



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**AUTOMATIC LIME CLEANING MACHINE CONTROLLED BY
ANDROID SYSTEM**

This report submitted in accordance with requirement of the Universiti Teknikal
Malaysia Melaka (UTeM) for the Bachelor's Degree in Electrical Engineering
Technology (Industrial Power) (Hons.)

by

MUHAMMAD IMRAN BIN ISMAIL

B071110091

921001 02 5063

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“I hereby declare that the work in this project report is my own work except for quotations and summaries which have been duly acknowledged”

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Date :

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor Degree of Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory committee is as follow:

.....
MISTER SHAHRUDIN BIN ZAKARIA

(Official Stamp of Supervisor)

ABSTRAK

Kemajuan teknologi telah membuat kehidupan kita lebih mudah di mana segala-galanya adalah terletak di hujung jari kita termasuk di dalam sektor pertanian. Penciptaan alat kawalan jauh untuk penyiraman air adalah salah satu yang dicipta untuk kemudahan dalam bidang pertanian. Salah satu tenaga manusia digunakan di sektor pertanian adalah pada operasi membersihkan sebelum mana-mana produk dikomersilkan kepada pengguna. Berkaitan dengan teknologi di seluruh dunia, Telefon Pintar adalah salah satu pelaburan dalam program dunia komunikasi ini di mana ia menggabungkan dua teknologi dan kemampuannya meningkat setiap tahun serta memainkan peranan penting dalam kehidupan seharian kita. Naluri dan budaya manusia hari ini tidak dapat dipisahkan dengan kehadiran telefon pintar. Sehubungan itu, penciptaan mesin automatik pembersihan limau digunakan pada sistem Android selari dengan teknologinya. Mesin pembersihan limau menggunakan telefon Android dapat menjimatkan masa daripada penggunaannya secara manual. Projek ini bertujuan untuk mereka bentuk Mesin Automatik Pembersihan Limau dan dikawal oleh sistem Android. Pelaksanaan ini adalah untuk mereka bentuk operasi pembersihan limau secara automatik menggunakan sistem komunikasi data tanpa wayar, Bluetooth dan kawalan operasi dengan menggunakan program baru aplikasi Android. Penciptaan mesin ini menggunakan modul Bluetooth HC-06 dan kawalan operasi digerakkan oleh Arduino Nano versi 3.0. Setiap butang ON disentuh dan mesin akan beroperasi untuk melakukan pembersihan limau manakala butang OFF untuk memberhentikan operasi tersebut. Penciptaan Mesin Automatik Pembersihan Limau yang dikawal oleh Sistem Android ini akan lebih memudahkan dan cekap kepada pengguna di sektor pertanian, di samping dapat menambahkan kemajuan dalam sektor tersebut.

ABSTRACT

Progress of technology has realized our life simpler where everything is available at our fingertip including on the agriculture sector. A few design has been developed in order to make the human workout can be reduced and more efficient such as on using the remote control to sprinkle water. Once of the human workout that used in the agriculture sector is on cleaning operation before any product is commercialized to the consumer. Related to the worldwide technologies, smartphone is one of the investments in the communication's world program where as its combination of the cellular phone and personal digital assistant (PDA) while it's affordability increases every year and they have begun to play important roles in our daily life due to its size and portability. People instinct and culture today are inseparable with the presence smartphone, so this Automatic Lime Cleaning Machine is used on Android's smartphone system. Controlling the lime cleaning machine using an Android phone give users the ability to control the operation anywhere in the Bluetooth range and saves the time spent rather than manually. This project is designing on the Automatic Lime Cleaning Machine controlled by Android system to replace by the human workout and the system is using wireless communication, Bluetooth and controlled the operation with the new development application on Android's smartphone. The design is using on App Inventor for Android (AIA) communicate with the serial communication for HC-06 Bluetooth module and controlling on mechanical operation using on Arduino Nano Version 3.0 board. The each of cleaning lime operation should operate when the ON button is pressed while stop when the OFF button is pressed from the Android application. It should have make the users is more easier and efficient to control the automatic lime cleaning machine using Adroid smartphone as the remote control unit and impact for the productivity for the agriculture sector.

