UNIVERSITI TEKNIKAL MALAYSIA MELAKA

GSM BASED APPLICATION FOR CONTROLLING WATER SPRINKLER

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's of Electronic Engineering Technology of (Telecommunications) with honours.

by

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the Bachelor's of Electronic Engineering Technology of (Telecommunications) with honours. The member of the supervisory is as follow:

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ABSTRACT

Water sprinkler controlling system is a scientific process of artificially supplying water to the land. Traditionally, they depend on rainfall water that to be supplied to the field either through canals, hand pumps and tube wells. But this method had severe problem such as need to much energy to do pumping process. Hence, water sprinkler controlling system is a method of applying water which is similar to natural rainfall. It is then sprayed into the air and break into small water drops which fall to the ground. Furthermore with the advance of technology it was possible to design system that eliminated the direct involvement of the home gardener with respect to water sprinkler for their plant or yard. Watering the yard or plant by hand is effective and efficient way of applying water to the selected plants. But in several case, it prove that hand watering is not suitable to use for home gardener that always busy with their other work or goes to vacation. So this system which is sprinkler system is one of the solutions that suitable for watering the home garden. This system will use the application of GSM and will be implemented into the system. Global System for mobile communication (GSM) is a standard set used to describe protocol for digital cellular network. This GSM facility serve as important part for controlling water sprinkler system in field and sending the result to the farmer using code signal to a mobile device which indirectly control the entire water sprinkler controlling system. The process and controller work act as a central core for functioning of the automated process after it has been initiated by the GSM based device and finally present the output of the devices.

ABSTRAK

Pemercik air sistem pengawal adalah proses saintifik buatan yang membekalkan air. Pada asalnya, mereka bergantung kepada air hujan yang akan digunakan untuk penyiraman sama ada melalui terusan, pam tangan dan telaga tiub. Tetapi kaedah ini mempunyai masalah seperti memerlukan tenaga yang banyak untuk melakukan proses mengepaman. Sistem pemercik air adalah salah satu cara untuk menyiram tanaman dengan menggunakan air dan sistem ini sama macam konsep air hujan. Air akan disembur ke udara dan akan menjadi titisan air dan menyerap masuk ke tanah. Tambahan pula dengan kemajuan teknologi pemercik ini dapat meringankan beban petani untuk menyiram setiap satu tumbuhan ke satu tumbuhan. Menyiram dengan kaedah tradisional adalah cara yang berkesan dan cekap untuk menyiram ke tumbuh-tumbuhan yang terpilih. Tetapi dalam beberapa kes, ia membuktikan bahawa kaedah ini tidak sesuai untuk digunakan oleh pekebun yang sentiasa sibuk dengan kerja-kerja mereka yang lain atau pergi bercuti dalam jangka masa panjang. Jadi system ini iaitu system pemercik adalah salah satu penyelesaian yang sesuai untuk menyiram tanaman di rumah. Sistem ini akan menggunakan aplikasi GSM dan akan dilaksanakan ke dalam sistem. Sistem sejagat untuk komunikasi mudah alih adalah satu set piawai yang digunakan untuk perihalkan protokol untuk rangkaian selular digit. Kemudahan GSM berkhidmat sebagai bahagian penting untuk mengawal sistem pemercik air di lapangan dan menghantar hasilnya kepada petani menggunakan isyarat kod untuk peranti mudah alih yang secara tidak langsung mengawal sistem pemercik air secara keseluruhan. Proses pembuatan dan kawalan kerja memainkan peranan sebagai pusat utama untuk fungsi automatic selepas ia dimulakan oleh peranti berasaskan GSM dan akhirnya membentangkan pengeluaran peranti.

DEDICATIONS

I dedicate my thesis work to my wonderful family offered me unconditional love and support throughout my life and the course of my Bachelor's Degree in Electronic Engineering Technology of Telecommunication with honours. A special feeling of gratitude is to my loving parents Ramli bin Mahadi and Noraisah binti Aman whose words of encouragement, immense support, and inspiration, selfless sacrifice and push for tenacity always ring in my ears. I also dedicate this dissertation to my friends that never stop support and encouragement to finishing my project.

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LIST OF SYMBOLS AND ABBREVIATIONS

GSM	-	Global System Communication
NC	-	Normally Closed
NO	-	Normally Open
IDE	-	Integrated Development Environment
ICIP	-	In Circuit Serial Programming
SIM	-	Subscriber Identity Module
USB	-	Universal Serial Bus
PMW	-	Pulse Width Modulation
SMS	-	Short Message Services
Wi-Fi	-	Wireless Fidelity
CDMA	-	Code Division Multiple Access
ETSI	-	European Telecommunication Standard Institute
TCP/IP	-	Transmission Control Protocol and Internet Protocol
MoU	-	Memorandum of Understanding
MS	-	Mobile Station
NSS	-	Network Switching Subsystem
RSS	-	Receive Signal Strength
OSS	-	Operation Support Subsystem

