



# **UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

## **DEVELOPING AN INTERFACING SYSTEM FOR HOME FARMING BY USING LABVIEW AND ARDUINO**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours.

By

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**TAJUK: Developing an Interfacing System for Home Farming by Using Labview and Arduino**

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## **APPROVAL**

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

.....

(Puan Siti Halma Binti Johari)

## **ABSTRACT**

This project focus on developing an interfacing system for home farming that user can easily control their plantation. Conventionally, people who practising in urban farming have to manage their time wisely in order to make sure their farming are healthy. Besides that, people needs to water the plant manually even they are busy. Hence, this project provides that solution for these people who experiences these factors. This project has water pump and dark on sensor circuit attached to it. Furthermore, this project allows user to either manual control the system or set a schedule for the system. Besides that, this project has motion detector that uses to protect the plantation. Any presence of object or motion will trigger to system to turn on the indicator at the user interface screen. Besides that, the buzzer will turn on too when there are object or motion detected by the sensor. This interface also has log file for user to analyse their plantation. The information that included in the log file are the starting and ending time for water pump, dark on sensor and the time when motion detected and motion ended.

## ABSTRAK

Projek ini memberi tumpuan kepada pembangunan sistem interfacing untuk pertanian rumah yang pengguna dapat dengan mudah mengawal perladangan mereka. Secara konvensional, orang yang mengamalkan pertanian di bandar perlu menguruskan masa mereka dengan bijak untuk memastikan pertanian mereka sihat. Selain itu, orang perlu menanam tumbuhan secara manual walaupun mereka sibuk. Oleh itu, projek ini memberikan penyelesaian kepada orang-orang yang mengalami faktor-faktor ini. Projek ini mempunyai pam air dan litar gelap yang dipasang padanya. Selain itu, projek ini membolehkan pengguna sama ada mengawal sistem atau menetapkan jadual untuk sistem. Selain itu, projek ini mempunyai pengesan gerakan yang digunakan untuk melindungi perladangan. Apa-apa kehadiran objek atau gerakan akan mencetuskan sistem untuk menghidupkan penunjuk pada skrin antara muka pengguna. Di samping itu, loceng akan bunyi apabila terdapat objek atau gerakan yang dikesan oleh sensor. Antara muka ini juga mempunyai file log untuk pengguna menganalisis perladangan mereka. Maklumat yang dimasukkan dalam fail log adalah masa permulaan dan akhir bagi pam air, litar gelap dan masa apabila gerakan dikesan dan gerakan berakhir.

## **DEDICATION**

This project is dedicated to my supervisor, Puan Siti Halma Binti Johari that assists me on developing this project. I would also thanks to my beloved parents who educated and supported me throughout the process of doing this project.

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## **CHAPTER 1**

### **INTRODUCTION**

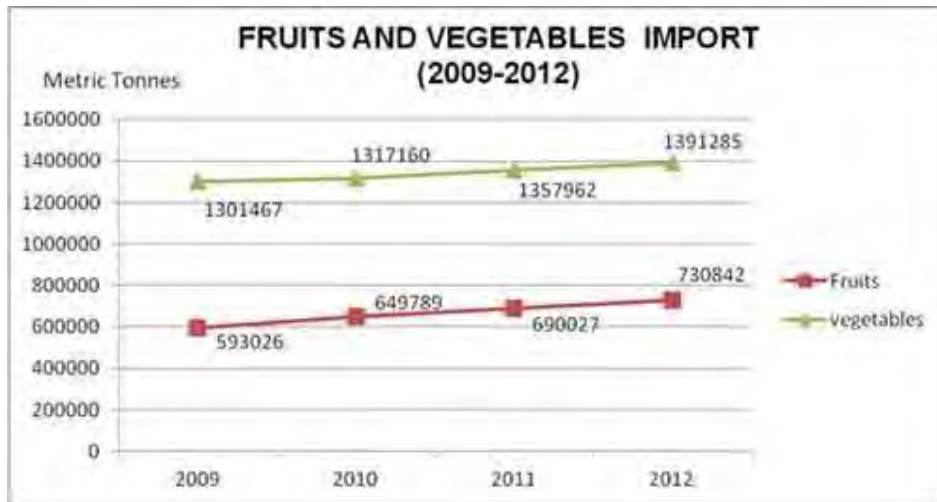
#### **1.1 INTRODUCTION**

In Malaysia, agriculture had taken approximate 12% of the nation's gross domestic product. Approximate 16% of Malaysia population is employed for agriculture. The weather in Malaysia stays hot and humid all year round. Besides that, this area is rarely affected by natural disaster.

