"I hereby declare that I have read through this report entitle "The Development of Online Monitoring System Prototype for Tigris Conservation Center" and found that is has comply the partial fulfillment for awarding the degree of
Bachelor of Engineering (Control, Instrumentation & Automation)"

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Name of Supervisor : ……..

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THE DEVELOPMENT OF ONLINE MONITORING SYSTEM PROTOTYPE FOR TIGRIS CONSERVATION CENTER

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A report submitted in partial fulfillment
of the requirements for the degree in
Bachelor of Electrical Engineering (Control, Instrumentation & Automation)

Faculty of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

JUNE 2016

"I declare that this report entitles "The Development of Online Monitoring System Prototype for Tigris Conservation Center" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree"

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:

To my beloved mother and father

ACKNOWLEDGMENT

I take this opportunity to present my votes of thanks to all those guideposts who really acted as lightening pillars to enlighten our way throughout this report to successful and satisfactory completion of this project. I am really grateful to my lecturer for providing me with an opportunity to undertake this project in this university and providing us with all the facilities. We are highly thankful to Mr. Mohamad Riduwan Bin Md. Nawawi for his active support, valuable time and advice, whole-hearted guidance, sincere cooperation and pains-taking involvement during the study and in completing the project of preparing the said report within the time stipulated. Lastly, I am thankful to all those, particularly the various friends, who have been instrumental in creating proper, healthy and conductive environment and including new and fresh innovative ideas for us during the project, their help, it would have been extremely difficult for us to prepare the project in a time bound framework.

ABSTRACT

The Wildlife Conservation Society (WCS) has the mission to save the inevitably wildlife animal especially tigers and the landscape through which they roam at Endau Rompin, Pahang. In conjunction with this effort, the development of online monitoring system prototype for Tigris Conservation is proposed. The presented system includes RF (Radio Frequency) and wireless technology for communication systems with very low power consumption, which can receive small signals at very long distances. The user can identify the tiger's mobility in the specified area and monitor the updated total number of tigers' population at that area using a PC-based software and networked base station located at the same area. The transmitter emits a unique RF signal that represents each number of tiger tagged to the receiver. The assigned authority will determine the suitable range setting for the receiver, based on the frequency that is typically placed in the tiger's tagged collar. The system will transfer the data to PCs without any cable connection. The processor will identify the tiger's movement based on locked-frequency. Then the tiger's location information will be sent to the PC-based monitoring system in control room station. User will enable to remark the updated tiger's location and get notified alert for any mishaps. Furthermore, the indication of the tiger's location will be available on the field.

ABSTRAK

Wildlife Conservation Society (WCS) mempunyai misi untuk menyelamatkan hidupan liar terutama harimau dan landskap di mana mereka berhabitat di Endau Rompin, Pahang. Demi usaha ini, pembangunan sistem pemantauan dalam talian untuk Tigris Pemuliharaan dicadangkan. Sistem ini merangkumi RF (Radio Frequency) dan teknologi tanpa wayar untuk sistem komunikasi dengan penggunaan kuasa yang rendah, yang boleh menerima isyarat kecil pada jarak yang sangat lama. Pengguna boleh mengenal pasti pergerakan harimau di kawasan yang ditetapkan dan memantau bilangan jumlah terkini harimau di kawasan itu menggunakan perisian berasaskan komputer peribadi dan stesen pangkalan rangkaian yang terletak di kawasan yang sama. Pemancar mengeluarkan isyarat RF unik yang mewakili setiap nombor harimau tyng telah dilengkapi kepada penerima. Pihak berkuasa yang bertugas akan menentukan tetapan julat sesuai untuk penerima, berdasarkan kekerapan yang biasanya diletakkan di kolar harimau. Sistem ini akan memindahkan data kepada komputer peribadi tanpa apa-apa sambungan kabel. Pemproses akan mengenal pasti pergerakan harimau berdasarkan frekuensi yang ditetapkan. Kemudian maklumat lokasi harimau akan dihantar kepada sistem pemantauan berasaskan komputer di stesen bilik kawalan. Pengguna akan membolehkan untuk peka terhadap lokasi harimau yang dikemaskini dan menyedari untuk sebarang kejadian yang tidak diingini. Tambahan pula, petunjuk tentang lokasi harimau akan disediakan di kawasan yang telah ditetapkan.