IMEI	-	International Mobile Station Equipment
IMSI		International Mobile Subscriber Identity
HLR	-	Home Location Register
VLR	-	Visitor Location Register
ME	-	Mobile Equipment
EIR	-	Equipment Identity Register
AuC	-	Authentication Center
GMSC	-	Gateway MSC
LED	-	Light Emitting Diode
LDR	-	Light Dependent Resistor
LTE	-	Long Term Evolution
RF	-	Radio Frequency
EEPROM	-	Erasable Programmable Read Only
LCD	-	Liquid Crystal Display
WSN	-	Wireless Sensor Network

CHAPTER 1

INTRODUCTION

This chapter introduces the project with its background project, problem statement, project objectives, Scope project, project significance and report organization in order to provide a sense of purpose and reasons to proceed with this project.

1.0 Background Project

In today's technology that currently running with time, it actually occupied human lifestyle. Although there is an interest for technology in our routine lives even someone whose lifestyle is very far away for a well-known technology. But it is the responsibility to design a few reliable systems which can be efficiently used by them. The basic idea gave birth to the project GSM based controlling water sprinkler for illiterates and this need to introduce automation technology in the world.

In Malaysia, agriculture industry stays to be a standout amongst those major commercial enterprises that help at our normal GDP. As stated by a report of Malaysia Investment Development Authority (MIDA), this business opportunity in Malaysia agriculture was the third most contributing sector toward national GDP (Gross household Product) during year 2012. Table 1.1 indicates the sectors that help towards nation GDP.(Nag et al., 2007)

Table 1.1: The contribution of each sector towards Malaysia's GDP

Sector	GDP contribution (%)
Agriculture	7.3
Mining	6.3
Construction	3.2
Manufacturing	27.5
Services	58.6

Technology nowadays brings positive impact toward this specific sector, as stated by farmer, press, precise watering system farmer will have better yield of crops. Under this project, the main point will be the incorporation of technology into the watering system, to make it automated, time saving and to provide accurate watering system. The effectiveness of this automatic watering system can be gauged by how well the system can provide suitable developing growing environment to the plant. This system could save the water utilization to watering system as relay will act as a switch to ensure the valve of the water pump will be closed once the watering plant is completed when get the notification via Short Message Services (SMS).

But in several case the hand watering is not suitable to use because when user needs to go for work or during traveling time who will take place their job to watering their yard? Therefore, researchers tend to make new ideas in ensuring a solution for this problem.

i. The goal of this project is to design and construct a "GSM Based Application for Controlling Water Sprinkler" that will be used as a tool by farmers to irrigate crops or farm. By using this system, it will help them to save water and easy to handle.

ii. The Water Sprinkler Controlling System is a method of applying water which similar to natural rainfall. The sprinkler system will irrigate to one or more control location that will act as output. The Water sprinkler will distributed by high pressure using the impact mechanism of water pump.

iii. The system will generate an instruction in the form of Short Message Service (SMS) to the system when get an instruction from the user. The GSM modem will use to allow the message to be sends to the system. GSM modem is a Global System for mobile communication which accepts a SIM card and operates over a subscription to a mobile. The Arduino UNO board based on the ATmega328P and it will act as a brain of the system that control input as well as the output of the system. The Uno will be programmed using Arduino Software (IDE).

Figure 1.1: GSM Module SIM900A

1.1 Problem Statement

As stated in Risk in Malaysian Agriculture, one of the threats being faced by agriculture sector in Malaysia will be the intense environmental change. The watering system received the bulk of its water supply from natural rain fall which will be influenced throughout dry season and it will affect the crop yield. In order to solve this problem, a watering system that helps to decrease that utilization and make the plant grow healthily should be created.

According to the report from economy planning unit, department of statistic, the total amount of water required for watering system is about 9.0 billion which is high as 78% of total water consumed. As a consequence, some farmers need to fork out RM10 until RM15 to proceed their watering system.

1.2 Project Objective

The main objective of this project which is GSM based water sprinkler controlling system is deeply concentrated on aspect as listed below:

i. To understand the application of GSM in this recent technology.
ii. To implement the application of GSM in water sprinkler controlling system.
iii. To develop the water sprinkler controlling system based on GSM for home garden.

1.3 Scope of Project

This project aim to reduce the usage of water utilized for watering system as well as can saving cost. As previously stated in the issue of inconsistency of water supply for the watering system, hence there is compelling reason to watering system that can helps to save water. Besides, it also helps to reduce the man power needed, as the process of watering the plant is now automated. The main scope for this project is to focus home gardeners that have a small yard at the backyard in their house. Besides, this system suitable for the home gardener that always busy with other work and not have time to watering their yard.

This project consist of Arduino Uno as the microcontroller for the GSM Based controlling water sprinkler, water pump and relay board that will act as a switch to control the water pump. From the observation, Arduino Uno was chosen because it a microcontroller board based on the ATmega328P. It has 14 digital input or output pin which is 6 of them can used as PMW outputs, 6 Analog inputs, a 16MHz quart crystal, a USB connection, a power jack, an ICSP header and a reset button. The GSM will receive the instruction from the user and sends the signal to the Arduino Uno. The Arduino Uno will give an instruction to the water pump and it starting to give a response. Then the sprinkler will initialize and starting to sprinkling a water toward the plants.

