UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SMART AQUARIUM USING GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology Telecommunication (Hons.)

by

NORAZLINA BINTI MOHAMAD

B071210324

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TAJUK: **Smart Aquarium Using GSM**

SESI PENGAJIAN: **2014/15 Semester 2**

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I hereby, declared this report entitled “Smart Aquarium Using GSM” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the Bachelor of Electronic Engineering Technology Telecommunication (Hons.). The member of the supervisory is as follow:

……

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ABSTRACT

The title of this project is " Smart Aquarium Using GSM". This project is about designing an automatic fish feeder using microcontroller Arduino that act as a main circuit which is uses Global System for Mobile Communication (GSM) modem. The owner will send the Short Message Service (SMS) to the GSM dor feeding the fish a required time. In this project, concepts are generated through the research on the existing patents to improve its limitations. The objectives of this project are to implement a system, which uses; Global System of Mobile Communication (GSM) modem for the automatically feeding fish, then to fasilitate an automatic fish feeding in the distance using GSM technology and also to learn and study about GSM modem interface with the main controller to produce a machine that automatically feed fish using ATMEGA328 microcontroller. A brief literature review was done on all the element involved in this system including ATMEGA328 microcontroller, GSM modem and relay circuit. The main scope of work used in this project is creating a machine that will automatically feed the fish at a certain time interval set by user. Then, study the operation of microcontroller and GSM. Next, identify the accurate and stable circuit and also suitable programming and its implementation. At the end of this project is designed and all of the objectives are achived.

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ABSTRAK

Tajuk projek ini adalah "*Smart Aquarium Using GSM*". Projek ini bertujuan untuk menghasilkan sistem memberi makanan ikan secara automatik menggunakan mikropengawal Arduino yang bertindak sebagai litar utama yang menggunakan *Global System of Mobile Communication (GSM)*. Pemilik akan menghantar *Short Message Service (SMS)* kepada GSM untuk memberi makanan ikan pada masa yang diperlukan. Dalam projek ini, konsep-konsep yang dihasilkan adalah melalui kajian tentang konsep yang telah ada dipasaran untuk memperbaiki kelemahan produk tersebut. Objektif projek ini adalah untuk melaksanakan sistem yang menggunakan; *GSM* modem dengan memberi makanan ikan secara automatik. Selain itu, untuk memudahkan pemilik memberi makanan ikan secara automatik pada jarak yang jauh dengan menggunakan teknologi *GSM* dan juga untuk belajar dan mengkaji tentang *GSM* modem yang bersambung dengan mikropengawal untuk menghasilkan mesin memberi makanan ikan secara automatik dengan menggunakan *(ATMEGA328)* Arduino mikropengawal. Kajian latar belakang juga dilakukan pada semua elemen yang terlibat dalam sistem termasuk *ATMEGA328* mikropengawal, modem *GSM* dan litar geganti elektrik. Skop utama projek ini adalah untuk mencipta mesin yang secara automatik akan memberi makanan ikan pada masa tertentu yang ditetapkan oleh pemilik. Kemudian, mengkaji operasi mikropengawal dan *GSM*. Seterusnya, mengenalpasti litar dan progrem implementasi yang sesuai untuk projek ini. Diakhir projek ini, sistem memberi makanan ikan secara automatik dihasilkan dan semua objektif tercapai dengan jayanya.

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DEDICATION

Dedicated to my beloved parents, family and friends, who taught me that the best kind of knowledge to have is that which is learned for its own sake.

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Alhamdulillah I was in contact with many people, researches, lecturers, academicians and friends and also my supervisor in preparing this report. They have contributed towards my understanding, ideas and thought this project. First and foremost, I would like to express my sincere appreciation to my project supervisor, En Abdul Halim Bin Dahalan for encouragement, guidance critics and assistance. This project would not have been same as presented here without their continued support and advice. His willingness to motivate and inspired me greatly to work harder in finishing this project until the end. Besides, I would like to thank the authority of University Technical Malaysia Melaka (UTeM) for providing me with a good environment and facilities to completing the final year project report.

In additional, an honourable mention goes to my families, especially my parents who is given me all the support from various aspects such as money, sprite, and confident level through up this project journey.

