more expensive that cellular phone. Figure 2.5 show the design of GSM Based on Car Security System.

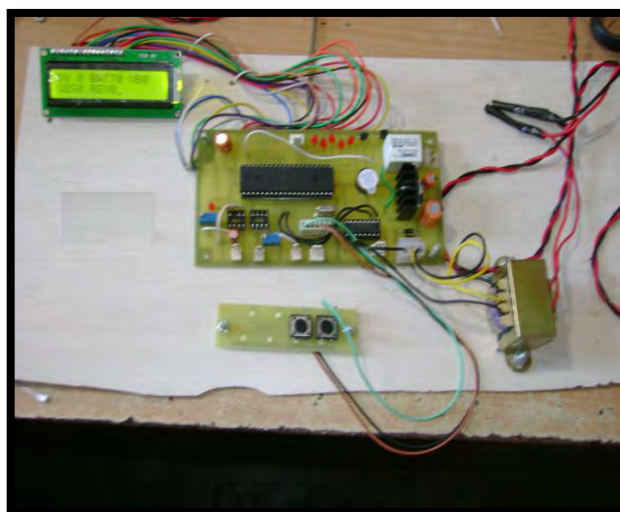


Figure 2.5: GSM Based on Car Security System

2.2.2 SMS Remote Control

SerasidisVasilis et al. has created a design that controls electrical appliances using SMS as a way to enable or disable the device. This circuit can control the device by sending SMS via mobile phone for which the circuit is very simple in which it uses a relay as a switch and a modem AT commands that can understand the data to be sent from a PIC micro controller [12].

This design is modified mobile phones to work as part of a transmitter that can send SMS when the switch is operated. Ericsson T10 mobile phones are used for this circuit in which the mobile communication terminal to operate at 5V with control by AT9052313. From this design, the Robot farm can be designed for to have the several relays and connected to the mobile phone. This concept can be use to robot farm for SMS notification system. Figure 2.6 shows the design of the SMS remote control circuit.

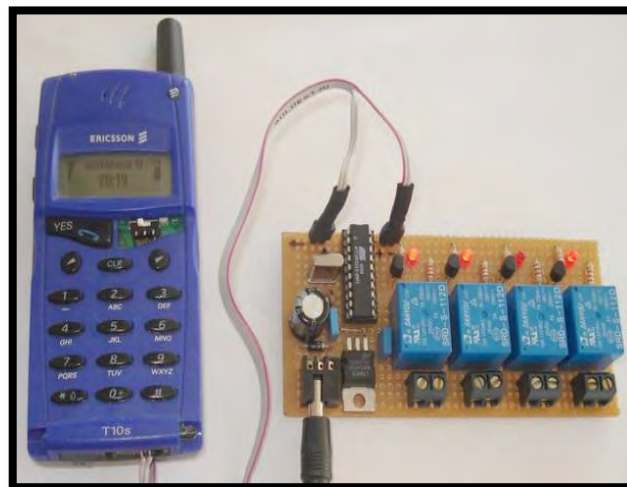


Figure 2.6: SMS Remote Control

2.3 COMPONENT SELECTION

After analyzed the circuit the components was selection. The important components that will use are:

2.3.1 PIC 16F877A Microcontroller

PIC is an acronym for „Programmable intelligent Computer“ made by Microchip Technology. Derived from the PIC1650 those originally developed by General Instrument’s Microelectronics Division [13]. PIC 16F877A can be used for controlling home appliances, remote sensors, industrial instruments, electric door locks and safety devices. The advantages of PIC 16F877A are low cost, low current consumption, easy handling, wide availability, large user base, extensive collection of application notes and flexibility, so it can make PIC 16F877A suitable in many areas. Figure 2.7 shows the pin of PIC16F877A.

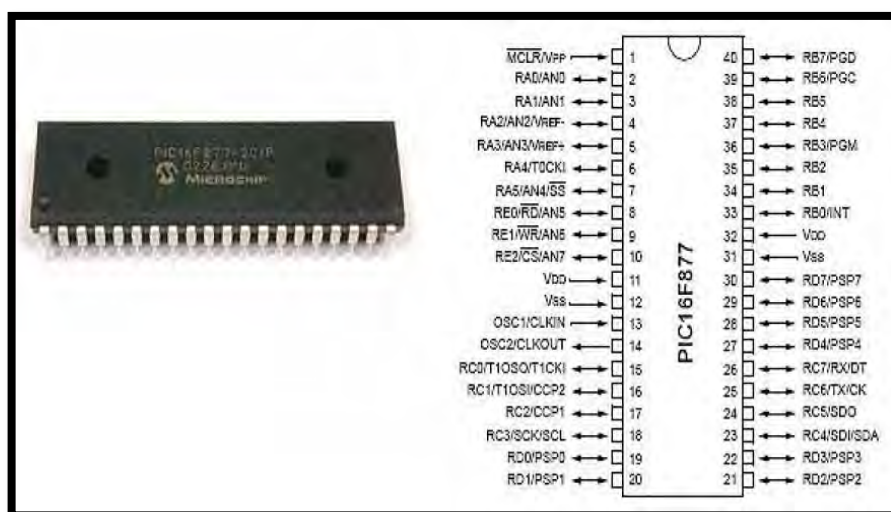


Figure 2.7: PIC 16F877A Microcontrollers

2.3.2 Relay

The Relay circuit is an electric switch that opens and closes because control of another electrical circuit. The switch is to operate as an electromagnet to open and close one or many sets of contacts. It is because, the relay can control an output circuit of higher power than the input circuit, it is can be considered to be a form of an electrical amplifier [14]. Figure 2.8 shows the diagram of relay.