ECO_SAVER MOWER (ESM)

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BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek   :   Eco_Saver Mower (ESM)

Sesi Pengajian   :

1	2	/	1	3

Saya   MAISARAH BINTI ABU BAKAR ASSARI

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Dedicated to my beloved family especially my parent, supervisor, lecturers, and all my friends

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ABSTRACT

This project is known as Eco_Saver Mower (ESM). It will be the next invention that will make the human life much easier. This machine works best at flat area and it is said to be easier because this machine will operate automatically with only click ON button to on the system, push the button ON for motor blade function and push the start button for it ready to move. Before the grass is cut, user must set the ESM at the center position because this mower will cut from the center area to the larger. The extra feature of this mower than other mowers is the cutting style during cuts the grass which it moves in hexagon pattern movement. It has a two infrared sensors which are attached at the front and right of the ESM for detecting any obstacle in the cutting area. It also have rain sensor that is attached at the top of the ESM for detecting rain and automatically shut down the system, so that the machine is durable. Furthermore, this machine will use lithium battery as the power source that will supply the power to generate the machine for the cutting session and the solar panel will use to recharge the battery. It is said to be saved because there is no fuel use and this will avoid our air from being polluted. It is very environmentally friendly and it's going to be an affordable machine that can be used by most of people in Malaysia.

ABSTRAK

Projek ini dikenali sebagai "Eco_Saver Mower" (ESM). Mesin ini akan menjadi sebuah mesin yang direkacipta bagi memudahkan kehidupan. Mesin ini bekerja di kawasan yang rata dan ia menjadi mudah kerana mesin ini beroperasi secara automatik hanya dengan hanya klik butang ON pada sistem, kemudian tekan butang ON untuk bilah motor berfungsi dan tekan butang mula untuk ia bersedia untuk bergerak. Sebelum rumput dipotong, pengguna perlu menetapkan ESM di kedudukan tengah padang kerana mesin ini akan memotong rumput dari kawasan tengah dan ke kawasan yang semakin besar. Ciri-ciri tambahan Mesin pemotong rumput ini daripada pemotong rumput lain adalah gaya pemotongan semasa memotong yang mana ia bergerak di dalam pergerakan corak heksagon. Ia mempunyai dua sensor inframerah yang dipasang di bahagian depan dan kanan ESM untuk mengesan sebarang halangan di kawasan pemotongan. Ia juga mempunyai sensor hujan yang di letakkan pada bahagian atas ESM untuk mengesan hujan dan akan mematikan sistem secara automatik, ini menjadikan mesin ini tahan lama. Selain itu ia juga mendapat sumber bekalan kuasa daripada bateri yang akan menjana enjin untuk proses pemotongan rumput dan solar panel digunakan untuk mencas semula bateri. Ia juga menjimatkan kerana ia tidak menggunakan minyak dan ini dapat mengurangkan pencemaran. Mesin ini sangat mesra alam dan mampu dimiliki oleh kebanyakan manusia di Malaysia.

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CHAPTER 1

INTRODUCTION

In this chapter, the introduction of this project will be explained. Besides, the main concept and explanation of the objectives about this project will be introduced. The problem statement explains the project significantly and gives the idea of a real time application. The main elements of this project are discussed in the scopes of work and common structure of this project will also be explained too.

1.1   Introduction of Eco_Saver Mower

Nowadays, people need some invention to save their time, easy and flexible even for workers, students and housewives. In addition, energy saving will be as a bonus because it can reduce our demand for energy produced from fossil fuels, and hence our contribution to global warming. So the idea for this final year project is coming up with making a machine that requires all the above matter.

This project is basically about automatic lawn mower known as Eco_Saver Mower (ESM). By creating this, it can save human energy because all the cutting process will be done by the machine automatically, furthermore the consumption of using fuel will decrease by using solar panel which it can help the machine to discharge the energy inside the battery which will be used to generate the mower.