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LIST OF SYMBOLS AND ABBREVIATIONS

GSM	=	Global System for Mobile communication
LED	=	Light Emitting Diode
SMG	=	Special Mobile Group
ETSI	=	European Telecommunications Standards Institute
SMS	=	Short Message Service
UART	=	Universal Asynchronous Receiver/Transmitter
GPS	=	Global Positioning System
DTMF	=	Dual Tone - Multi Frequency
GND	=	Ground
AC	=	Alternative current
TDMA	=	Time Division Multiple Access
SIM	=	Subscriber Identity Module
GPRS	=	General Packet Radio Service
MSC	=	Mobile Switching Centre
BSS	=	Base Station Subscriber
HLR	=	Home Location Registers
AUC	=	Authentication Centres
MS	=	Mobile Station

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CHAPTER 1
INTRODUCTION

This chapter to introduce the concept of the project, which is brief a background for the smart aquarium using GSM. Several problem statements, objectives of the project, scope of work also the thesis outline.

1.0 Background

A Smart aquarium using Global System for Mobile Communications (GSM) is not a new system in today's world; it is a machine that allows the user to automatically feed the fish. There are various ways to achieve this goal of allowing the user to control the machine at a distance of feeding fish. As we know, most of the fish feeder uses manual system of fish feeder to their home. This system is inefficient since when the manually system used it need a short distance and need a more time. In order to overcome this problem, a smart aquarium using GSM is used.

The smart aquarium using GSM automatic control system will fully automate the management of fish feeding using the latest systems and technology diffuse. The proposed system of control the motor and turn on the light is using Arduino and GSM modules. The project involves the design and builds a prototype automatic feeder fish for aquarium. For this project, the short message is sent via GSM and will provide directions to the location of the control circuit in the aquarium to work. When user wants to feed the fish, they will send a short message using a smartphone to GSM modem. Then, GSM modem will receive a message and it will give directions to the main circuit to work. Using LED, the lights will be lit at night or in dark conditions when they send a SMS to ON the LED. While, to off the LED user

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must send the message to GSM to OFF the LED. Light emitting diode is a semiconductor device that emits visible light when an electric current passes through it. Short messages can be sent over long distances and makes it easier to feed the fish.

1.1 Problem Statement

In our daily life, electrical devices are very important in order to improve the quality of our life. This project is for users are interested to keep fish in their home or office but did not have time to take care of, or they are concerned to keep asking their neighbours to care for and feed the fish if they are not present or not at home. They always forget to feed the fish because it was too busy and have no time. With this system, user can easily operate the devices without touching the operation button.

1.2 Objective

The main objectives of this project are:

i. To implement GSM technology for the automatically feeding fish.

ii. To facilitate an automatic fish feeding in the distance.

iii. To study GSM modem interface with the main controller.

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1.3 Scope of Project

The scope of this project is to create a machine that will automatically feed the fish at a certain time interval set by the user. In combination with new technologies microcontroller used in this project to control the process to ensure that enough fish food and fish feed in automatically. Then, study the operation of microcontroller into Arduino and GSM module. To make this project more innovation Global System for Mobile Communications (GSM) has been used to control the feeding time to ensure that enough fish food and fish feed automatically. GSM function is to receive a message from the owner to inform the circuit to work to feed the fish food in the aquarium.

1.4 Project Significant

The Automatic fish feeder using GSM is designed to create a machine that will automatically feed the fish and to easier the owner controls their fish feeder at the far distance. Other than that, they also can control the process to ensure that enough fish food and feed is given in automatically. In addition, these projects give the opportunity to people to design the innovation project using Global System for Mobile Communication (GSM) in technology era nowadays.

1.5 Thesis Outlines

The thesis is divided into five chapters and combination of all this chapter that contains and elaborates specific topic such as introduction, literature review, research methodology, result, discussion, conclusion and further development that can be applied in this project.

Chapter 1 basically is an introduction of the project. In this chapter, the main idea about the background and objectives of the project will be discussed. The full design and basic concept of the project will be focused in this chapter. The overview

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of the entire project also will be discussed in this chapter to show proper development of the project.

Chapter 2 is about the literature review and the methodologies for the development of the smart aquarium using GSM. The literature review examined a comprehensive background of other related research works about the hardware and software that should be considered in designing the project. This includes the future project development that can be added in this project.

Chapter 3 will discussed about the design of this project development. In this chapter, it will explain how to create a circuit using Arduino Uno and GSM module. Other than that, this chapter also discussed about the process of this project which is in hardware and software system.

Chapter 4 presents the results and discussion. Simulated and testing results are compared. The experimental verification process is explained with numerical analysis given. The key contributions in this thesis are highlighted.

Finally, some recommendations on further work as well as concluding statement are given in chapter 5.