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CHAPTER 1

INTRODUCTION

1.1 Project Background

Wild tigers are found in three main landscapes in Peninsular Malaysia: Belum-Temenggor, Taman Negara and Endau-Rompin [1]. However, due to poaching of tigers and tiger prey, in addition to habitat degradation, the integer of tigers in each of these landscapes is below the resonant size. Less than 500 Malayan tigers are supposed to remain in the empty space. The WCS-Malaysia's inclusive tiger conservation program in the Endau-Rompin landscape for the past four years. WCS-Malaysia has been occupied strictly with the State Governments of Johor and Pahang (in Peninsular Malaysia) to recruit a rescue program of the tigers and other wildlife in the Endau-Rompin landscape. WCS-Malaysia is dedicated working in this landscape over the many years to achieve a repossession of the tiger residents. There are three main direct intimidations to tigers in the Endau-Rompin landscape: habitat loss in key corridor areas, direct killing of tigers by poachers and, killing of tiger prey by poachers [1].

To address these serious issues, WCS-Malaysia works with the state and federal governments of Malaysia to simplify the following involvements: tiger-friendly land-use planning in the key corridor areas; a robust, continuous, on-the-ground anti-poaching effort across the whole Endau-Rompin landscape, outreach programs with local societies living in and around the Endau-Rompin landscape to rise consciousness on protecting the tiger and its prey and regular monitoring of tiger and prey population numbers around the conservation area. Online monitoring system is a good supportive project management for the wildlife conservation project. It implicates the systematic and continuous collection of data useful for auxiliary analysis (review and evaluation) and for understanding decision-

making. Online monitoring mainly to ensure the population of tiger in The WCS-Malaysia tiger conservation program focuses on two major activities to control poaching in the Endau Rompin landscape. The first is catalyzing and supporting effective on-the-ground ranger patrolling across the Endau-Rompin landscape. Some patrols are on foot in the backcountry while others use vehicles and boats. Mobile spot checks and static checkpoints are also conducted at the entry points to the landscape, as a further means of deterring the high number of relatively less committed, minor poachers and the smaller number of more committed poachers. WCS Malaysia's engagement with the enforcement units of the state governments has led to a dramatic increase in the effectiveness of the on-the-ground anti-poaching activities by develop the online monitoring PC based for rangers. A second major anti-poaching activity of WCS-Malaysia is to strengthen the laws that impact poaching in the landscape. The efforts will enable a vital and constant on-the ground being there of strong surveillance that will protect and allow for the recovery of wild tigers across the Endau-Rompin landscape.

One of greatest needs is the ability to monitor key 'scorching spots' of the forest as close to real-time as possible so fast action in reporting illegal activity that could threaten tigers or their prey. Basically the monitoring required is visual, and would be of specific sites within the forest approximately 10m² in area. Monitoring is important for keeping track of the tigers' movement patterns, habitat utilization, poaching incidents and breakout. This valuable information has potential advantages to management applications, especially in planning successful strategies to control the population of tigers in Malaysia [3],[4].

From the background studies, one of the method implemented to track animals is through cellular technology. The advantages of cellular technology are steadily increasing, especially in the coverage of the network around the world and the continuity advanced speed in data transfer through cellular networks. However, the cellular technology drawbacks are the technological challenge of reducing the size space, the users' demand of reducing power consumption, and the complexity usage of different cellular architectures in different landscape [5].