The main difference of ESM with other lawn mower is their movement when cutting the grass. Basically, current automatic mowers are moving randomly, so the probability of the grass that's not exposed to cut is high and it is only suitable for a small area. Therefore, to overcome that problem, the ESM is created by moves in a hexagon pattern from the center area and the larger which it is more suitable for field that not have any permanent obstacles such as a football field, stadium, university or house area that has the spacious lawns.

In addition, the other functions of ESM are to detect an obstacle and rain. If the ESM detects any obstacle, it will stop or stay in pause condition to avoid the obstacle and LCD display will then show "OBJECT!" at the screen. Also same if the ESM detects rain; it will stop and show "WATER!" on the screen after detecting the water to safeguard the motor from damage.

There is some basic equipment that will involve in this project which is the microcontroller, solar panel, battery, DC motor, LCD display, sensors (water sensor detector, IR sensor) and a trimmer string line as a cutting blade.

1.2 Objective of ESM Project

The objectives of doing this project are stated below:

1. To develop a lawn mower machine that's running in hexagon pattern movement.
2. To reduce the time used for cutting the grass and minimize the power consumption of battery during cutting grass.
3. To create a lawn mower machine with auto shutdown function when rainy days.

1.3   Problem Statement

Currently, many automatic lawn mowers produced today are operated randomly. By running randomly, the grass area is not cut completely and it will take a long time to make sure the lawn mower finished cutting the entire grass area. So, it is hard for random automatic lawn mower finished their job in a spacious area like a football field and others. This will cause battery usage will increase and the durability of battery is not durable. To overcome this problem, ESM is proposed by produce the automatic lawn mower with program to operate in the hexagon pattern movement. So, the cutting time and power of battery usage can be reduced.

Usually, by using others lawn mower, more worker is required depending on how large the size of the lawn. By using this ESM, it can reduce worker and human energy because only require one person or worker to monitor from afar the movement of the machine. Moreover, the machine will reduce human power to conduct the ESM safely because if the IR sensors detect the obstacle, it can avoid from breaking that obstacle, human or others (which in pause condition) by itself automatically when the machine is working. By using the automatic lawnmower, it only takes about fewer 5 minutes to set up and leave the machine to finish the job until it found the permanent obstacle like barriers of a football field. The LCD display used to easier for users know the status of the machine during running the ESM.

Nowadays, the cost to cut the grass is expensive which includes the cost of hiring people, fuel and maintenance. This invention will help a lot in reducing this cost. Besides, no fuel needed to operate the ESM. So that, no emission and no pollution where it is 0 % of exhaust emission of this machine.

Moreover, the others automatic lawn mower will always operate even during rainy days which probably can damage the lawn mower motor. So there is an additional function of ESM that can detect rain by using a water sensor detector. When it's raining, ESM will stop immediately and will begin to operate again when in the dry state.

1.4   Scope of Project

In order to complete the ESM project, there are several aspects that need to be implemented such as programming and hardware. The language that will use in this project to program the programmable integrated circuit (PIC) is assembly language programming by using MPLAB Integrated Development Environment (IDE) software. All functions of this ESM which is to control the movement in hexagon pattern and allow the machine detect the obstacles and water. It will programmed by using this software and all input and output ports that will use during program the entire function of this ESM are referred to the data sheet of microcontroller type, PIC16F877A. Furthermore, to get files.hex, compiler type PICkit2 will be used.

For hardware part of this project, the main component that will use is a microcontroller or programmable integrated circuit (PIC). As mention above, the PIC that will use is PIC16F877A. Furthermore, the related sensors that used in this project will contact with the PIC to control the ESM in automatically according to the function of the ESM. Furthermore, the LCD displays are used to display the instruction to make easier for users used the ESM and also display whether the machine detect the obstacle and the water. The sensor is involved in this project is:

i.   Water sensor or rain sensor to detect rain. If the sensor detects any water or rain it will stop the mower from cutting the grass and the LCD display will show "WATER!" on screen.

ii.   Infrared sensor uses to detect any obstacles that can be found on the ground such as ball, human or others. If the sensor detects any object, it will stay in pause condition to mower from cutting the grass and the LCD display will show "OBJECT!" on screen.