For the software development and from study observation the Arduino software (IDE) from Arduino was chosen because it allows serial communication on any of the Uno's digital pins. Besides, ATmega328 also supports TWI and SPI communication. After that, the circuit will be implementing on the prototype. So GSM based water sprinkler controlling system designed is helpful to farmers in controlling water sprinkler using a mobile phone and make their work run smoothly.

This prototype can be test for its performance for the plant when received an SMS to start or stop watering system. The limitation of this project itself is that this project is only suitable for countries like Malaysia but not suitable for country that has 4 seasons. Besides this system is suitable for vegetable plant and not for fruit plant because fruit plant do not need much water during growth period. Lastly this system is only designed for small and middle size of farm.

1.4 Project Methodology

As stated earlier at the objective of this project, the target for this project is to save the consumption of water, manpower and time. Firstly, the problem faced by farmer was identified and solution for this problem must be solved. This process will enable us to combine all the comparison and details about the watering system available in Malaysia and identified the problem.

The specifications required in building the project were listed below:

i. The system has a relay board that will be used to control the water pump and it will initialize the water pump when get an instruction from user.

ii. There are two outputs. Which are the output for user which is water pump and another output from GSM technology (sending the notification message)

iii. For GSM technology it needs GSM module to interface the system.

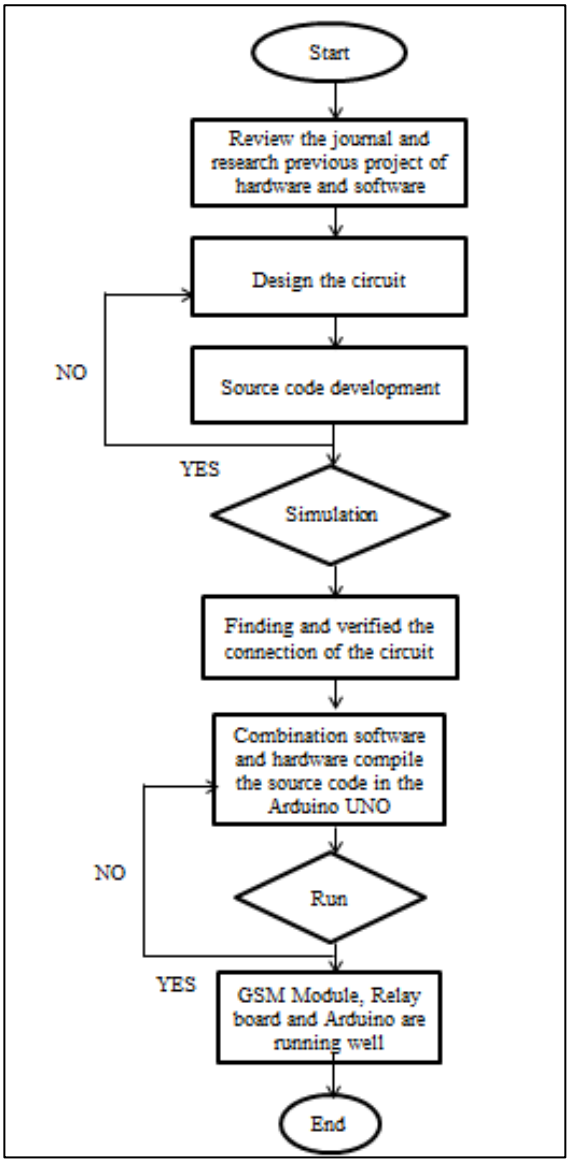

Figure 1.2: Flow Chart

The projects are summarized into the flow chart as shown in figure 1.2. First, search and collect all the information about GSM Based Controlling Water Sprinkler with relay in order to analyze the problem facing for current available product. After do some research, the hardware components and software has been identified. The suitable circuit is searched for assemble well all components in this project. The next step is to design the circuit and the developing of the coding has been done using Arduino. When the simulation is success, the process to verify the connection had been done and the coding are uploaded into the Arduino to identified either the project of GSM Based Controlling Water Sprinkler is functioning or not. After that, the circuit had been testing and complete connection of the circuit had been done. In order to identify either the project is success or not, the circuit is running to observe how the Arduino communicate to hardware built and is it success sending and received a notification message through smart phone.

1.5 Report Organization

This report is divided into five chapters. In chapter 1, an introduction of "GSM Based Controlling Water Sprinkler" is presented along with the project objective and scope in order to achieve the desired goal. While chapter 2 provides a literature reviews on the research of the components that are used in the project. In chapter 3 describe the overall project has been identified along with an explanation of programming and hardware design. The result and discussion will be presented in Chapter 4. Lastly Chapter 5 discusses the conclusion of this project and future work that can be done.