Together with this effort, a development of monitoring system prototype for wildlife animal is proposed. The presented system includes RF (Radio Frequency) and wireless technology for communication systems with very low power consumption, which can receive small signals at very long distances. The user can identify the tiger's mobility in the specified area and monitor the updated total number of tigers' population at that area using a PC-based software and networked base station located at the same area. The transmitter emits a unique RF signal that represents each number of tiger tagged to the receiver. The assigned authority will determine the suitable range setting for the receiver, based on the frequency that is typically placed in the tiger's tagged collar. The system will transfer the data to PCs through wireless system.

The tiger's location information will be sent to the PC-based monitoring system in control room station. In conjunction with this project, a programming language and environment developed by Microsoft. Based on the BASIC language, Visual Basic was providing a graphical programming environment and a paint metaphor for developing user interfaces. Instead of worrying about syntax details, the Visual Basic programmer can add a substantial amount of code simply by dragging and dropping controls, such as buttons and dialog boxes, and then defining their appearance and behavior. User will enable to remark the updated tiger's location and get notified alert for any mishaps. Furthermore, the indication of the tiger's location will be available on the field.

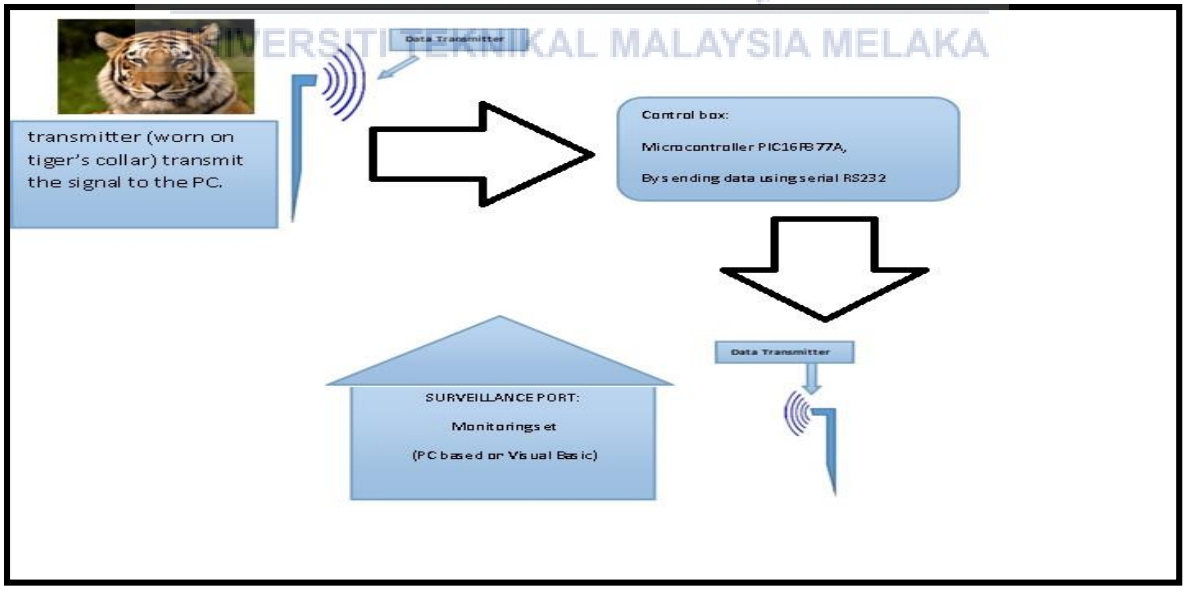

Figure 1.1: Block Diagram for Online Monitoring System Prototype for Tiger Conservation Centre.