1.5   Brief Explanation of Methodology

First of all, this project has begun with a discussion with supervisor regarding general ideas and concepts that would be used in this project. Next, for the literature review part, the background of this project was studied thoroughly and several researches were done by referring various resources including reference books, IEEE journals, refers the related data sheet, online reading and also video learning via

YouTube. On the next stage, MPLAB IDE software programming is studied. This software will use to develop assembly language programming to function the microcontroller. The front panel development and simulation are studied by referring the notes of microcontroller subject that has taken before, via YouTube tutorial videos and online self study. All input and output of the Programmable Integrated Circuit refer to the data sheet of PIC used. Then, the crucial part of this project which is circuit design was studied by using Proteus Software. Hardware design will be done on my next semester stage including of hardware fabrication and design the body. The program for this whole project will be developed and combine with hardware and if the output run according to expected goal, this project is considered success, otherwise troubleshooting will be implemented in order to find faulty components or connections.

1.6   Report Structure

This report is documentary delivering the ideas generated, the concepts applied, and activities done. It consists of five chapters. The followings are the chapter-by-chapter description of information in this report.

Chapter 1 conveys readers a basic introduction on why and how the idea of this project is developed. This chapter consists of introduction, objectives of the project, problem statement, scopes of work, brief methodology and report structure.

Chapter 2 is a literature review of theoretical concepts applied in this project. This chapter includes background study of several existed automatic lawn mower in our country and any other related project. Apart from that, explanation of the hardware that will be used which PIC, sensors and others are explained too in this chapter.

Chapter 3 introduces the methodology of the project which include a flow chart that explains the overall method taken along the development of the project and also a flowchart that explains on how the system operate in a desired sequence.

Chapter 4 discusses the result of this project. At last, chapter 5 will be the conclusions about this PSM include some recommendations for the suitable that can be applied to the ESM.

CHAPTER 2

LITERATURE REVIEW

This chapter will review about existing projects to get an idea about the project design, conception and additional information related to the project. Due to various existing projects available, this research is important to get a clearer picture of the project. Besides, the study of the elements included in the scope of work is also done in this part.

2.1   Study of others Automatic Lawn Mower

Before deciding on the concept, scope, and function to design an automatic lawn-mower, it is important to study the related projects of ESM to define the advantage of ESM with other automatic lawn mower and research which type of microcontroller need to use in this project and find the suitable hardware like the type of sensor need to use in this project, the suitable power of battery and solar panel which applicable with the ESM function.

2.1.1   Solar Powered Automatic Lawn Mower "Lawn Buddy" by Darwin Ramos and Jessie Lucero, San Jose State University, US. [1]

In this project, the author applied a microcontroller, multiple sensors, and a solar charging system. The goal of their robot is to see the difference between grass and concrete while monitoring its surroundings continuously. The microcontroller that they used for their automatic lawn mower is ATmega16. Besides, the humidity sensor used to detect if it was on grass versus on concrete. Since concrete/dirt and grass are distinctively different in density and moisture levels, the humidity was a good factor to distinguish both materials. In addition, the passive infrared sensor used to detect the heat radiation from humans and an ultrasonic sensor to detect if the robot was heading into an object. Other than that, the recharging batteries used as the power supply of the robot and will recharge by using solar panels. The nickel-metal hydride (NiMH) was found to use because given a low charging current, it will not overcharge. Sizing the battery will depend on what we are powering, specifically the motors. Like batteries, there is a range of motors to choose from. Two 7.2 DC motors with integrated gear heads. The needed torque did not need to be a lot because only for a small prototype. Moreover, this robot is randomly cutting the grass during the cutting process. Figure 2.1 below shows the body design of the Lawn Buddy.

