Faculty of Electrical and Electronic Engineering Technology

Smart Goat Feeder With SMS And Android controller

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Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours

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Smart Goat Feeder With SMS And Android controller

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A project report submitted
in partial fulfillment of the requirements for the degree of
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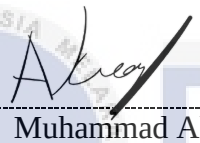
2021

DECLARATION

I declare that this project report entitled “Smart Goat Feeder With SMS And Android controller” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

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APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours.

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Date : 11 Januari 2021

Signature :

Co-Supervisor :

Name (if any)

Date :

DEDICATION

To my beloved mother, Nor Asidah Binti Osman,my beloved father, Mazlan Bin Shoib
And my supervisor, Mr Muhammad Fareq Bin Ibrahim

ABSTRACT

Taken care of goat is a hard job for shepherd, especially during feeding time. So, this project proposes that an automated machine that can be used to feed the goat is needed to ease the shepherd. The title for the project is Smart Goat Feeder With SMS And Android Controller. This paper will presented problem that arise that make the shepherd needed to have this machine. Many shepherds especially in Malaysia still uses traditional way of feeding the goat as not many machines design for goat feeding purpose. So, this project was design to make almost fully automated food distributer that will distribute the food to the food tray so that goat will eat the food there. The project also designed to be able to coordinate with android application that can connect with the Arduino, the brain of the system for control purpose. In other words, the user can setup the machine using only their smartphone. Other purpose for the project is to be able receive notification about the food shortage through SMS medium. This will make the shepherd to have less worry as the machine able to monitor the food capacity in tank. With the help of this machine, the productivity of the goat produce will increase, thus making the shepherd happy and satisfy.

ABSTRAK

Menjaga kambing adalah pekerjaan yang sukar bagi pengembala, terutama semasa waktu makan. Oleh itu, projek ini mencadangkan agar mesin automatik yang dapat digunakan untuk memberi makan kambing diperlukan untuk mengurangkan keresahan pengembala. Tajuk untuk projek ini adalah Mesin Memberi Makan Kambing Pintar Bersama SMS dan Alat Kawalan Android. Laporan ini akan mengemukakan masalah yang timbul yang membuat pengembala perlu memiliki mesin ini. Banyak pengembala terutamanya di Malaysia masih menggunakan cara tradisional untuk memberi makan kepada kambing kerana tidak banyak reka bentuk mesin untuk tujuan memberi makan kambing. Oleh itu, projek ini dirancang untuk membuat mesin pengedar makanan hampir automatik yang akan mengedarkan makanan ke dulang makanan di mana kambing akan memakan makanan di sana. Projek ini juga dirancang untuk dapat berkoordinasi dengan aplikasi android yang dapat berhubung dengan Arduino, otak system bagi projek ini untuk tujuan kawalan. Dengan kata lain, pengguna boleh melaksanakan pelarasan terhadap mesin hanya menggunakan telefon pintar mereka. Tujuan lain untuk projek ini adalah untuk dapat menerima pemberitahuan mengenai kekurangan makanan melalui media SMS. Ini akan menjadikan pengembala kurang risau kerana mesin dapat memantau kapasiti makanan di dalam tangki. Dengan penghasilan mesin ini, produktiviti kambing akan meningkat justeru, memberi kegembiraan kepada pengembala.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Mr Muhammad Fareq Bin Ibrahim for their precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) for the financial support which enables me to accomplish the project. Not forgetting my fellow colleagues, for the willingness of sharing their thoughts and ideas regarding the project.

My highest appreciation goes to my parents, and family members for their love and prayer during the period of my study.

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LIST OF SYMBOLS

%	-	Percentage
V	-	Voltage
Kg	-	Kilogram
Hz	-	Hertz(frequency)
KB	-	Kilobyte
%	-	Percentage
V	-	Voltage
Kg	-	Kilogram
cm3	-	Cubic centimeter
sec	-	second

LIST OF ABBREVIATIONS

SMS	-	Short Message Service
UTeM	-	Universiti Teknikal Malaysia Melaka
IDE	-	Intergrated Development Environment
GSM	-	Global System For Mobile Communications
I/O	-	Input And Output
RAM	-	Random Access Memory
PLC	-	Programmable Logic Control
PIC	-	Programmable Interface Controller
ROM	-	Read-only Memory
LED	-	Light Emitting Diode
SRAM	-	Static Random Access Memory
EEPROM	-	Electrically Erasable Programmable Read-only Memory
DC	-	Direct Current

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will introduce the general background of the Smart Goat Feeder With SMS and Android Controller. This chapter also will show problem statement that can be used as source of inspiration for the project. Other than that, objective and scope and limitation will be also shown in this chapter.

1.2 Background

Nowadays, many people have migrated from traditional ways of living to the modern lifestyle. The uses of technology such as electrical and electronic devices are widely utilize by humans regardless how hard the job that needs to be done. Since the industry revolution era hit the world, a lot of innovation were created in order to help humans in their chores. Some of the aspects that the industrial revolution had bring to a new light are agriculture, communication, education and stock breeding.

As all other aspects are important, stock breeding in particular, have been something that is crucially needed innovation in order for us, the consumer to have not only healthy food but also can enjoy quality meat. To have that kind of meat, the things that we needed to look into the way the stock is eating. One of the major types of animal that breed and taken care by stock breeders also known as shepherd as stocks is goats.

In order to make sure all goat eating well, not only shepherd, but researcher, technologist and other experts have been constantly thought of the ways to take care of the goat's meal. Go back to early humans' civilization, the feeding of the goats only involving the shepherd to let the goat eat anything edible by them such as grass, fruits even the tree barks. Day by day, decade by decade and century by century, the civilization getting expanded, and so does the way of feeding goat also become little by little changes

throughout all those times. Humans now develop a lot of nutritional food that delicious and healthy for the goats. Even though the kind of food feed for the goat is changing but the way of shepherd feeding them, especially in Asian countries like Malaysia still using the traditional ways of serve them which is more onto labour works that hard on the shepherd themselves.

Figure 1.1:Shepherd Feeding The Goats With Grass Using Traditional Ways

Figure 1.2:shepherd Giving Hays Towards The Goats Inside A Barrel.

The Figure 1.1 and Figure 1.2 shows that the goats is serve the food in a traditional ways which will need an improvement.

1.3 Problem Statement

Feeding the goats is one of the jobs that needed to be done by the shepherd. It is crucially to feed all the goats that the shepherd taken care equally. But, to do that, the shepherd needed to spend more times and energy in feeding them. Usually, the shepherd will take half to one hour if they take care of the goats themselves to feed all the goats. The time of eating for each goat depend on their age. Normal adult goats only needed to be served only 1kg up until 2 kg of food while the milkers which is the goat that serve milk to the infant needed up to 3.5 kg of food daily. The time needed to serve all this food vary with the behaviour of the goats themselves. If active, the food time for them should be 2 to 3 times a day while for the unactive goats needed to be serve 1 time to 2 time per day only.

For the shepherd, the daily intake of the food for the goat will make them even more exhaust as they not only needed to take care of the goat's meal but also the well being of those animals such as cleaning the barn or the pens, doing daily health check-up and keeping the goats from running away. Not only the time and energy will be taken a lot from the shepherd, but the hygiene of the food serve will be in high risk of being spoiled. This is because the interaction of shepherd outside of the pen will affect the food given by them thus leading towards the animals to be sick since they are very delicate.

Through those statement from above, the researcher for this BDP project believes that the innovation is needed in order for the shepherd to take care of the food for the goats better as we are reaching an era that solve those kind of problem in a creative and meticulous ways possible.

1.4 Objectives

At the end of this project, there is a few objectives that must be achieved. For automatic goat feeding machine with SMS and android controller these projects are able to:

1)Design and develop an automatic goat feeding machine with SMS and android controller

2)Analyse the distribution feeding amount and cycle for the automatic goat feeding machine

1.5 Scope of Project

In order to achieve the objectives of this project, there are several scopes that had been outlined to be focused on. This project will use Blynk application to create an app to control the system, Arduino Uno microcontroller as the main brain for the system will be programmed inside Arduino IDE, GSM module to make sure that it can connect to application and sending message notification to the user. This is to allow the project to be relevant to the industrial 4.0 where most machines are automatic.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

To understand the project better, a lot of research required which could be found from many resources. In this chapter, necessary topic that relatable towards the research of the project will be discussed. Inside this chapter also will be shown the rough knowledge of the system and devices that will be used to realise the project.

2.2 Type Of Goat Food

One of the most important in taking care of a goat and any farm animal is the food that their taker's feed. Goat just like cow like to eat grass. By just eating grass or hay (dried grass), the goat and other farm animals will not gain enough nutrient and become less productive. Inadequate nutrient supply to livestock especially during scarcity period is a matter of concern (Balwinder, Brar, Verma, Kumar , & Singh , 2019). So, in this topic, the type of nutrient that that the goat and possible other farm animals needed and being feed nowadays will be shown.

2.2.1 Alfalfa Pellet

Alfalfa or its scientific name, Medicago sativa is a type of plant that has low-calorie and nutrient-dense type of food. According to (Ensminger , 1992),alfalfa as a meal is rich in protein, mineral and vitamin. So, many shepherds had turn to this as the extra nutrition needed for the goat. To make the food became easy to obtain and easy to handle, the alfalfa plant had been manufactured to pellets for control the dietary of the goats. The alfalfa pellets will make the goats and any farm animals to produce less waste. Besides the alfalfa pellets provide dust and mold-free which is good for older animal that have problems with their teeth.

Figure 2.1: Alfalfa Pellet

2.2.2 Grass Hay Pellet

Since the grass and hays is the synonym food for goats, the manufacturer has develop pellets from this particular resource to make shepherd to be able to gives the goats that same taste as the normal hays and grass. But not many goats exited towards the grass or hay pellet compared towards forages (Nieman,2020). But there are still towards the liking of this type of pellets.