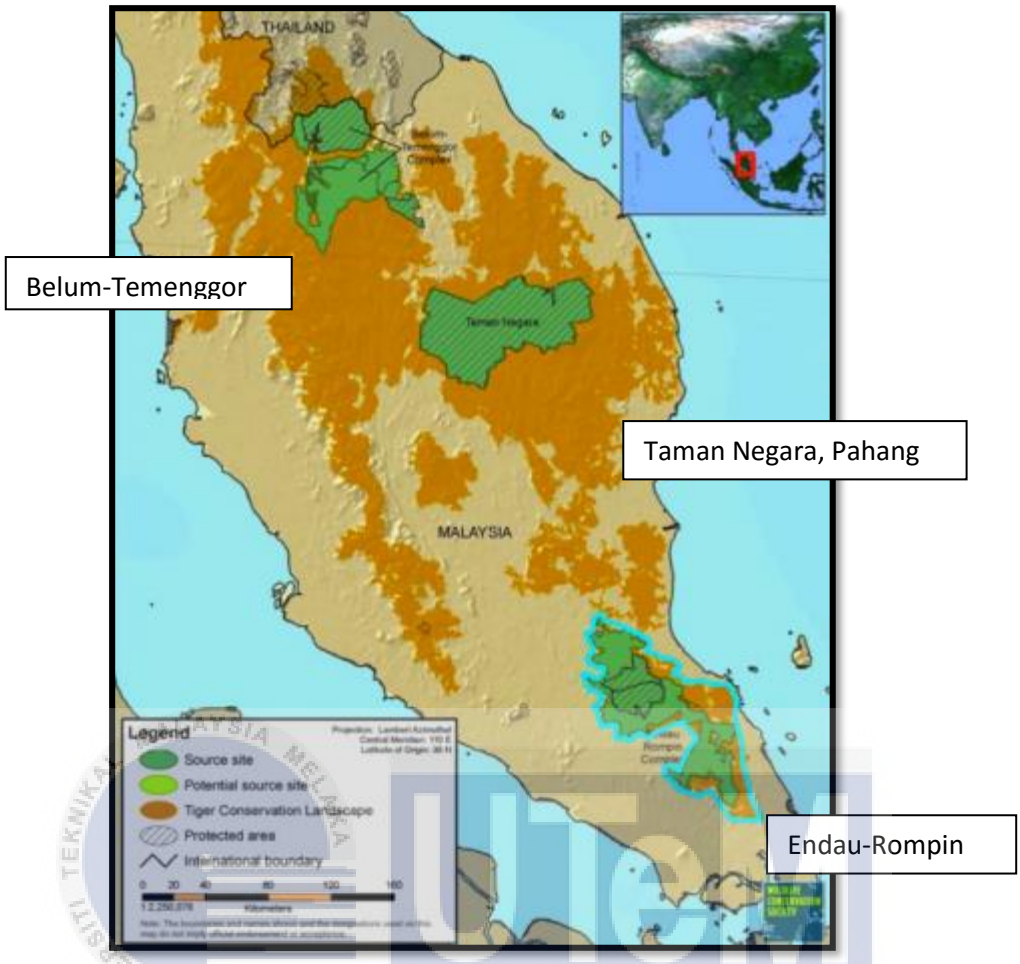

Figure 1.2: Location of Three Main Tiger Conservation Landscape in Peninsular Malaysia

1.2 Objective

The purpose of this study as listed below:

- To monitor the number of tiger in National Park
- To design online monitoring scheme in Visual Basic.
- To develop online PC- based monitoring system prototype for the population of tiger at National Park Endau Rompin through wireless application.

1.3 Motivation of Project

The proposed of monitoring system prototype for wildlife aim's is to have real-time monitoring system to indicates the mobility of tigers at Endau Rompin National Park. The online monitoring system prototype enables rangers to identify the total number of tigers' population at all times as well as to get notified if any mishap occurs in the tigers' conservation wildlife area. The system further allows effective wildlife enforcement patrol to be taken among all community rangers, park managers, any groups, agencies or individuals directly engaged in, supporting, or responsible for the wildlife conservation, especially the tigers' population. This project can be used across a broad range of conservation contexts, from strictly protected areas to multiple-use zones, ranging from terrestrial to ecosystem. This product can motivate wildlife park rangers in their daily work by carrying the task of collecting data regarding the tigers' population during their daily site patrol. In addition, the usage of this product may empower conservation manager to gather and monitor timely and accurate information on what and where the treats are occurring to the tigers' population and how the enforcement teams are responding to that situation.