DEDICATION

Dedicated to

my beloved parents ISMAIL BIN AHMAD and AZIZAH BINTI AHMAD,
brothers and sisters.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURES

| | |
|---------|---|
| PDA | Personal Digital Assistant |
| US | United States |
| UK | United Kingdom |
| DC | Direct Current |
| OS | Operating System |
| SDK | Software Development Kit |
| NDK | Native Development Kit |
| AVD | Android Virtual Devices |
| ADB | Android Debug Bridge |
| FEC | Forward Error Correction |
| AIA | App Inventor for Android |
| ISM | Industrial, Scientific and Medical |
| RF | Radio Frequency |
| LMP | Link Manager Protocol |
| L2CAP | Logical Link and Control Adoption Protocol |
| SDP | Service Discovery Protocol |
| RFCOMM | Radio Frequency Communication |
| TCS-BIN | Telephone Control Protocol-Binary |
| UART | Universal Asynchronous Receiver Transmitter |
| PWM | Pulse Width Modulation |
| USB | Universal Serial Bus |
| HTML | Hypertext Markup Language |
| Mbps | Megabyte per seconds |
| MHz | Mega Hertz |
| RAM | Random Access Memory |
| ROM | Read Only Memory |
| SMD | Surface Mount |
| SPP | Serial Port Profile |

3D

3 Dimensional

GFSK

Gaussian Frequency Shift Keying

CHAPTER 1

INTRODUCTION

1.1 Introduction

Historically, in Malaysia, department of agriculture is established in the year 1905 while the agricultural sector has played a big role in the early 1920 year through the rubber industry that lift Malaysia as the world's leading producer of natural rubber until 1980 (Jabatan Pertanian Negara, 2014). With the development in this sector, many manufacturing machines for the agriculture are designed in order to reduce the human workout and make any work easier, automatic and efficient. One of the machines in the agriculture sector is for the cleaning operation before the product is commercialized.

Today, many of the automatic machines for the agriculture are projected with the communication technology such as wireless sprinkling system. Wireless mean the sprinkling activity are connected wirelessly or without any cable to a server or central controller or remote control unit in order to give any command or instruction to the system. This development is implanted for automatic machine are more reliable and effective for the users, but with the presence the remote control unit. Communication technologies also have on invention of the smartphone by combining the cellular phone and personal digital assistant (PDA). Time Magazines have taken a Smartphone survey of 5000 people from United States (US), United Kingdom (UK), South Korea, South Africa, Indonesia and Brazil and result found that 84% claimed that could not go a single day without their phones means that people are inseparable with their phones (Gilbert. J, 2012).

From the foundation of a smartphone, Operating System (OS) type and version is has been often in the conversation of the users. One of the popular OS type is Android, which is programmed in the open source type and survey found that about 70% of the shipped 207.6 million units of the worldwide (International Data Corporation, 2014). Android has become and will be the widest, greatest and highest value on smartphone's operating system on future.

This project is about to design the Automatic Lime Cleaning Machine controlled by the Android system. This project also has not available in Malaysia and it's related to the advancement of manufacturing technology for the agriculture sector and communications technology (Institut Penyelidikan dan Kemajuan Pertanian Malaysia, 2014). By using this system, cleaning lime machine operation is controlled by the Android operating system on the smartphone. Automatic means that the process of cleaning is absence on human workout. The users can control the machine from their smartphone, no need on to push any button manually. This project also is introduced the wireless control from the Android's smartphone using on Bluetooth technology and this project will embark the development of the agriculture sector to make it is more productive and effective.

1.2 Problem Statement

In the agriculture sector, lime product that commercialized should properly clean to make sure it's to employ for the consumers. Real agriculture, cleaning lime is on using the human workout and the lime that dirty either pick from the tree or on the ground should be clean one by one. The course comes in thousands, then it requires a solid day to clean that lime and maybe need to hire more workers. For this reason, this project's purpose is to design an automatic cleaning lime machine with the using on new technologies, Android smartphone's OS to control the machine under the range of wireless communication.

1.3 Project Objective

The objectives and goals of the project are:

- (i) To design prototype of the automatic cleaning machine for the lime productivity.
- (ii) To develop a user friendly Android application to control the automatic cleaning lime machine.
- (iii) To develop the cleaning machine controlled by Android system using wireless communication.