Urban farming or home farming is a type of practice where food is produced at a cities around town areas. In Malaysia, urban farming is not a new concept in this country. This type of cultivation has widely named for example, home farming, urban agriculture and etc. Home farming is practiced as a hobby, source of frints and vegetable for people and in some case, earing extra income for household members.

In Malaysia, until 2014 around 58% of the citizens live in town with home farming and that percentage is aspect to increase up to 60% by 2025. This culture is expected to continue in line with population growth and rapid civilization. The phenomenon is cause by land scarcity, migration of rural people and also economic factors. The migration of rural people to the city increased the population density of urban areas. Thus, this led to lack of food supplies, nutrition and food security to the population. Malaysia can be seen even more dependent on food supply, particularly fruits and vegetables from other countries, especially Thailand and China. The Malaysian food imports increase to 1,391,285 tons of vegetables and 730,842 tons of fruit in 2012 from 1,357,962 metric tons of vegetables and 690,027 thousand metric tons of fruits in 2011 as shown in Figure 1.1 in the next page. Highly dependence on food imports provides an indication that the country is

facing problems in food supply. This tendency makes the practice of urban farming very significant and relevant to serve the needs of the urban residents, particularly those which are more vulnerable to the food crisis compared to rural folks. Among the factors that lead to the needs of urban farming in Malaysia's context is reducing the household food bills.



**Figure 1.1 : Import of Fruits and Vegetable, 2009-2012**

## 1.2 PROJECT BACKGROUND

In Malaysia, the increasing population increasing every year. The most populated state in Malaysia is Selangor, Kuala Lumpur and Johor. It had increased more than three times for the past three decades excluding the main town, Kuala Lumpur. Selangor is among the important states which indicate the diversity of economics sectors in Malaysia such as services, manufacturing and agriculture. Therefore, the people who practice urban farming have to share the scarcity of land and water with human needs and to choose the suitable technologies which can solve space and water problems in urban farming activities. Hence, to ensure the heartiness of the crops, the method to fertilize is important. There are various fertilizing techniques and methods, which can be applied to the plants. However, some of the techniques and inputs are not environmentally friendly and are very



harmful to humans. There are other constraints faced by people in the practice of urban farming. Therefore, there are needs that need to be identified which include suitable fertilizer and techniques to apply in urban farming. All the suitable practices to overcome constraints are welcomed by the public. Therefore, urban farming does need the right technologies and techniques to deal with the issues

### **1.3 PROBLEM STATEMENT**

Home farming has to deal with water supply to plantation, space for residential and farming purpose, potential hazard and is also considered harmful for agricultural input and outputs such as organic fertilizers, agricultural wastes, chemical residues and pollutants. Hence, the method to fertilize is important. However, some of the technique and inputs are not environmentally friendly and are very harmful to humans. There are other constraints faced by people in the practice of urban farming. For example, office workers need to work 8 hours a day, additional 3-4 hours of traffic jam while travelling to and back from work; these people does not have additional time for urban farming although some of them interested in urban farming. Other constraints such as laziness does pull back the practice of urban farming.

## **1.4 PROJECT OBJECTIVE**

The purpose of this project is to increase the population of urban farming by using latest technology. Thus, the objectives of this project are as stated below:

1. To study the collaboration of LabVIEW and Arduino and the characteristics of Arduino.
2. To develop an interfacing system for home farming by using LabVIEW and Arduino.
3. To evaluate the performance of interfacing system for home farming.