1.4 Problem Statement

Nowadays, the number of tigers' population in the world has been declined. This situation has led to the need effort to protect the endangered animals, in this case the tigers. In Malaysia, the Endau Rompin National Park in particular, is the chosen suitable wildlife reserve to conserve the tigers' population. Currently, there is no effort to carry out the real time surveillance monitoring for tiger conservation in Malaysia. It is difficult for the authorities at Endau Rompin National Park to track and monitor the tigers' population at the wildlife reserve. The Wildlife Conservation Society (WCS) Malaysia needs an effective solution that can visually monitor illegal activities regarding to tigers' mobility. The main component of this system is an Arduino, by sending data via wireless networking, using radio frequency system. Microsoft Visual Basic as interfacing system in server. The purpose construction of these system, it is expected that the number of tiger

shows in detail of mobility of the animals in real time. If the surveillance monitor shows the illegal incidents do occur, the WCS staff need to be informed quickly so that the relevant Endau Rompin National Park authority can be assigned to stop the illegal activities regarding the endangerment of tigers' population. Therefore, to overcome this problem, a monitoring system is proposed.

1.5 Scope and Limitation

In this pre-development prototype, the range distance from the transmitter and the receiver need to be defined according to the tiger's territory's in Endau Rompin National Park. Frequency booster and repeater are implemented to intensify the radio frequency for transmitting and receiving process. The system designed to implement hardware with an interface to the computer where the circuit system may interact with the computer through the interface. Write a program using Visual Basic language to computer and show the number of the tiger in the certain area.

CHAPTER 2

LITERATURE REVIEW

2.1 Project Overview

The surveillance system for tiger conservation is developed to monitor the mobility for the tiger in the area and the overall total numbers for tigers. This system prototype applies communication protocol, and uses the RF transceiver. It has the characteristic of low power consumption, low cost, flexible structure and accurate counter scheme. Furthermore, it also can achieve long monitoring for tiger's condition in real time [1]. Serial communication has some advantages over the parallel communication. One of the advantages is transmission distance where serial link can send data to a remote device more far then parallel link [2].

2.2 Project Overview at Conservation Centre, Endau-Rompin

For the past four years, WCS-Malaysia has been working closely with the State Governments of Johor and Pahang (in Peninsular Malaysia) to initiate a recovery of the tiger population and other wildlife in the Endau-Rompin landscape. WCS-Malaysia is committed to working in this landscape over the many years it will take to achieve a recovery for the number of tiger. For these reasons, a system is needed to be in place for continuously monitoring the number of tigers to surveillance and prevent the decrease of population tigers at large scale by implement the online monitoring system. Online monitoring system is an automated communications process by which measurements are made and other data collected at remote and transmitted to receiving equipment for monitoring. This work has considered the problem of tracking and monitoring wild animals and their interaction and dependency on their environment. An adaptable solution

has been proposed, that allows the mobility of tigers to be monitored using the online monitoring system and which automatically sends data through the network to the end user. Thus, this work has the potential to greatly enhance the understanding of animal behaviour, by providing large amounts of inter-related data with minimal human input. Furthermore, online monitoring allows for real-time location of an animal as locations are determined automatically.

Online monitoring is thus specified such that some parameter (such as lifetime) is maximized, at the cost of a decrease in some other desirable feature (such as sampling frequency). Obtaining data from tracking tags deployed in the field can be a time consuming and laborious affair. The WCS-Malaysia tiger conservation program focuses on activities to control the number of tigers in the Endau-Rompin landscape. It catalyzing and supporting effective on-the-ground ranger patrolling across the Endau-Rompin landscape. Some patrols are on foot while others use vehicles and boats. Mobile spot checks and static checkpoints are also conducted at the entry points to the landscape. Since year 2009, Camera-trap study to estimate the density of tigers are also underway in the area Endau-Rompin. During the study population, the camera-trap and social-economic survey will produce a baseline and to identify the environmental factors that affect the ecology of tigers and prey species. The preliminary results of this ongoing study has become a guide for environmentally friendly infrastructure design Endau-Rompin in Johor and land use planning in that area. ecologically friendly. Preliminary results of the camera-trap study under conservation centre in 350 km² in Endau-Rompin had recorded at least seven tigers [3].