Figure 2.2: Fresh Grass Pellets and Dried Grass Pellets

2.2.3 Sweet Feed Pellet

This type of nutrient supply is a combination of whole grain pellet with molasses. The addition of molasses will make goat becomes obsessed as it is become sweet. This proves that not only human like sweet thing, so does animals. The molasses added towards this pellet will gives iron and sugar which is good for the growth of the goats. The goats also can be train using this type of extra nutrient such as during check-up, milking and even making them easily to call for feeding time (Sartell,2016).

Figure 2.3: Molasses Pallets

2.3 Current Method Of Goat Feeding

The method of feeding is a very important topic regarding the research as it will gives insight on how the shepherd nowadays feeding their goats whether it is hard or easy and how it will affected the time and energy spend by them.

2.3.1 Manual Feeding

This type of feeding method is being done by giving the food towards the farm animal using manual labour. This method actually widely done practically by many shepherds just like most shepherd in Malaysia**.** This type of method utilises the stall which

is the place of stay and sleep for goats and place the barrel on the outer stall for goat to eat. This is done when the shepherd low on source that the goat is mainly known for rearing gradually but the demand for the feed for the goat is higher especially for someone who has many goats (Shinde, & Sejian,2013). Besides, this type of stall feeding reduce the headache of the shepherd to take care of them as the shepherd knows what the type is of food they eating compared to traditional ways of goat farming (reddy,2018). This included the harmful substance that contain on normal pastureland as many farmers tend to use pesticide towards the grass and many plants to remove bugs. This will also allow shepherd to overseer their goat with ease as they not moving out of their stall during feeding hours.

Figure 2.4: Stall Feeding For Goats.

2.3.2 Automatic Feeding

The era of technology does not only affected our personal lifestyle and make it easier, but it also helps the animal farmer by easing the feeding of their livestock. This type of feeding system required the uses of machine to provide feeding automatically. This method developed in order to ease the burden of shepherd that need to take care of their farm animal that keep growing that will give the taker higher workload. So in order to reduce working time and other workload, growing farms has starting to automate the feeding system (Oberschätzl et al.,2009). The use of automation is said would reduce the time of work to feed the farm animals to 25% and decrease the usage of manpower but

will gives higher profit as the bigger the farm size the larger the demand for meat and all other product according to (Nisha, Sonam, Pratiksha, Preety, & Saban, 2019)

Figure 2.5: Automatic Feeding Machine System

2.4 Current Feeding Machine Available On Market

The uses of machine in dairy farm is getting popular as it ease the shepherd in handling their workload. So many companies have develop their various type of feeding machine for this purpose.

One of the machines used in feeding is GEA Automated Feeding Machine with WIC Technology. This type of feeding machine is develop by the GEA company which specialize in creating feeding machine. This feeding machine allow the customer to set ingredient and volume and delivery time using WIC software. WIC can be accessed using pc or smartphone to keep tab on machine.

Figure 2.6: GEA Automated Feeding Machine With WIC Technology

Figure 2.7: Lac-Tek Auto-Feeder

Another one would be Lac-tek auto-feeder. This type of feeding machine develops by premier1supplies. This feeding machine not feeding food but milk towards the infant goat. The milk produced using the mixed of milk powder and warm water automatically. Then it will flow through the tube that the goat can drink from it.

Figure 2.8: Triolet Feeding Robot

Last but not least, Triolet feeding robot. This type of feeding machine is develop by the Triolet company, one of the leading companies in creating machine regarding to the animal farming. This feeding robot travelled on wheel and power by battery will feed the goat at required time setting inside the robot. The robot can navigate itself toward the destination as long as there is induction wire or transponder on floor.

2.5 Microcontroller

Microcontroller is a component that is very important in any automated machines and devices. According to (Lutkevich,2019), it is a compact integrated circuit which designed to command specific operation in embedded system. It mainly consists of processor, memory and input/output(I/O) peripherals in a single chip. The processor work as the brain of the devices which perform many processes for the instruction put on the microcontroller. The memory part work to store data from the instruction and I/O processes for the processor to process that data. While the I/O peripherals which is the input and output device that act as interface or gate for the processor connected towards outside world such as printer, monitor and sensors.

2.5.1 History Of Microcontroller

According to (John,2013), during the time period between 1970 and 1971, when the Intel corporation developing their own microprocessor ,the first microcontroller was design also Gary Boone, an engineer at Texas Instrument using that same idea of microprocessor that can work to handle many instructions independently. This was TMS1802NC. This microprocessor contains 5000 transistor and provided 3000 bits of memory for program and 128 bits of RAM(Random Access Memory). This microcontroller was initially created to be used as the circuit to build a calculator then develop more to work in many other devices that we have seen nowadays such as PLC system and also Arduino.

Figure 2.9: First Microcontroller Created By Gary Boone Which Is Named As TMS1802NC

2.5.2 Type Of Microcontroller

There are abundance types of microcontroller build by many companies. Some of them are like 8051 microcontroller which develop by Intel Corporation used in robotics and automobile, PIC microcontroller which develop by Microchip Technology that uses in plc programming system and Atmel AVR series which also from the same company as PIC microcontroller being used in many Arduino integrated circuit system (Shidling,2020).

Table 2.1: Basic Specification For Three Different Microcontrollers On Market

	8051	PIC	Atmel AVR
architecture	Has 8-bit CISC (complex instruction set computer) architecture	Has 13-bit RISC(reduced instruction set computer)architecture	Has modified version of 8-bit RISC(reduced instruction set computer) architecture but some has 32-bit
ROM	4 kilo bytes	2 mega bytes	256-bytess -1 kilo bytes EEPROM
RAM	128 bytes	256-4096 byte	512 bytes -2 kilobytes
I/O pin	32 pins	16-72 pins	8-100 pins

advantages	• Low time required for performing operation. • The processor chips are very small, and flexibility occurs. • Due to their higher integration, cost and size of the system is reduced. • The microcontroller is easily to interface additional RAM, ROM and I/O ports. • Once microcontrollers are programmed then they cannot be reprogrammed. • At the same time many tasks can be performed so human effect can saved. • Without any digitals parts it can be act as microcomputer. • It is easy to use, troubleshooting and systems maintain is simple.	• PIC microcontrollers are consistent and faulty of PIC percentage is very less. • The performance of the PIC microcontroller is very fast because of using RISC architecture. • When comparing to other microcontrollers, power consumption is very less, and programming is also very easy. • Interfacing of an analog device is easy without any extra circuitry.	• Lower in price • Easy to use. • Readily Available • Have vast community (Tutorials, resources, forums etc) • Have different types of boards depending on your needs. • Have abundance of different Peripherals. • Easy to program • Extensive detailed datasheets • Easy to set up. • Onboard memory
disadvantages	• The microcontroller cannot interface high power devices directly. • It has more complex structure as compared to microprocessor.	• The length of the program is high due to using RISC architecture (35 instructions).	• Single source: only available from Atmel. • Power: Atmel AVRs have fairly low power
	• It only performed limited number of executions simultaneously. • It is generally used in micro equipment.	• One single accumulator is present and program memory is not accessible	

applications	automobile, aeronautics, space, robotics, electronics, defence application, mobile communications, rail transport, industrial processing, and medical applications	peripherals, audio accessories, video games, plc and etc	Automotive, peripherals, Arduino and etc

2.5.3 Arduino And Its Type

Arduino is one of the open-source electronic platform that have easy to handle hardware and also software. This type of platform uses Atmel AVR as part of its integrated circuit hardware. This type of device can be used to read input such as sense light and pressing button to activate an output such as switching on LED and moving motors(Administrator,2016). This type of integrated circuit board can connect to many I/O to perform a variety of programme and instruction. Example of devices uses Arduino is line sensor robot and security system.

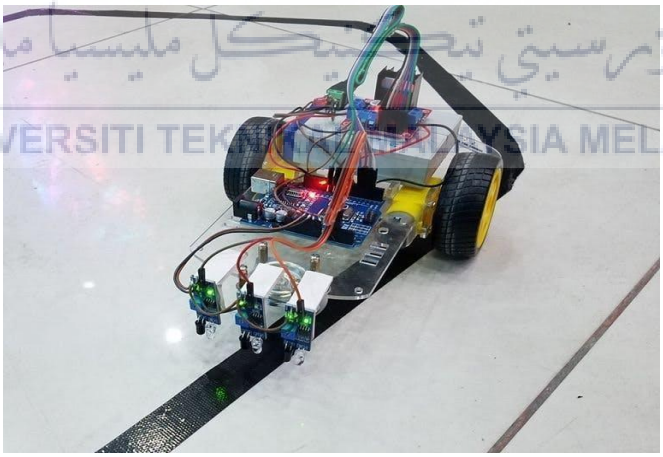

Figure 2.10:Line Following Robot

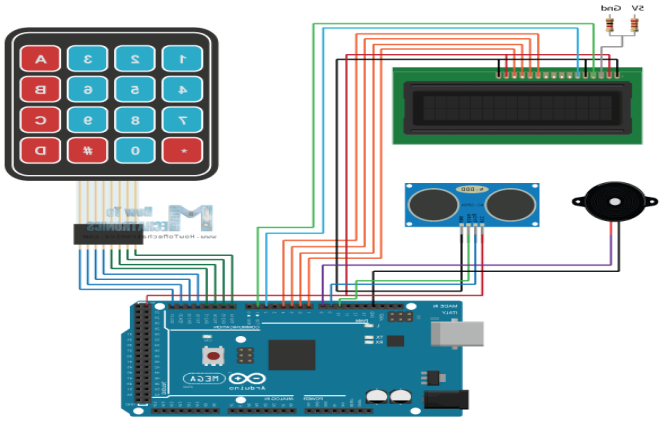

Figure 2.11: Security System With Alarm

Some of the of the famous Arduino that many people use are Arduino UNO, Arduino Mega, Arduino Due and Arduino Nano. The specification can be found on Table 2.2.