1.4 Project Scope

The project scope is important in parliamentary procedure to become the guidelines for the task that should be insured or not and give the limitations. For this project, in the effort of achieving the objectives, several scopes have been outlined. The development of the project is estimated at 60% of software and 40% of hardware. The scopes of the project involve:

- (i) Focused on building up the Android software application to control the ON or OFF status of the cleaning lime machine operation
- (ii) Designing the prototype of the automatic lime cleaning system.
- (iii) Developing the wireless communication between the Android application and the hardware designing using on Bluetooth modules on one way instruction.
- (iv) Using on a microcontroller for the cleaning lime machine operation, Bluetooth.

1.5 Project Significant

On this project purposely will give the benefit of the agriculture sector of lime plantation productivity. It can make the commercialized lime will more effective and more hygiene for the consumers. Other than that, this project also will give on

satisfaction and knowledge for the researchers to embark the contribution of agriculture and communication technology.

1.6 Thesis Organization.

Chapter 2 incorporates the introduction and literature review on the development of hardware and software for the cleaning operation and the communication monitored by the Android system. This chapter describes the characteristics and device that need to research on developing in this project. It has also embarks a new innovation with the technology in a human daily life for an easier work for the future.

Chapter 3 consists of methodology about the equipment, device and software that will be utilized as a primary guideline to plan. Project planning, researched and software development is the contribution to this chapter. That also discuss about method to execute the project planning.

Chapter 4 describes the result and analysis for the whole project. This chapter discusses about the programming model using App Inventor for Android for the automation on controlling the lime machine. At the end, explain model simulation strengthens the successful programming model as a new method.

Chapter 5 contains the conclusion of the project. The conclusion supports the goal and objective of the project. It also discusses the future works for this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter is drawn around the mechanisms necessary in designing the cleaning lime machine and in order to make it automatic and electronic system also will be discussed and detailed assist the reader understands. Generally, the cleaning operation is related to the brush and to make it efficient with designing motor and conveyor. smartphone configuration, Android's OS type and architecture also will be discussed. Moreover, using on a wireless system, Bluetooth also will discuss on technology and how it can communicate to become medium between the controller and Android's smartphone. Then, understanding and information around the Android Development Software also will be represented in the preceding part. Some related works will also be presented to share the reader on previous works and recent advancements done in the automatic cleaning lime monitored by android system.

2.2 Mechanical Cleaning Operation

2.2.1 Conveyor.

Microcontrollers, sensors, actuators and low power wireless radio transceivers are design to modify the landscape of future automation systems due to advancement of

networked sensor-actuator system's technologies (Qi Z. & Swapna S.G, Std- 2008). Crude materials and product need to be propelled from one manufacturing stage to another point in the process or manufacturing industry. This handling equipment is designed in order to reduce the human workout, fast and safe loading and the designer is used on a belt conveyor system. The availability on the automation is evaluated when the model is finished on a practically test to find the data for the collecting problem occur or the various activity the machine. Generally, the conveyor system is contribution with the motor in controlling speed.

Conveyor system should design properly where as it becomes a medium to transmit from one to some other process. The particular system of conveyor is to provide the system topologies, so if the topologies are given on bad impact, it will make the system failure to recover the human ability. Modeling the conveyor with motor controlled speed should take in consideration.

2.2.2 Direct Current (DC) Shunt Wound Motor

For the design of selecting a DC motor for a granted application, there are two elements that need to be taken on the consideration that is the allowed variation in speed for a given change in load and the allowed variation in torque for a given change in load (Hanif H., 2014). Shunt wound motor is categorized in two types that is self-excited DC shunt motor meaning that the field windings and armature windings using a same power supply. While the other one separately-excited DC shunt motor that's mean separate power supply is used for field winding and armature winding. One's of the characteristic of using DC shunt motor because it has the lowest starting torque. That's mean when the operation of the motor is ON condition, it start with a smoothly constant speed. Figure 2.1 and Figure 2.2 below showed the schematic diagram and wiring diagram for the DC shunt wound motor.