Moreover, for some of these systems (in particular manual monitoring), the presence of the rangers in the field tracking the animals causes disturbance to their natural behaviour. This disturbance is likely to introduce bias into the obtained data. In addition, the network should adapt to node insertions and removals with zero configuration required from the user – the network should be a transparent method of information delivery, not a system which requires technical skill to operate and configure. Somehow, the workload of traditional artificial monitoring is big, `trapping technique, is higher and environmental impact is big. They can only monitor generally. Thus, traditional wildlife monitoring methods are far cannot meet the needs of the current. The current surveillance system in general is the use of long distance wireless communication technology is by using PC-

based monitoring via visual basic development, which is relatively easy while its portability is very low besides it is a kind of low cost, multiple technology fusion of online monitoring is designed and realized in this study.

Figure 2.1: camera-trap images of tigers in Endau-Rompin taken in 2007. These photos and others from 2007 inspired senior Malaysian government officials to fully endorse the tiger conservation efforts and to allocate increased Government funding and other resources to tiger protection.

Figure 2.2: WCS-Malaysia staff setting up a camera trap in Endau-Rompin

2.3 Research Background

The accurate estimation of wildlife population density is difficult and requires considerable investment of resources and time. Population indices are difficult to obtain and being influenced by many unknowns and the relationships to actual population densities are usually unclear as recorded in Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Therefore, a method to monitor a wildlife population may need to be tested or validated, to surveillance the population of endangered wildlife animal such as tigers.

A large number of methods have been used to monitor the threaten wildlife animal. The population may be a valued species such as deer, bear, elephant and tiger that is being managed on a sustained-yield basis may need more rigorous method to monitor their mobility for density estimation or a known population size

Technological developments have provided several methods for monitoring populations such as the use of remote camera application. Remote cameras in [4], can assist estimating population numbers, and understanding animal activity patterns. As example, [4] demonstrates the ability of remote cameras by identify the Canadian Rockies multi-species occupancy. The main findings of the Canadian Rockies Multi-Species Occupancy Monitoring Project is a collaboration between Parks Canada and the University of Montana focus the research is 270 remote cameras that placed throughout 5 Canadian national parks. These data are used to help Parks Canada inform its remote camera monitoring as efforts for surveillance large mammal populations in Canada.

Figure 2.3: Data from Camera Trap for Online Monitoring System

On the other hand, the developments in [5] have delivered other methods for monitoring the mobility of wildlife animal by using Mobile monitoring, that is widely used nowadays. In order to determine the real-time animal mobility, [5] proposed the monitoring to avoid such problems in the finding exact geographical location of animal in the jungle, national park or in wildlife reserves, wildlife animal mobile monitoring is used. This system utilizes technologies such as Global Positioning System and Global System for Mobile Communication. In [5], modem has SIM card, which is used to send SMS to the forest authority or to any government authority.

Furthermore, PC-based monitoring system has developed as one of the methods for monitoring populations. Tele monitoring system in [6], consists of sensing unit and receiving unit with PC-based for monitoring. As the technology is already part of modern farming, [6] implement a system to be in place for continuously monitoring the animal health as to control and prevent the eruption of diseases at large scale. This project is development has been used in electronic livestock farming and focused on the development of animal health tele monitoring systems via PC-based method.