Table 2.2: Table Of Specification Of Four Famous Arduino

	Mega	Due	UNO	Nano
Size	biggest	bigger	smaller	smallest
Microcontroller used	Atmega2056	ATSAM3X8E Cortex-M3	Atmega328	Atmega328
Frequency	16Megahertz	84Megahertz	16Megahertz	16Megahertz
Program memory	256kilobytes	512kilobytes	32kilobytes	32kilobytes
EEPROM	4kilobytes	-	1kilobytes	1kilobytes
RAM	2kilobytes	96kilobytes	2kilobytes	2kilobytes
Digital I/O	54+12 PWM channel	54	14	14
Analog I/O	12 analog input and 2 analog output	16	6	6
Power operates	5V	3.3V	5V and 3.3V	5V and 3.3V

2.6 SMS(Short Message Service)

All people who have mobile phone regardless of its model will not escape from getting message that notify renewing the credit from service provider when the credit is nearly expiring date. SMS is a technology that can send message in text form over wireless network. This type of technology allows 160 characters message to be send wirelessly but for other type of language such as Chinese or Arabic only 70 characters are allowed (Triggs,2013).

2.6.1 History Of SMS

According to (Erickson, 2012), Friedhelm Hillebrand and Bernard Ghillebaert develop the SMS concept during 1984 with the Franco-German GSM cooperation. According to (Chan, 2018), SMS was designed to allowed information to travel from one point to another. It uses store then forward to allow message been send if the phone is shutoff or out of connection. In this case, the message will be receive after the phone get connectivity or turn on again. This type of service used signalling link technology to allow the SMS to be able to receive by recipients even during receiving or done the call. Plus, the local service, weather and traffic information even nation warning can be realize through the broadcast of the SMS like the SMS about Covid-19 by the MKN.

2.6.2 GSM Modules

In order to be able to send SMS, a specific technology is needed and that is the GSM module. GSM which stands for Global System for Mobile Communications is a device that allow establishment of microcontroller and also mobile device's network. The GSM is referred as second generation digital cellular network or else known as 2G. Design as chipset that work to transfer data from one place to another, it needed a larger device to place that particular chipset which is GSM modem. The modem works is to modulate and demodulate the signal in order to perform connectivity allowing a gate to be open for data to transfer (Administrator,2017). There are many GSM module been

created just like the previous microcontroller as to keep fulfilling the demand of rising network provider day by day which keep expanding.

2.6.3 Famous Brand Of GSM Modules

The first GSM module to be discussed was M95FA.This type of GSM module was develop by Quectel wireless solution which one of the top leading company that supply networking devices. With a size of 19.9 × 23.6 × 2, this GSM being recognised as one of the tiniest quad-band GSM modules. It also able to withstand extended temperature range and also it power consumption is super low. To allow the firmware to be able update, this GSM also has built-in unique QuecFOTATM technology. Serial multiplexer, integrated TCP/IP protocol stack and enhanced AT commands was also Built-in to make sure reliable and fast transmission of SMS, voice and data via GSM/GPRS network. Besides, the functionality of the application will be able to be extended without adding cost. This GSM able to perform an array application such as Industry PDA, VTS, Wireless , POS Personal Tracking, Smart Metering and many other M2M applications.

Figure 2.12: Quectel M95FA GSM Module

The second GSM module to be discussed was SIM800.This type of GSM module had been develop by S*IMCom* Wireless Solutions Co.,Ltd which is a global leading company that focussing on creating M2M(machine to machine) wireless module. It also can supports CS-1, CS-2, CS-3, and CS-4 GPRS coding schemes .It has one UART port and a single USB port to make sure firmware can be update and debugging purposes. To allow voice interface to be used, voice channel also being installed .SIM800 has one SIM

card interface. It integrates TCP/IP protocol.AT(assistive technology)allow the GSM to be controlled through simple command through UART interface. It can be used for making calls, sending/receiving messages, sending/receiving data over the internet, etc. This makes it useful for applications such as, home automation, security and agriculture technology, etc.

Figure 2.13: SIMCom SIM800 GSM Module With Connection Board

Table 2.3: Specification And Differences Of M95FA GSM Module And SIM800 GSM Module

	M95FA	SIM800
Size	19.9 x 23.6 x 2.65 mm .	24 x 24 x 3 mm
Supported Frequency Band	850,900,1800,1900MHz	850,900,1800,1900MHz
Operation heat range	-35 to 80 C	-40°C to 85°C
Power consumption	3.3V to 4.6V	3.4V to 4.4V
Firmware upgrade	UART port	Main serial port/ USB port
Supported phonebooks	SM,ME,FD,ON,MT	SM,FD,LD,RC,ON,MC
Supported SMS service	Text and PDU mode only	MT, MO, CB, Text and PDU mode

2.7 Android Controller

Android controller is a type of software that can be uses to connect microcontroller or any machine using a medium device which is smartphone. This type of software can integrate to any android based smartphone to control the operation embedded inside a microcontroller such as Arduino. An android is an operating system inside many smartphones such as Samsung, Realme, Vivo etc.

2.7.1 Robot Control Design Using Android Smartphone

This journal, (Mrumal, Javed, Aaroushi , Reshma, & Raunak, 2015) discussed on designing a robot that can be controlled using android based mobile phone. The author uses Bluetooth feature to run the control over robot remotely. The control of the robot will be integrated using microcontroller as the system brain. The robot will be using DC motor and the android controlling software will interact with the microcontroller to move the motor. To be able to just connect the robot with the controller a proper android controller application that can make Bluetooth connection precisely needed to be used according to the author.

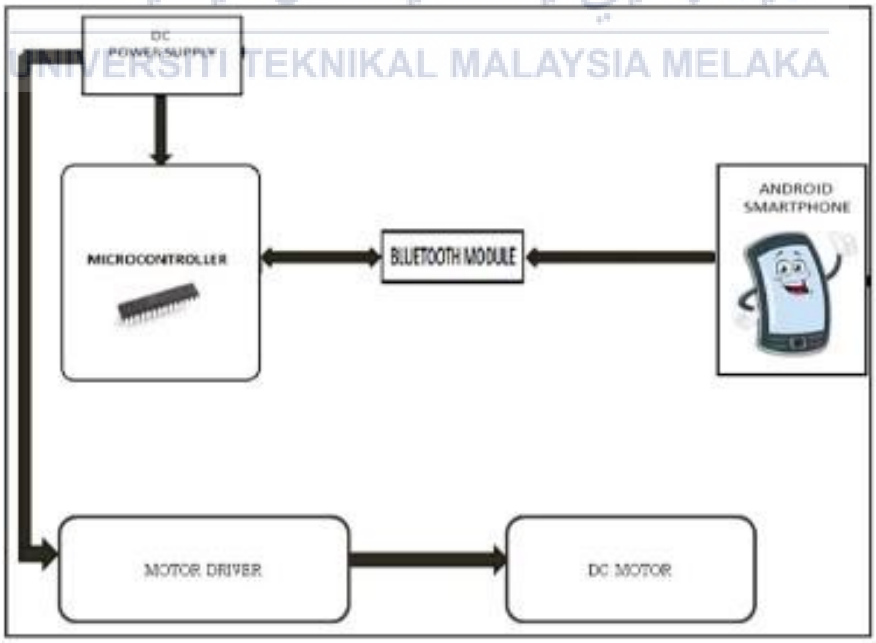

Figure 2.14: System Operation Block Diagram (Mrumal, Javed, Aaroushi , Reshma, & Raunak, 2015)

The robot that designs by the author is a vehicle like robot which in the shape of skateboard required the android controller software to control the speed of the skateboard robot whether to accelerate or decelerate. When the acceleration command being pressed on smartphone, the motor will turn faster but when the deceleration command being pressed, the motor will turn slower. This show that the speed of the motor can be readjust to suite the person who controlled it.

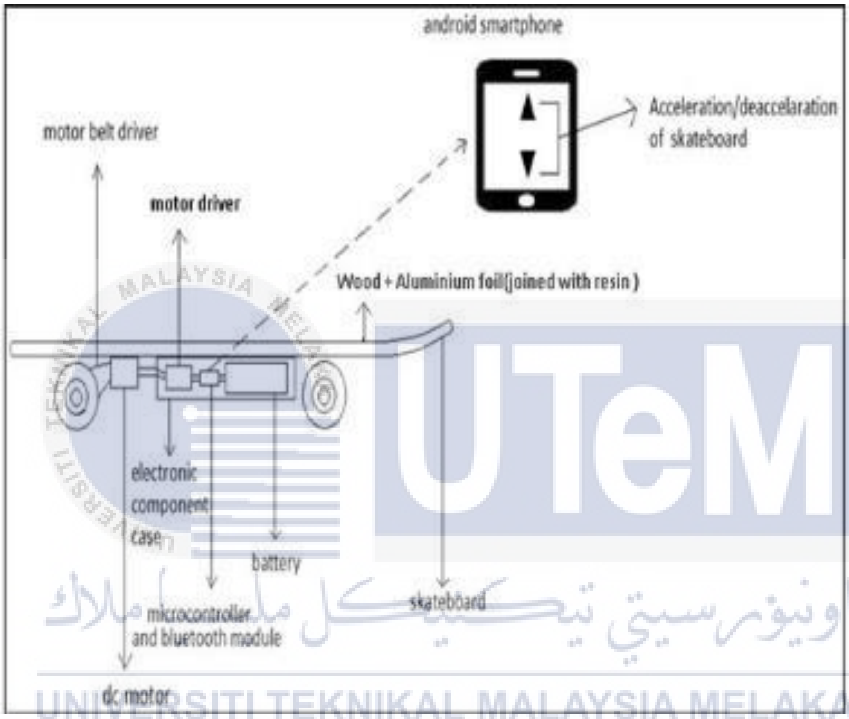

Figure 2.15: Skateboard Robot Design (Mrumal, Javed, Aaroushi , Reshma, & Raunak, 2015)

2.8 Motor

Motor is a very important for machine in automation as to make the automation move required motor to function. Motor is a device that turn electrical energy to mechanical energy. The motor applies electromagnetic concept in their operation as the motor will move when the force is exerted when electricity is being flow into the motor.