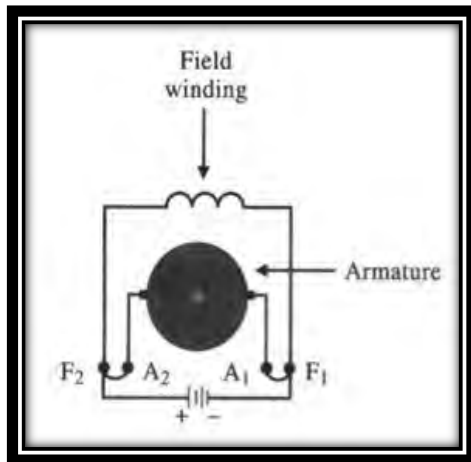


Figure 2.1: Schematic Diagram

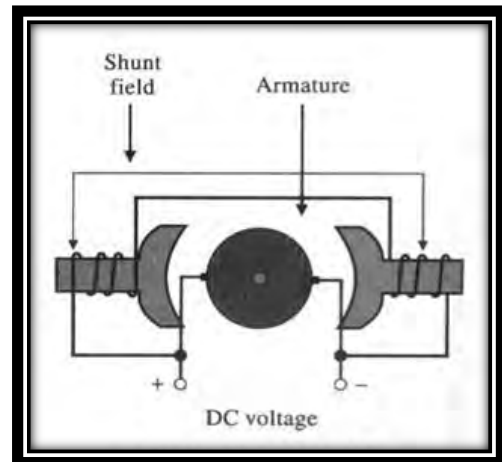


Figure 2.2 : Wiring Diagram

2.3 Smartphone Operating System (OS)

Generally, Operating System (OS) on a smartphone is generally combines the characteristics of a personal computer operating system with other feature including touch screen, cellular, Bluetooth and etc. It is different in term of Types of OS and version of the OS itself for each smartphone. Each of users on smartphone always had on a conversation about the operating system. Below is the OS type that commonly used in the world.

- (i) Android
- (ii) iOS
- (iii) Window Mobile/Phone
- (iv) Blackberry OS

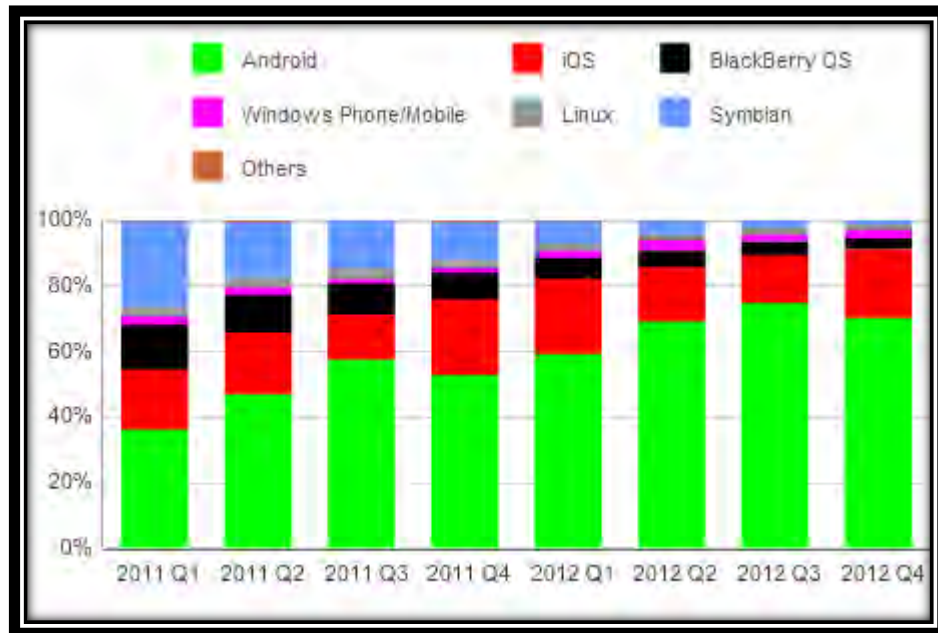


Figure 2.3: The market share user of Operating System on Smartphone until second quarter of 2013 (International Data Corporation, 2014)

From the comparison on the Figure 2.3 according to the smartphones OS market share above, from the first quarter of 2012 to second quarter of 2013, the Android OS is the acme of the user on the operating system followed by the iOS.

2.3.1 Android Application

A system that operates, including middleware, key application, and software stack for a mobile device is the Google Android. September 23th, 2008 was the date for the first Google's Android Phone T-Mobile G1 was announced at Guastavino in New York City (Cheng M. L., Jyh H. L., Chyi R. D., & Chang M. W., Std- 2011). Android as well as a software stack, which is set of software subsystem needed to present a fully operational solution for smartphone. This stack software partly based on Java and key application is written in Java such as web browser and a contact manager (Kushwaha A. & Vineet A., Std-2012).