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CHAPTER 2
LITERATURE REVIEW

In this chapter are the reviews of previous discovery of fish feeder in many journals from various references. This chapter is provided detail description of literature done regarding the project title and the development of automatic fish feeder system using Global System for Mobile Communications (GSM). Besides, this chapter also reviews some components that will be used in this project with some other related studies.

2.1 Global System for Mobile Communication

The GSM system has become the most popular system for mobile communication in the world. Criminals commonly used GSM phones, and it is therefore a need for forensic investigators to understand which evidence can be obtained from the GSM system. With GSM, systems for mobile communication reached a global scale. In the western world, it seems everyone has their own mobile phone, and GSM has taken more and more of the market.

In the beginning of the 1980s several different systems for mobile communications were developed in Europe. The need for a common system that allowed roaming between countries was early recognized. In 1982 a number of European countries created a new standardization organisation called “Groupe Speciale Mobile” (GSM). The term GSM has been chosen as a trademark for the system, meaning “Global System for Mobile communications”, whereas the group within ETSI working with the standards has been renamed SMG (Special Mobile Group). Today GSM is the

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largest system for mobile communications in the world, and exist on all continents [Svein Yngvar Willassen, 2003].

2.1.1 Entities of the GSM System

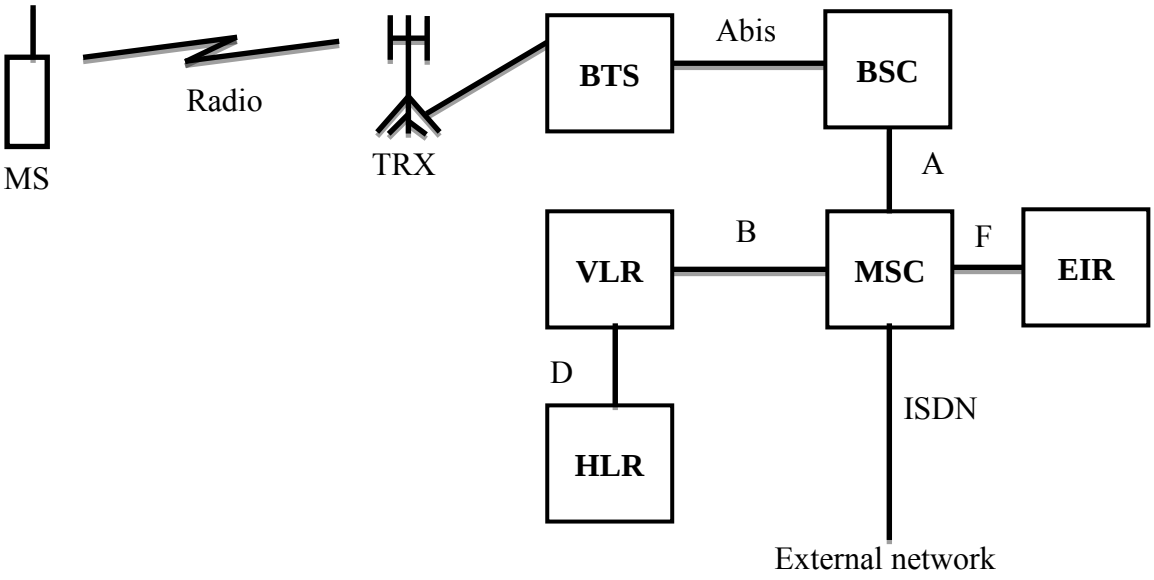

Figure 2.1: Entities in the GSM system

The GSM system consists of a number of separate entities (GSM0302). Figure 2.1 show the entities are connected through interfaces with their own names according to the specifications; these names are shown on the figure.

2.2 Application of GSM Technology

2.2.1 GSM in Agriculture

This project is about GSM based automatic irrigation control system for efficient use of resources and crop planning by using an android mobile. The greenhouse based modern agriculture industries are the recent requirement in every part of agriculture. In this technology, the humidity and temperature of plant are precisely controlled. It makes very difficult to maintain the uniformity at all the