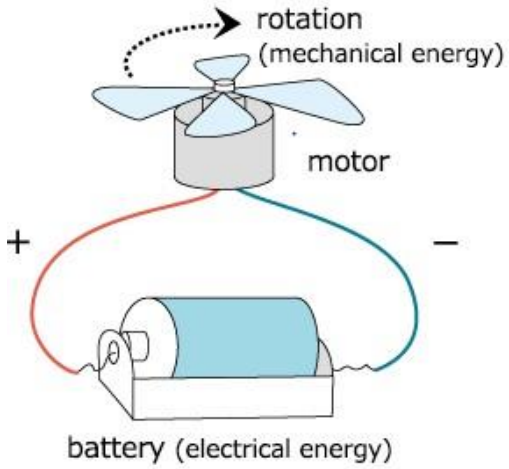

Figure 2.16: Principle Of Motor

2.8.1 History Of Electrical Motor

According to (Arnett,2020), the first electrical motor was invented by Thomas Davenport in 1834. This motor is being used by him to make a small-scale printing press power-up. Then, on 1886, fully functional DC motor was born that can run at constant speed which develop by Frank Julian Sprague. This motor invention was the pioneer for many motors that can power up a large operation. On 1887, one of the famous scientists, Nikola Tesla design and invented the first AC motor which could run for longer time than DC motor. During 1891, a three-phase induction motor was developed by General Electric company.

2.8.2 Motor Component

In all motors, there are three important component which is rotor, commutator and stator.

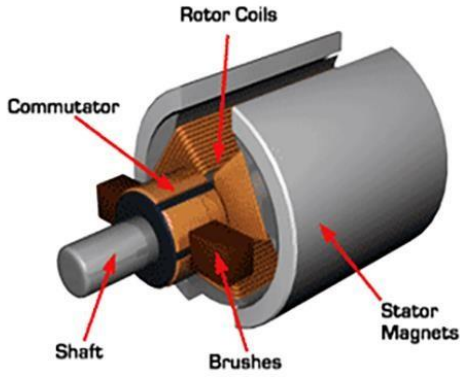

Figure 2.17: Basic Motor Component (Collins,2019)

Table 2.4: Description Of Motor Component

Component	Description
Stator	This type of component is a stationary part inside the motor which is a magnet (Bethel, Tyler, Jordan, kailyn, & Jason, 2018)
Rotor	This type of component is a rotatable part of a motor. Place on the motor axle that can move that is at the inside of the stator (Bethel, Tyler, Jordan, kailyn, & Jason, 2018)
Commutator	This type of component act as a connecter bridge with current source and rotor. Commutator function is to keep reversing the current flow into rotor that that allow the rotor to keep spinning . Opposing force of magnetic and electromagnetic that produce from current flow inside the rotor will push the rotor to move (Bethel, Tyler, Jordan, kailyn, & Jason, 2018)
Power source	The power source supply electrical power towards the motor(Bethel, Tyler, Jordan, kailyn, & Jason, 2018)
Brush	this type of component allows electricity to flow into commutator to provide electromagnetic force to the rotor (Bethel, Tyler, Jordan, kailyn, & Jason, 2018)

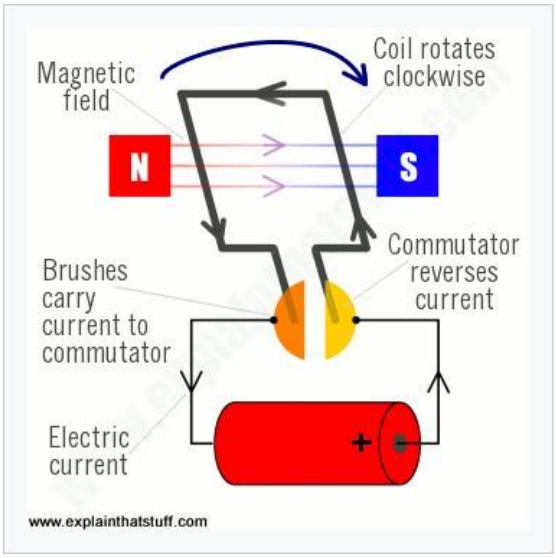

Figure 2.18: Basic Motor Operation(Collins,2019)

2.8.3 Type Of Motor

2.8.3.1 DC Motor

This type of motor is most common use in many devices and machines. There are two type of DC motor: Brushed and Brushless.

Brushed DC motor can be found in in anywhere such as house appliances, toys even laptop cooling fan. This is because it is one of the simplest motors to build and controlled. This type of motor uses metallic brush as a connecter for electricity to flow into commutator. The commutator will rotate alongside rotor to make a reverse current flow. During rotation, the commutator will keep contacting the brush and friction will happen. This is not a very good as the more the friction happened, the heat will pile up the reduce the efficiency of the brush as they will worn up. The friction of the brush also causes audible noise to produce. This is one of the reasons this motor is one of the cheapest one. This type of motor is still good as the torque produce is high for low speed (Helen,2019).

Brushless DC motor uses almost the same operation as its counterpart, but it does not require metallic brush to do the job better. This type of DC motor changes the rotor that is uses coil as its rotating base to magnet and stator is using coil unlike its counterpart

that uses magnet. The reversal of component placement still allows the motor to be function as before because it's still using same principle. This type of upgrade version of DC motor will not cause pile-up heat that can cause spark besides the no presence of noise. This motor is very efficient as the they can keep achieving maximum rotational torque. Therefore, this motor is pricier than brushed one. Other than that, some of these motors are difficult to controlled and need specialized regulator (Helen,2019).

2.8.3.2 Stepper Motor

Stepper motor is a motor that move slowly but precise and in discrete step. Since the move precisely, they can be finding inside many devices than need precision such as printers, security camera and etc. this type of motor uses controller system to sends the electric pulse to driver which interpreting this pulse and send necessary voltage to the motor which make the motor to move accurately with fixed angle increments. This motor work like the DC brushless motors but in smaller step unlike the latter that can move faster. This type of motor does not only precise in its positioning but also in its speed control. Stepper motor can achieve maximum torque in low speeds which is less than 2000rpm. But the downside of this motor is that they will produce some noise during running and achieve less torque during high-speed which make this type of motor does not suitable for machine that need to have higher speed. Compared to DC motors, this motors consumption of current is very high as they always consume maximum current which resulted is less efficiency (Helen,2019).

2.8.3.3 Servo Motor

Precises motion control can be available with the help of the servo motors. This motor consists of DC motor which rotate at high rpm and produce low torque. But, inside the servo motors, arrangement of gears is present to change the motor operation to become low speed but high torque. The arrangement of gears is plastic in many servos but there are some that uses metal which is for higher and heavier workload. The motor also contain encoder which is a positional sensor on the final gear which use to move the rotor to final position if error happen. This motor can achieve high torque with speed more than

2000rpm which is suitable for high-speed operational devices and machines. There are two type of servo motor: positional rotation servos and continuous rotation servos (Helen,2019).

Positional rotational servo motor is used in small-scaled project widely where only a normal positioning needed. This servo motor can only rotate maximum of 180 degrees of range with no speed control and gradual rotation (Helen,2019).

Continuous rotational servo motor does not have limit to degrees of rotation and can move clockwise or anti-clockwise at speed can be change (Helen,2019).

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, the methodology of the goat feeding system with SMS and android controller was discussed and clarify in detail. In this chapter also will introduce the component that will be used in the project.

3.2 Progress Flowchart

This project started its journey with literature review. A lot of online journal and article studied to get a lot of idea on fulfilling the project objective: design and develop an automatic goat feeding machine with SMS and android controller. Then, the project development continues with the creating the circuit for the project through simulation. Through the simulation, the design for the hardware can be establish better. The next step would be developing the project by integrating both hardware and software. After that, the project will undergo testing to identify problems of the project. Finally, the analysis of the system is done to fulfil the next objective of the project which is to analyse the goat feeding machine with SMS and android controller. Every project process is shown on Figure 3.1.