## **1.5 SCOPE OF PROJECT**

The scope of this project is to develop an interfacing system using LabVIEW and Arduino for home farming or also known as urban farming. In this project, Arduino UNO is used to act as a DAQ that will collaborate with LabVIEW to develop an interfacing for people. This interfacing system is than connect to a relay board to control any agriculture output such as water pump, fertilizer pump and etc. Agriculture input such as light control and object detector, these component will generate signal. User may connect the signal direct into Arduino UNO port. Later on, LabVIEW will interpret the signal accordingly and perform action as stated by the programmer respectively. Furthermore, some plantation needs light control, thus, an additional light control circuit can add into consideration. To make sure the project is multifunctional, the system will be evaluated and analyzed.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

This chapter is about the research of the whole project. It contains the knowledge and skills need to complete this project. The main component in this chapter is the summary or idea on other journal that related to this project or some other information from others resources such as books, thesis, internet web site and etc. By analyzing and understand the project did by other researchers, the idea and skills used will use to improve and to develop a successful project.

#### **2.2 Previous Project Research**

This section involve the research based on the thesis and journal that had been found. This part is important because this project is made based on these reference. The method, theory and practical construction may include in this section.

##### **2.2.1 Automation of street light using Arduino and NI LabVIEW**

(Chaitanya et al., 2016) designed and constructed an automatic street control system circuit. Component used in this project is Arduino UNO, ultrasonic HC-SR04 and NI LabVIEW. This project provides intensity control with respect to vehicle, real time controlling and etc. A clock is used in this project to provide specify time. The time is used to switch ON or OFF

the light. The light intensity is controlled to save energy. The incoming vehicle is track by using ultrasonic sensor. When vehicle passes through, it reflects the wave and ultrasonic sensor will detect the feedback wave. Then, the light glow in synchronize with it.

### **2.2.2 Electrical Power Measurement Using Arduino UNO Microcontroller and LabVIEW**

(Fransiska et al., 2013) designed a wattmeter which is interfaced with a personal computer by utilizing Arduino UNO microcontroller and LabVIEW program. This project involves conditioning analog signal, analog to digital converting and digital data processing. The data result in this project is display voltage, electric current, power consumption, energy use, frequency of the power source and the usage fees. Besides Arduino UNO, IC 4051 analog multiplexer is used in this project to transmit two analog signal by turns to the microcontroller by using only one analog pin. The final result of this project is that the wattmeter does not give good result for electronic devices that consume very low power because of the limitation of voltage measurement precision and current measurement precision. The lowest power able to measure is 6.5mW DC. The current and voltage signal is processed using the multiplexer. This multiplexer is used to regulate the signal transmission from the sensing circuit to the Arduino. Signal transmission regulation is controlled by the LabVIEW program through the Arduino digital pin.

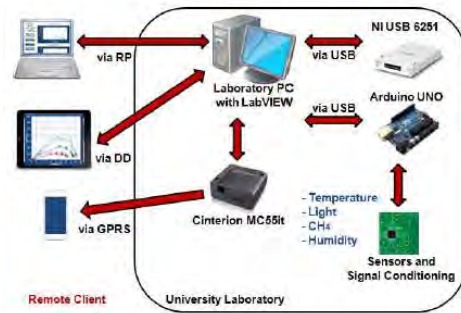
### **2.2.3 Smart Farming using Arduino and Data Mining**

(Patil, Naik, Beldar, & Deshpande, 2016) developed a smart farming which utilize wireless sensor web technology for moisture detection in the soil in conjunction with a smart phone application which plays a vital role in helping farmers. Component used in this project are Arduino UNO, soil

hydrometer sensor, android application and etc. The function of soil hygrometer sensor and the servo motor is to sense the level of moisture in the soil and to send a signal to the Arduino UNO if watering is required. Any option selected by farmer will be send to Arduino UNO to carried out appropriate action. A database is developed in this project. The database will contain detail information about corps such as cost of the seeds, soil moisture level required, fertilizers and pesticides to be used. By using this database, farmers may share their farming methods and give their review about different methodologies. The improvement that may do for this project is give more accurate predictions about weather condition. Besides that, they recommend to sore all information to server for future usage.

#### **2.2.4 Arduino and LabVIEW in Educational Remote Monitoring Application**

(Calinoiu, Ionel, Lascu, & Cioabla, 2015) implemented a project that develop a monitoring circuitry that uses LabVIEW, Arduino as DAQ device and mobile application. In this project, the main component is LabVIEW. LabVIEW is used in order to implement a program which records and analyzes data from different environmental sensors such as humidity, temperature, light and CH<sub>4</sub>. NI USB 6251 and Arduino UNO is used in the project as data acquisition process. The main application controls the process and can be accessed using remote panel. A code is used to send SMS warning using GSM and AT command. Initially, Arduino UNO is used with light sensor, relative humidity sensor and methane sensor. The NI USB 6251 is used for sending SMS warning with the help of specific AT command. The sensors parameter is feed into LabVIEW for monitoring purposes. The setup for this project are as shown There are few recommendations that able to made for this project such as improving the sensor sensitivity, convert parameter value and decide when to use the digital line in order to open a relay which trigger the irrigation process and etc. Figure 2.1 below shows the experiment setup for this project.