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places in the farmhouse manually. Global System for Mobile Communication (GSM) is used to inform the user about the exact field condition. The information is passed onto the user request the form of SMS. Drip irrigation is artificial method of supplying water to the roots of the plant. In this project, user communicates with the centralized unit through SMS to any information. The centralized unit communicates with the system through SMS which will be received by the GSM with the help of the SIM card. The GSM sends this data to ARM7 which is also continuously receives the data from sensors in some form of codes. This enables users to take advantage of the globally deployed GSM networks with its low SMS service cost to use mobile phones and simple SMS commands to manage their irrigation system. It will be possible for users to use SMS to monitor directly the conditions of their farmland, schedule the water needs of crops, automatically control watering and set control operational conditions in accordance with the water needs of crops. This will help minimize overwatering and crop production cost. Other than that, the pump switching system was tested for functionality using a simple code to perform on-and-off operation of the LED. The functionality of GSM was tested by connecting it to the microcontroller board which was programmed to turn on-and-off an LED using SMS from a mobile phone. In addition, the system supports water management decision, which determines the controlling time for the process and monitoring the whole system through GSM. (Pavithra D. S, and M. S. Srinath, 2014)

2.2.2 GSM Based Irrigation Control System

Figure 2.2 is show the block diagram of the irrigation control system and it shows the function for each block. The connections between the two mobiles are done using GSM. The GSM module and microcontroller are connected using UART (universal asynchronous receiver / transmitter). Global System for Mobile Communication (GSM) is used to inform the user about the exact field condition and the information is passed onto the user request the form of SMS. (Pavithra D.S, and M.S. Srinath, 2014)

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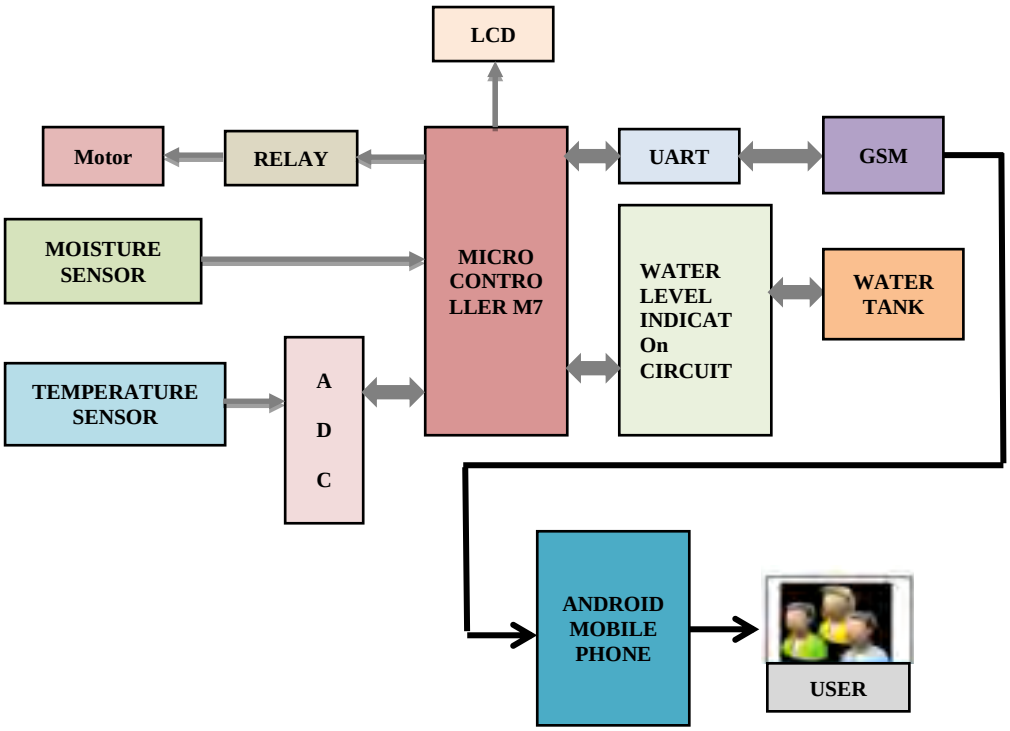

Figure 2.2: Block diagram of the irrigation control system

2.2.3 GSM Based Control System for Electrical Appliances

This project is presents the development and implementation of Global System for Mobile Communication (GSM) based control system for electrical appliances that enables the complete control of the interface on which it is based. GSM module was used for receiving short message service (SMS) from user's mobile phone that automatically enable the controller to take further action like switching ON and OFF electrical appliances such as fan, air-conditioner and light. The system was integrated with microcontroller and GSM network interface using C language which is MPLAB software was utilized to accomplish the irrigation. The system is activated when the user send the SMS to the controller at home through GSM. Then, the microcontroller unit automatically controls the electrical appliances by switching ON or OFF the devices according to the user's order. (Oke A.O., Emuoyibofarhe J. O, and Adetunji A. B., 2013)

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