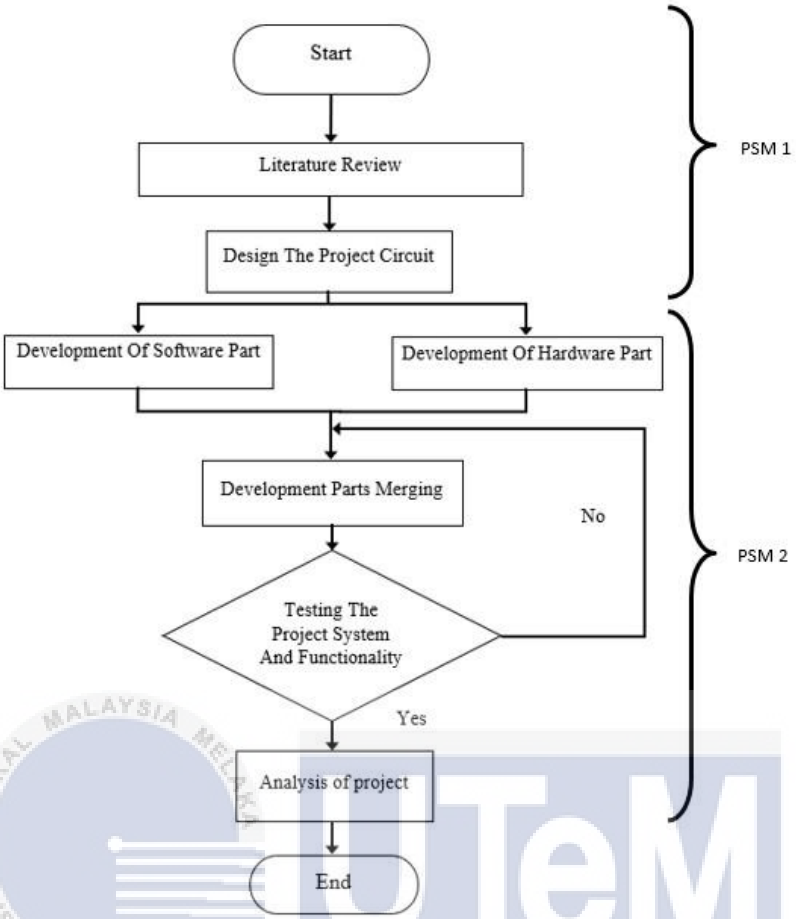

Figure 3.1: Flowchart Of Project Development

3.3 System Design And Architecture

In order to realize the project, a system is needed to be designed to suit the project purpose. The flowchart in Figure 3.2 shows the system that needed to design based on the purpose of the project which is to feed the goat automatically and notify the users if the food in the tank is shortage.

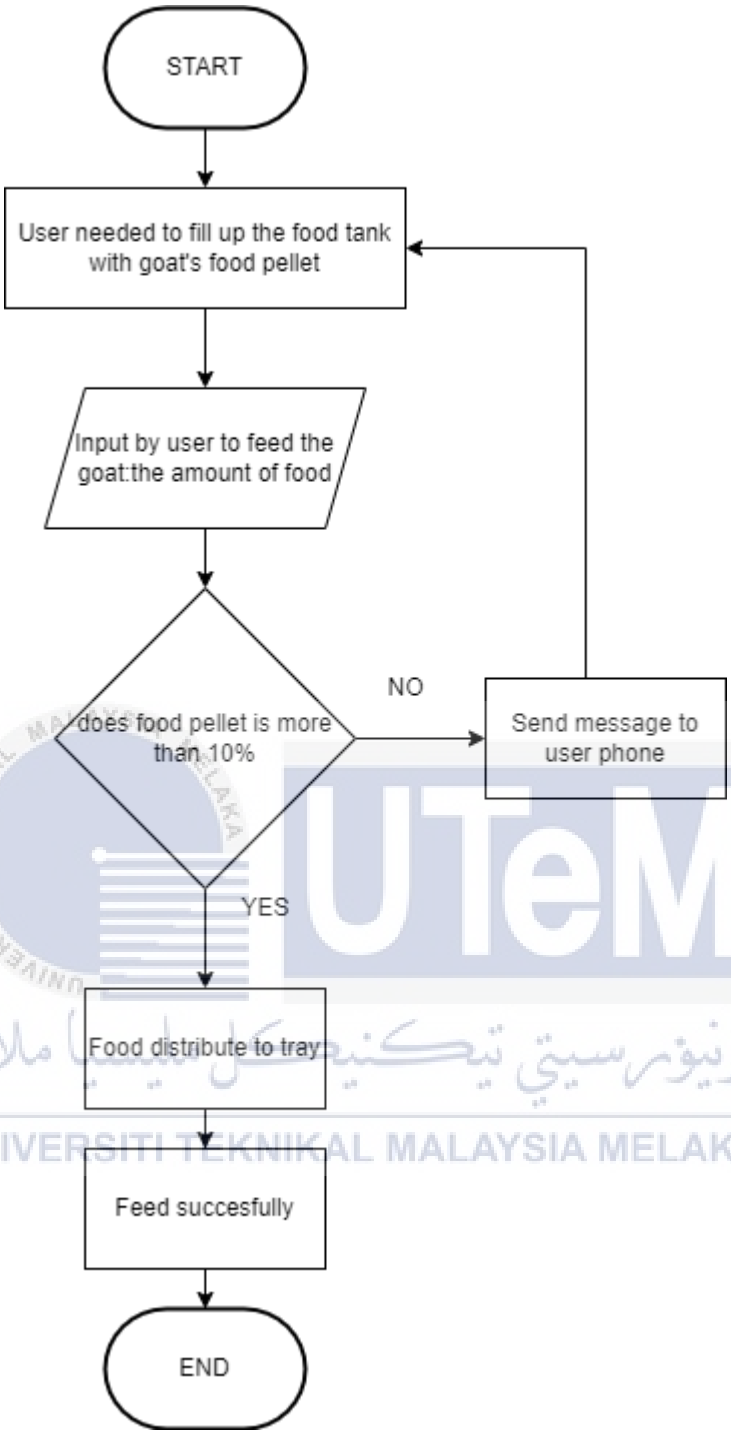

Figure 3.2: Automatic Goat Feeder System Flow

For the architecture of the system, Figure 3.3 showed all the component connected to realise the system in Figure 3.2. The main component for the goat feeder system would be a microcontroller in the form of Arduino Uno. The proximity sensor will be programmed within the Arduino Uno microcontroller to detect the goat foods, whether available or not. To make sure data can be transferred through connective device, GSM

module is used. An application that can provide interface and also allow users to control the goat feeder will using GSM module to communicate with the Arduino. The goat feeder will only operate after receiving command from the Arduino.

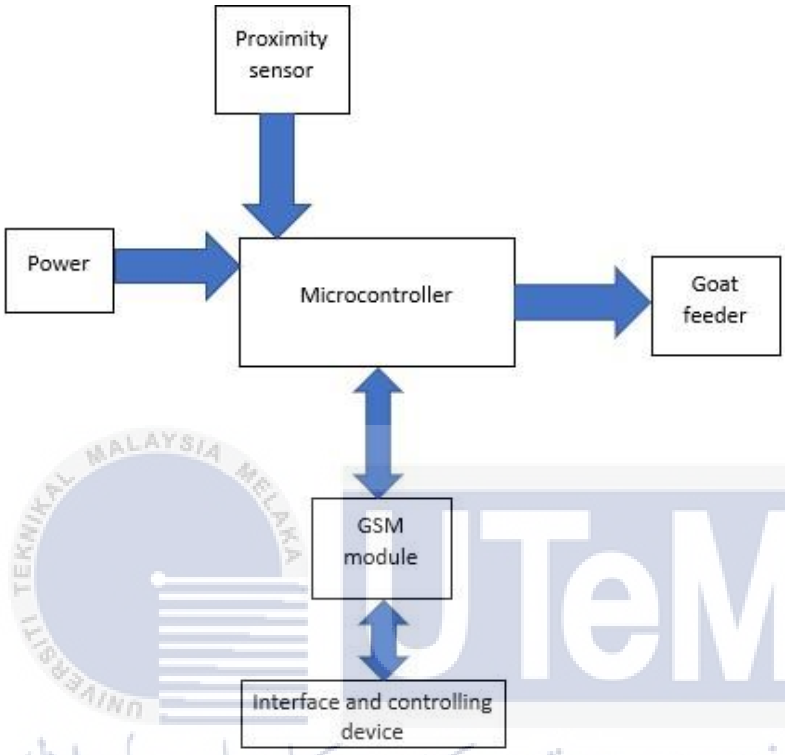

Figure 3.3: Automatic Goat Feeder System Architecture

3.4 Technology Implemented In Project

3.4.1 Arduino Uno

Arduino uno is one of the famous components uses in any project. It is microcontroller board that can be used to integrate with many items like sensor, motor and many others. It can be programmable that allow it to receive information and give command that relatable to the information. The reason this microcontroller board famous because it provided open-source platform for all sorts of people indulging in exploring Arduino. This component act as brain for the project.

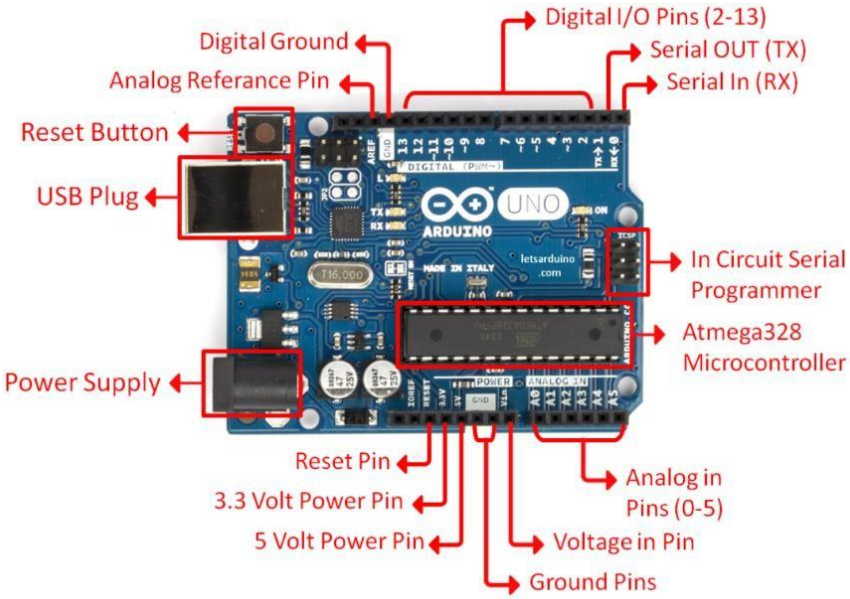

Figure 3.4:Parts Of Arduino Uno

Table 3.1: Arduino Uno Specification

microcontroller	Atmega328P
Digital I/O pin	14(with 6 can also act as PWM pin)
Analog pin	6
voltage operates	5V and 3.3 V
Input voltage(suggested)	7 V to 12V
DC current for I/O pin	20mA
DC current for 3.3V pin	50mA
SRAM	2KB
EEPROM	1KB
Flash memory	32KB
Clock speed	16MHz

3.4.2 Arduino Software

Just having Arduino is not enough to operate any system. Yes, Arduino indeed can integrate with many components for communicate with but without the software to programme the microcontroller board, nothing will happen. Arduino software which is named as Arduino IDE is a platform to put programme inside the Arduino board for the system to operate. This software uses its own programming language, but it is based on

C++ programming language. This software will be used to program the Arduino with the integration of many other components.