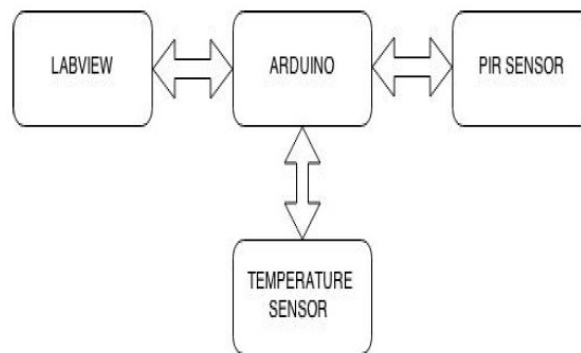
**Figure 2.1 : Experiment Setup for Project 2.2.4**

### **2.2.5 Control and Monitoring System of Small Water and Wind Power Plant**

(Kovalcik, Fecilak, & Jakab, 2013) designed a project that is used to versatile the solution for remote administration and monitoring of sensor network based on Arduino Development Environment, export reading to a central data repository and to support price affordability solution with respect to SOHO solution. The main component of this project is the DAQ system that acts as the interface between a computer and signal from the outside world. The computer in a DAQ system is used for processing, visualizing and storing measurement data. The measurement data such as room temperature, the light intensity of a light source or the force applied to an object is obtain with appropriate sensor. In this project, few sensor is involving, for example, round sensor which used to sense rounds of turbine for wind and water based, ammeter to sense current of all energy source and voltmeter that used to sense the voltage at the input controller. The DAQ system that mentioned above is done by using Arduino with USB Host Shield. Arduino with USB host shield is an ideal combination for DAQ system. The data captured by the sensor from either digital pin or analog pin, is being processed and transmitted to the application on a mobile phone which is connected via USB cable.

## 2.2.6 Smart Thermostat

(Gandhi, Parmar, Mohit, & Patel, 2015) developed a project that measure and control the temperature based on bio-sensing technique. This project involves bidirectional communication to receive the data and process it. The component involve in this project are temperature sensor which will detect the temperature and PIR sensor that will detect the movement in the room. Software that involve in this project are LabVIEW and microcontroller that used in this project is Arduino. Smart thermostat is a combination of LabVIEW and LM35 while temperature is control by using LabVIEW and Arduino. Hence, in this project, LabVIEW is use as a GUI for this project. Arduino UNO is used to communicate between LabVIEW and sensors. The interface between LabVIEW and Arduino UNO is done by using a hardware known as DAQ card which support 3<sup>rd</sup> party hardware. The temperature sensor LM35 and PIR sensor is connected to the Arduino UNO. In this project, PIR sensor is used to detect motion. It will blink the light and indicate that there is some motion if motion is detected. A message will display on the LabVIEW GUI and the light is activated by LabVIEW through Arduino UNO. Figure 2.2 below shows the hardware setup for this project.



**Figure 2.2 : Hardware Setup for Smart Thermostat**

## 2.3 COMPONENT REVIEW

This section involves research on the component being use for this project. The main component that used in this project is Arduino UNO, which acts as an data acquisition processor that will linked into LabVIEW platform. Other component that may involve in this project are relay switch circuit, light control circuit and motion detector and etc.

### 2.3.1 Arduino UNO

Arduino is a microcontroller board based from ATmega328 microcontroller chips. Arduino UNO has 14 digital input / output pins, 6 analog inputs, a 16MHz crystal oscillator, a USB connector, a power jack and a reset button. To get started with Arduino UNO, simply connect to a computer with a USB cable or power it with a AC to DC adapter or a battery. Figure 2.3 shows the Arduino UNO board in the next page.



**Figure 2.3: Arduino UNO Board**

The specification for Arduino UNO are as stated at Table 2.1 below.