Figure 2.1: The Lawn Buddy body design [1]

2.1.2 Design and Modelling a Prototype of a Robotic Lawn Mower by Taj Mohammad Baloch and Timothy Thien Ching Kae, Petronas Technology University, Malaysia. [2]

A major goal of robotics is to develop machines that perform useful tasks independently with minimal supervision. In this project, the author applied PIC16F877 micro-controller to enable the robot to be cost effective. The programming languages required for this controller are C++ Programming. The

model was installed the infrared sensor for sensing the obstacle like a wall, tree, stone. Furthermore, Motors and actuator are the "muscles" of the robot. Proper motors need to be selected for desired output and tasks. Three types of motor have been identified for the robot; Continuous Motors, Stepper Motors and Servo Motors. Robots may include feedback driven connection between sensor and actions which are not under direct human control. Responses may take the form of electromagnetic motor or actuators (effectors) which may control arm, open or close grips. Control and feedback are provided by a computer program which can be either external or internally inside the robot itself. To operate the robot, the author used a rechargeable battery without use for fuel. Besides, the cutting operation that will do with this robot is random cutting style until finished cutting the entire area. This project more uses a mechanical part to conduct the movement of this robotic lawn mower. Figure 2.2 shows the expected body design of Robotic Lawn Mower.
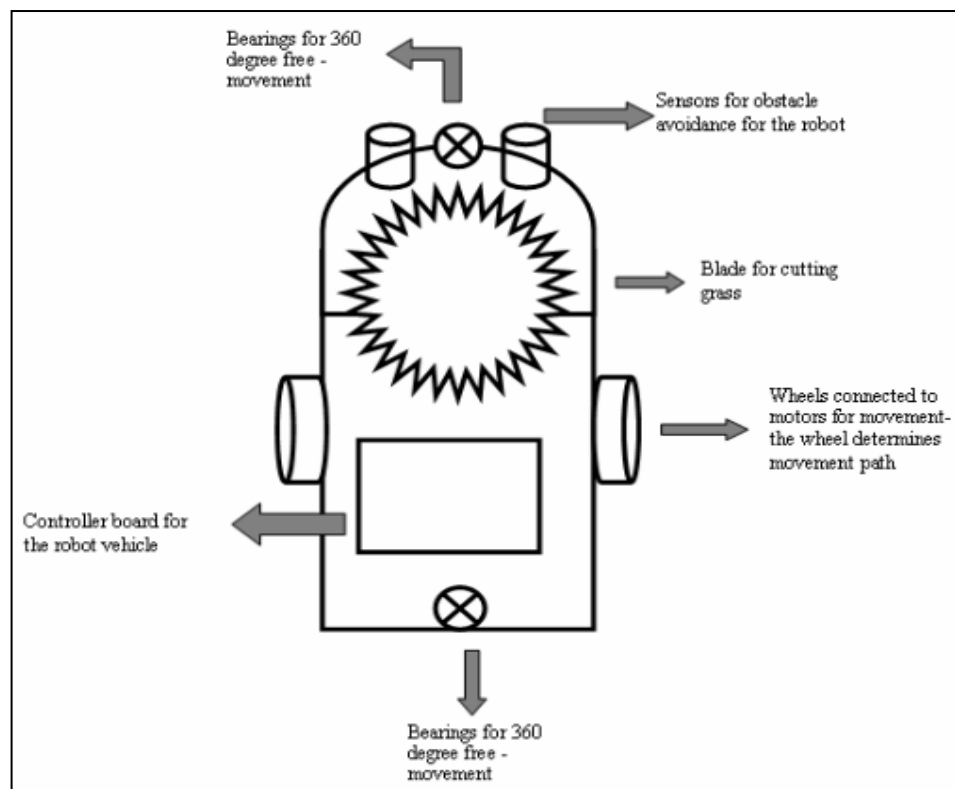

Figure 2.2: The expected Robotic Lawn Mower by student of Petronas University [2]

2.1.3 Comparison between old version lawn mower and other automatic lawn mowers.