Figure 3.5: Arduino IDE Interface

3.4.3 SIM800L GSM Module

SIM800L GSM module is small in size which make it easier to place in any project but still gives the same function as any of its kind which is to be connecting two devices from far away, sending message, for IOT purpose and many more. This type of component used to send message to phone if food is less inside tank and act as connector for android controlling app.

Figure 3.6: SIM800L Front And Back

Table 3.2: SIM800L GSM Module Specification

Frequency band	Quad-band(850, 900, 1800, 1900)
pinout (12 main pin)	• Antenna(NET) • Power supply(VCC) • Reset(RST) • Receiver(RxD) • Transmitter(TxD) • Ground(GND) • Interrupt(RING) • Sleep mode(DTR) • Microphone(MIC) • Speaker(SPK)
Operating voltage(from external)	3.4V to 4.4V(with 2A surge)
Power source	External(Li-Po battery or DC-DC buck converters with rating of 3.7V,2A)
Baud rate	1200bps to 115200bps
antenna	external

3.4.4 Servo Motor

Servo motor is a device that can rotate only 180 degrees with precise coordination. It can integrate with Arduino so that, the user can programme to obtain desired rotational position. Small but produce a high torque allow this type of motor uses in many projects required precise rotational coordinate that the users want and also powerful force. This component used as door for distributing food.

Figure 3.7: Servo Motor

3.4.5 Ultrasonic Sensor

Ultrasonic sensor is one of the proximity sensors and needed to integrate with device like Arduino to function. This type of sensor able to detect any object that within its sensing range. This type of sensor uses reflecting wave(transmitter send wave to object and bounce back to receiver) to calculate distance between the sensor and object that being sense. This means, this type of sensor able to detect whether the object is close to it or not. This component will be used as food detector to detect food inside tank.

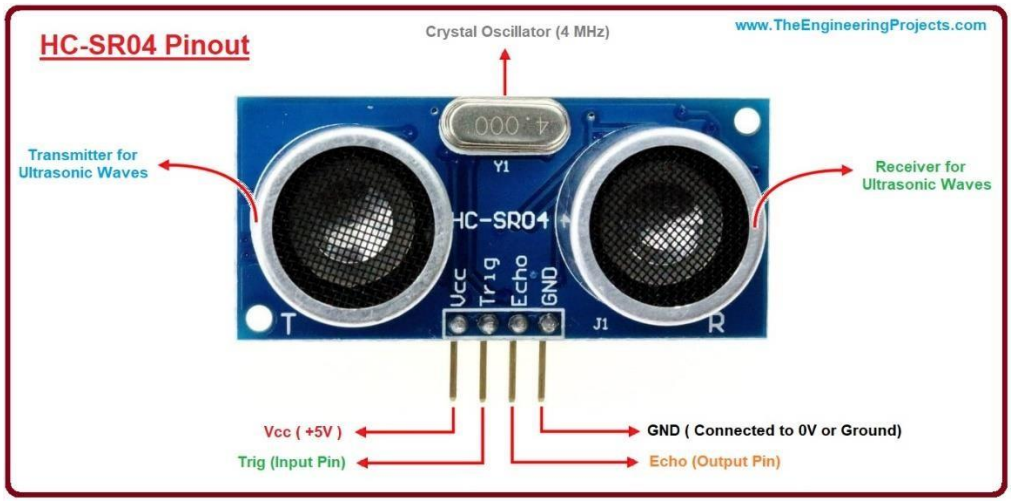

Figure 3.8: Ultrasonic Waves

3.4.6 Android Controller

Android controller is a type of technology that can be used to control IOT devices. It uses android as a platform to connect devices like Arduino microcontroller and able to control component that integrate with the Arduino such as sensors, motors and many more. Many controllers integrated with android technology through the software applications inside the android phones and tablets. One of the most famous applications used to create an android controlling interface and application is Blynk app. This software will be used to create application for controlling and monitoring the feeding machine.

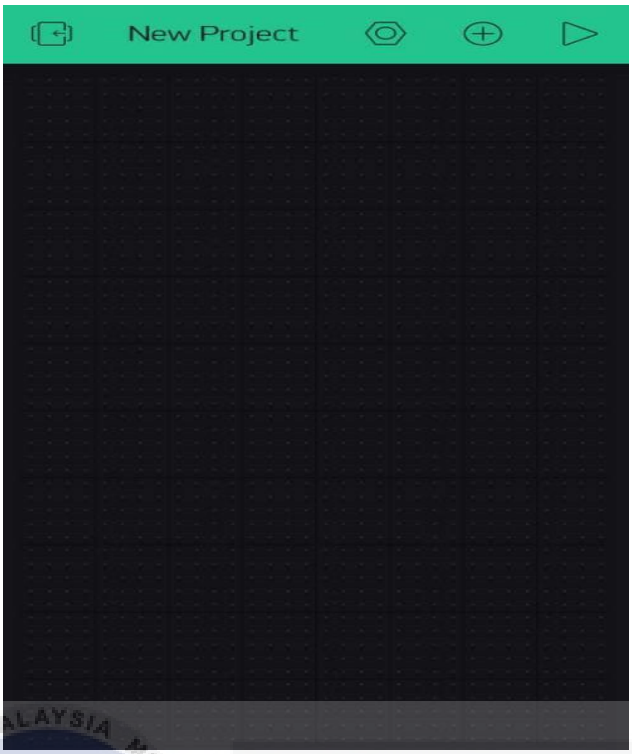

Figure 3.9: Blynk App Interface

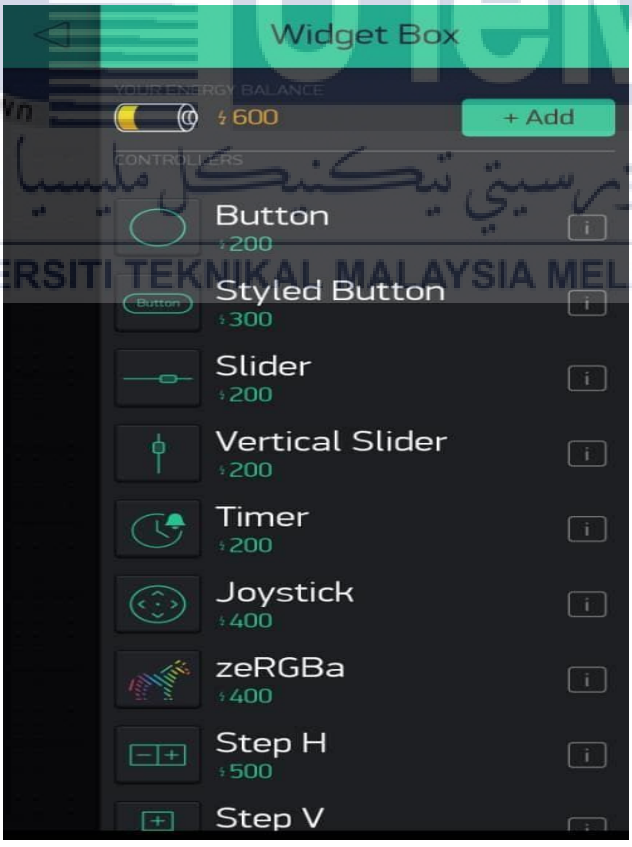

Figure 3.10: Blynk App Tool For Android Controller

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

In this chapter, the overview of the proposed project which included the both the hardware and the software construction. The project will go through a lot of testing and also troubleshoot in order to get various data for analysis purposed to ensure the project is successful.

4.2 Hardware And Software Construction

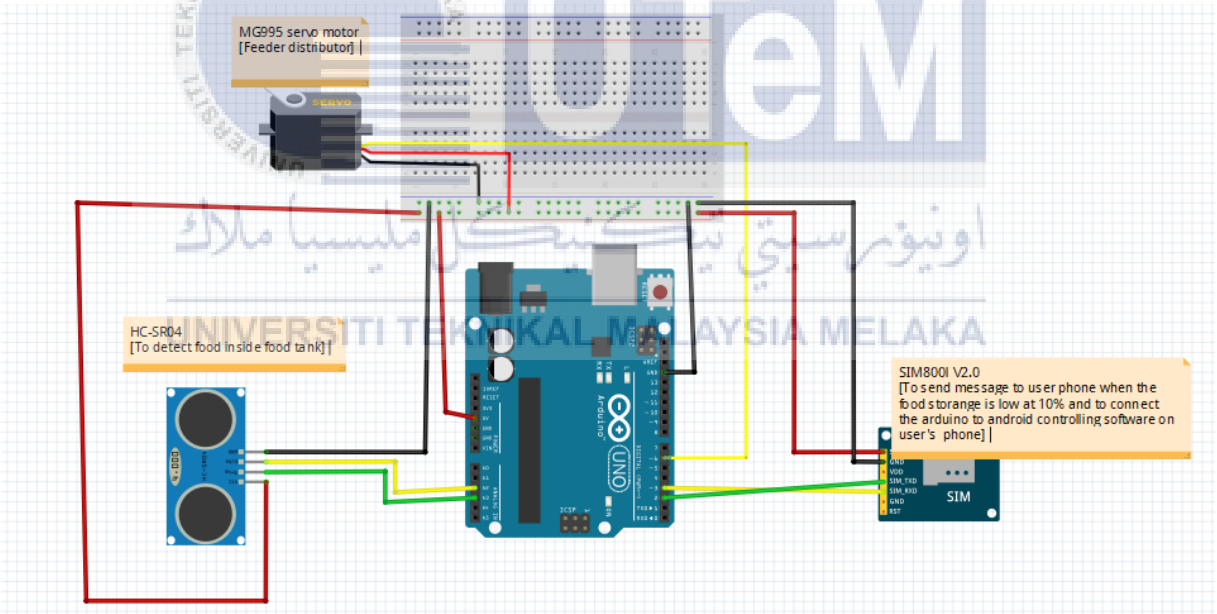

Figure 4.1: Circuit Design

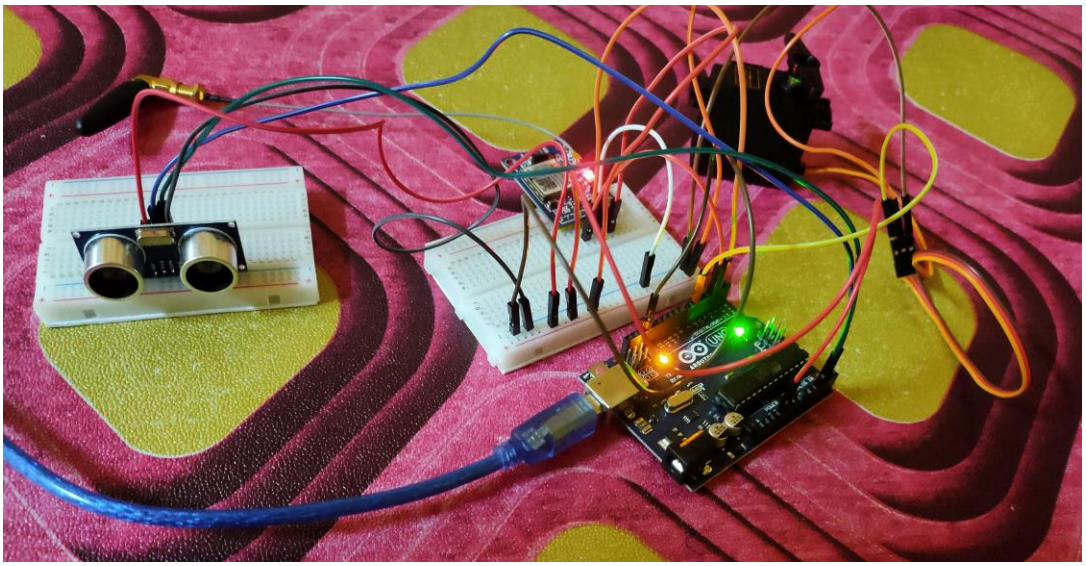

Figure 4.2: Circuit Hardware

Table 4.1: Circuit Pin Placement

Component	Component pin symbol	Arduino pin connected	description
SIM800L	VCC	5v	Power supply connected to Arduino 5V pin
	RXD	3	Receiver pin
	TXD	2	Transmitter pin
	GND	GND	Ground connected to Arduino ground pin
HC-SR04	VCC	5V	Power supply connected to Arduino 5V pin
	TRIG	A3	Trigger pin(transmitter)
	ECHO	A2	Echo pin(receiver)
	GND	GND	Ground connected to Arduino ground pin
MG995	VCC	5V	Power supply connected to Arduino 5V pin
	PULSE	6	Controller pin(to control servo motor)
	GND	GND	Ground connected to Arduino ground pin

Table 4.2: Hardware And Software Component

No	Component	category	quantity
1	SIM800L GSM module	hardware	1
2	HC-SR04 ultrasonic sensor		1
3	MG995 servo motor		1
4	Arduino Uno		1
5	Arduino IDE	software	1
6	Blynk application		1

The project should follow the connection of the circuit design in Figure 4.1 as shown in Figure 4.2. One ultrasonic sensor used to detect food inside tank. This is to allow the motor to be only turn on when the food is presence and turn off when no food detected.

Figure 4.3: The Placement Of HC-SR04 Inside The Cover Of Tank

Next, one of the MG995 servo motor will be used as door to distribute food from the tank to the trays as shown in Figure 4.4. During feeding time, the servo motor should rotate to open the door from the container to distribute food to the tray as shown in Figure 4.5. The amount of food filled in tray will be set by the users.

Figure 4.4: The Placement Of MG995 Servo Motor On Top Of Distribution Pipe

Figure 4.5: The Operation Of Motor To Open Distribution Door

The SIM800L GSM module is used to connect users' phone to the Arduino to be able to monitor the food and able to control the food distribution quantity and time. The GSM module will be sending message to user when the food inside tank is less than 10% capacity.

Figure 4.6: The Placement Of GSM SIM800L Top Of The Tank

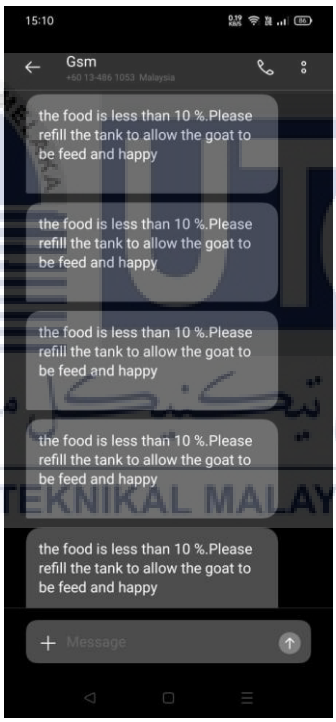

Figure 4.7: Message When The Food Is Lower Than 10% Of Its Capacity

Other function of GSM is to connect with the phone to allow control and setup over the feeding machine. This is done through the Blynk application. Through this application that, users can monitor the amount food inside tank. the user also can manually turn on the motor for feeding purpose by pressing the button.

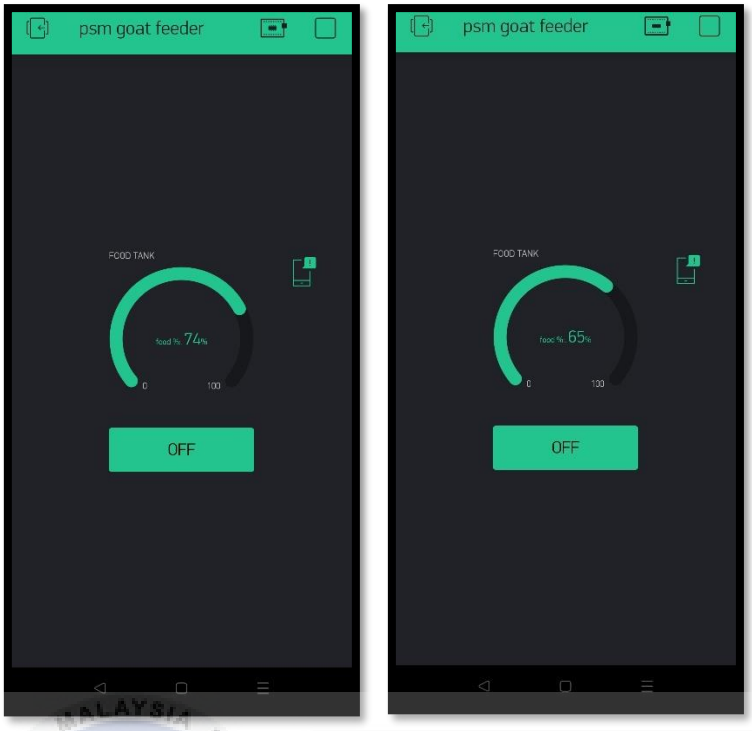

Figure 4.8: User Interface Inside The Blynk App

The final assemble of the product that shows the overall position of the component and also the design of the product prototype can be refer to Figure 4.9.

Figure 4.9: Final Product Appearance

4.3 Testing And Analysis

This part will dig deeper on the test and analysis that done to obtain required data necessary for the project. The analysis that done is included the food distribution test for the different landscape and food distribution test for determination of cycle.

4.3.1 Landscape Food Distribution Test

This test is done to check whether different landscape will change the outcome of the food distribution. Two different landscape was chosen which is the stable and also non-stable landscape. The result for the test is shown on the Table 4.3 and Table 4.4.

Table 4.3: Stable Landscape(1 Sec Opening)

Testing Number	Volume of food(cm3)
1	118
2	115
3	117
4	120
5	119
6	119
7	119
8	117
9	118
10	119

Table 4.4: Unstable Landscape(1 Sec Opening)

Testing Number	Volume of food(cm3)
1	124
2	121
3	120
4	117
5	118
6	119
7	119
8	117
9	119
10	119

Based on the results, the average volume for Table 4.3 is 118.1cm3 while for Table 4.4, the average is 119.3cm3 which is almost the same. The volume at the first four test shows quite different value between Table 4.3 and Table 4.4, but the rest tests shows the the value is almost the same for both tables. This proves that the different lanscape does not really change the volume of food distribute.

4.3.2 Food Distribution Test

This test is done to check whether different opening time affect the amount of food distribution to require the number of times the food can be distribute before empty. The result of the test is shown on table 4.5 and Table 4.6.

Table 4.5: Food Distribution For 1sec Opening

No of food distribute	Volume of food(cm3)
1	120
2	107
3	101
4	95
5	85
6	70
7	76
8	75
9	75
10	83
11	85
12	25

Table 4.6: Food Distribution For 2sec Opening

No of food distribute	Volume of food(cm3)
1	310
2	290
3	250
4	150

Based on the result shown on Table 4.5 and Table 4.6, there is large different between the number of times the food can be distributed and the amount of distributed food that caused by the opening time of the distribution door. For the 1 second opening, the amount of food distributed is small and this allow the food to be distributed for a lot of time compared when the door is opening for 2 second which distribute higher amount of food but also reduced the cycle of distribution.

Through comparing the results for the two-opening time, final cycle of distribution of the food can be which shown on Table 4.7.

Table 4.7: Cycle For The Time Of Opening

Time of Opening(sec)	Cycle Of Feed
1	12 (Ideal=11)
2	4

From the result on Table 4.7, The ideal time of tank opening should be 1 second as it allows for more cycle with good amount of food which gives the lesser losses. The ideal cycle feed should be only 11 cycles rather than 12 because the last cycle is less than 10 percent of the food maximum quantity which is 1KG or equivalent to 1000cm3. The 10 percent of the maximum quantity of food is 100cm3 and the last cycle for 1 sec opening is 25 which less than 100cm3.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the conclusion will be summarising the all the chapter regarding the project. The future recommendation also will be added for the purpose of enhancing the project.

5.2 Conclusion

The time of the hardship of the shepherd taken care of goat's meal will be reduce with the introduction of feeding machine that will reduce time and workload. The world of IOT is very large as it expands to the animal farming aspect. This thesis main point is to introduce the integration between technology of IOT with the feeding method to produce a smart feeding machine that can run automatically and sending information in the form of message to the owners about the problems that occur such as less food in the tank. This thesis purpose also to introduce the method to monitor and control the machine from distance using android controlling technology in the form of application inside android mobile phone. All, the purpose has been proved through the creation of the prototype of the feeding machine with suitable analysis. To conclude, this thesis able to introduce the idea regarding the smart feeding machine with SMS and android controller that should be a huge help to the shepherd and animal farmers.

5.3 Future Work Recommendation

The creation of this product surely gives a great help for the people involved in animal agriculture. Despite that, ideas of improvement are a good thing to take a look at as the efficiency of the project can be increase. Some of the recommendation is such as:

- Using alarm during feeding time to call the goats for feeding.

- Adding more feeder distributor which is the door that will open to distribute the food. This is useful when a shepherd has many animals and require many trays.
- Build a better software or application to allow shepherd to customize themselves about the automatic food feeder whether about cycle or about amount of food distribute and only the owner able to access the automatic food feeder.

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APPENDICES

Appendix 1 Gantt Chart PSM 1

Gantt Chart PSM 1															
Week / Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Briefing								MID SEMESTER HOLIDAYS							
Workshop 1 PSM 1															
Discuss project with SV															
Workshop 2 PSM 1															
Update Report project															
Chapter 1: Introduction															
Chapter 2: Literature Review															
Chapter 3: Methodology															
Chapter 4: Results And Discussions															
Chapter 5: Conclusion															
Prepare Slide, Video and Recheck Report															
Presentation PSM 1															

Appendix 2 Coding Prototype

```
#define TINY_GSM_MODEM_SIM800
#define BLYNK_PRINT Serial
#include <TinyGsmClient.h>
#include <BlynkSimpleTinyGSM.h>
#include <SoftwareSerial.h>
#include <Servo.h>
SoftwareSerial SerialAT(2, 3);
TinyGsm modem(SerialAT);


char auth[] = "cu-NPLyIf8q_eV-7wZq1rvuIhzVq16YR";
char apn[]  = "celcom3g";
char user[] = "";
char pass[] = "";

BlynkTimer timer;


//hc-sr04
#include <NewPing.h>     // Use the NewPing library


const int trigPin1 = A3;    // HC-SR04 trigger connected to pin A3
const int echoPin1 = A2;    // HC-SR04 echo connected to pin A2


const int tank1Full = 13;      // depth measured when tank 1 is full
const int tank1Empty = 21;  // depth measured when tank 1 is empty
const int maxDistance = 25;  // Sets a maximum distance for the sensor object N.B. must be greater than the empty value

NewPing sonar1(trigPin1, echoPin1, maxDistance);  // Create a NewPing sonar object
int measuredDistance = 0;      // Stores the measured distance to liquid surface
int percentage = 0;            // Stores the calculated percentage of tank volume

//for gsm8001
SoftwareSerial sim(2, 3);
int _timeout;
String _buffer;
String number = "+60195936231";

//mg995 servo
Servo myservo;  // create servo object to control a servo

//blynk button
int motor1State = LOW;


BLYNK_CONNECTED() {

  Blynk.syncVirtual(V1);
  Blynk.virtualWrite(V1, motor1State);

}


BLYNK_WRITE(V1) {
  motor1State = param.asInt();

  if (motor1State==1){
    Serial.println("door open");
    myservo.attach(6);
  delay(15);
  myservo.write(13); // sets the servo position according to the scaled value
  delay(1000);// waits for it to get to the position
  myservo.detach();
  delay(1000);
  if(motor1State==0){
     myservo.attach(6);// attaches the servo on pin 6 to the servo object
  delay(15);
  myservo.write(90);// sets the servo position according to the scaled value
  delay(1000); // waits for it to get to the position
  myservo.detach();
  delay(500);
          Serial.print(" door closed");
          Serial.println();

        delay(10);
    }
  delay(5000);
  myservo.attach(6);// attaches the servo on pin 6 to the servo object
  delay(15);
  myservo.write(90);// sets the servo position according to the scaled value
  delay(1000); // waits for it to get to the position
  myservo.detach();
  delay(500);
          Serial.print(" door closed");
          Serial.println();
        delay(10);
```

```
  }

  else
   myservo.attach(6);// attaches the servo on pin 6 to the servo object
  delay(15);
  myservo.write(90);// sets the servo position according to the scaled value
  delay(1000); // waits for it to get to the position
  myservo.detach();
  delay(500);
          Serial.print(" door closed");
          Serial.println();

        delay(10);

}

void setup() {
    sim.begin(9600);
  Serial.begin(9600);
  SerialAT.begin(9600);
  SerialAT.println("AT+CMGF=1");
  SerialAT.println("AT+CNMI=1,2,0,0,0");
  delay(1000);
  Serial.println("Initializing modem...");
  modem.restart();
  Blynk.begin(auth, modem, apn, user, pass);
    myservo.attach(6);
}



void MotorRun(){
     Blynk.run();
     Blynk.virtualWrite(V0, percentage);
    Serial.print("Contents of tank 1 ");  // Print it out.
    Serial.print(percentage);
    Serial.println("% Full");
    BLYNK_WRITE(V1);
    delay(1000);
  Serial.print("turn on motor \t");
  myservo.attach(6);
  delay(15);
  myservo.write(13);// sets the servo position according to the scaled value
  delay(1000);// waits for it to get to the position
  myservo.detach();
  delay(1000);
  myservo.attach(6);// attaches the servo on pin 6 to the servo object
  delay(15);
  myservo.write(90); // sets the servo position according to the scaled value
  delay(1000);// waits for it to get to the position
  myservo.detach();
  delay(1000);
          Serial.print(" finish");
          Serial.println();

        delay(10);

  }


void SendMessage()
```

```
{
  BLYNK_WRITE(V1);

    Blynk.virtualWrite(V0, percentage);
    Serial.print("Contents of tank 1 ");  // Print it out.
    Serial.print(percentage);
    Serial.println("% Full");
  //Serial.println ("Sending Message");
  sim.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
  delay(200);
  sim.println("AT+CMGS=\"" + number + "\"\r"); //Mobile phone number to send message
  delay(200);
  String SMS = "the food is less than 10 %.Please refill the tank to allow the goat to be feed and happy";
  sim.println(SMS);
  delay(100);
  sim.println((char)26);// ASCII code of CTRL+Z
  delay(200);

 BLYNK_WRITE(V1);
}


void sendSensor(){
   Blynk.run();
   BLYNK_WRITE(V1);

   measuredDistance = sonar1.ping_cm(); // Request the distance to solid surface from the sonar object (in cm)
  if ((measuredDistance > tank1Empty) || (measuredDistance < tank1Full)) {  // Sanity check the distance
    Serial.println(measuredDistance);
    Blynk.virtualWrite(V0, 0);
    BLYNK_WRITE(V1);
  }
  else
  {
     Blynk.run();
     BLYNK_WRITE(V1);

    percentage = map(measuredDistance, tank1Empty, tank1Full, 0, 100); // Convert the measured distance to a percentage of the tank depth
    Blynk.run();
    BLYNK_WRITE(V1);

    Blynk.virtualWrite(V0, percentage);
    Serial.print("Contents of tank 1 ");  // Print it out.
    Serial.print(percentage);
    Serial.println("% Full");
    BLYNK_WRITE(V1);
     if(percentage<=10 && percentage>=0){
        SendMessage();

      }
      BLYNK_WRITE(V1);
      delay(10000);
      BLYNK_WRITE(V1);
      motorsense();
}

}
    Serial.println(measuredDistance);
    Blynk.virtualWrite(V0, 0);
    BLYNK_WRITE(V1);
  }
  else
  {
     Blynk.run();
     BLYNK_WRITE(V1);

    percentage = map(measuredDistance, tank1Empty, tank1Full, 0, 100); // Convert the measured distance to a percentage of the tank depth
    Blynk.run();
    BLYNK_WRITE(V1);

    Blynk.virtualWrite(V0, percentage);
    Serial.print("Contents of tank 1 ");  // Print it out.
    Serial.print(percentage);
    Serial.println("% Full");
    BLYNK_WRITE(V1);
     if(percentage<=10 && percentage>=0){
        SendMessage();

      }
      BLYNK_WRITE(V1);
      delay(10000);
      BLYNK_WRITE(V1);
      motorsense();
}

}
```