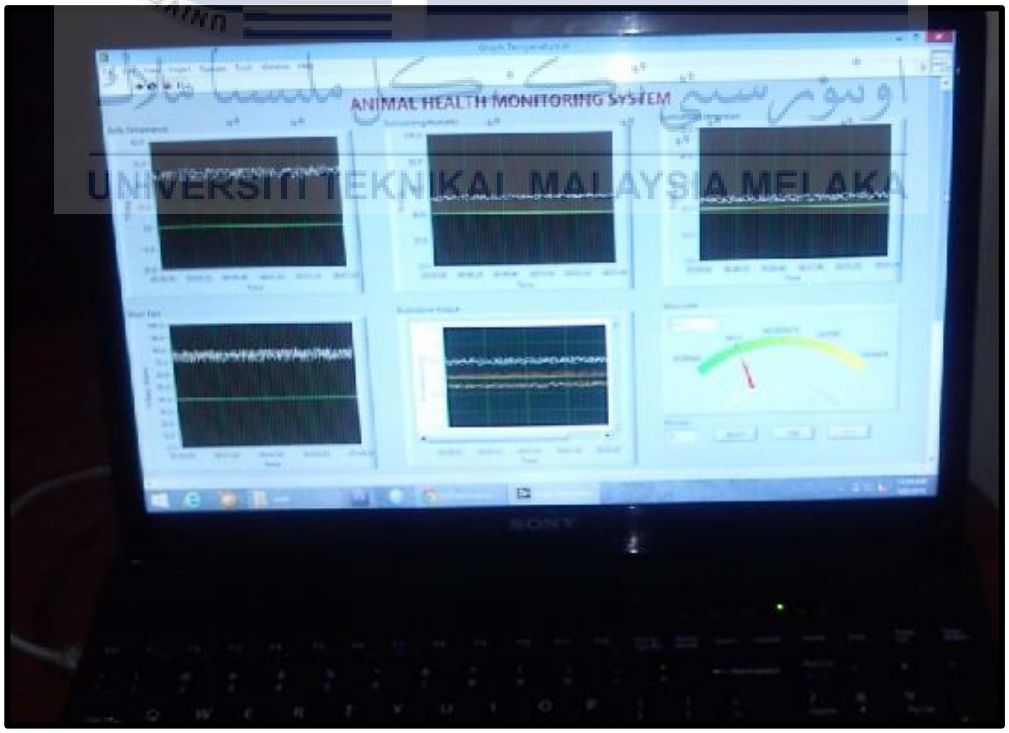

Figure 2.4: The front panel of the PC based monitoring system

2.4 Application for Online Monitoring Display

A computer-based monitoring system, also known as an electronic monitoring system is an automated communications process by which measurements are made and other data collected at remote and transmitted to receiving equipment. Technological developments for PC-based online monitoring have provided several methods for monitoring populations such as the use of web-based application and window-based application.

A web-based application is any application that uses a website as the interface (the 'front-end'). Users access the application from any computer connected to the Internet using a standard browser, instead of using an application that has been installed on their local computer. Web-based application platform likes MySQL, Apache and JSP has been used in [7], as an integrated method for reporting and recording of livestock health records. This web-based livestock monitoring systems is used to help farmers and livestock veterinary to share information for the purpose of early prevention of dangerous diseases from infected their livestock via monitoring the health status of a livestock.

In addition, web-based monitoring system has offered several advantages for Cost effective development. With web-based applications, users access the system via a uniform environment—the web browser besides it also easier to install and develop.

On the other hand, online monitoring development is also providing another convenient module for communication that is by using window-based application. Compared to web-based application module, window based application delivered advantages of window based. As in [8], applied a mechanism for ubiquitous monitoring and smart alert generation systems. In [8], the system updates the central database whenever necessary and will be able to generate views and reports whenever necessary. This project depicting these activities and overall work flow using some screen shots. Online monitoring system provide some of the Apps likes Patient Monitoring, ICU Direct Monitoring, Vitals Chart Lab Wizard, are monitored and are discussed in detail.

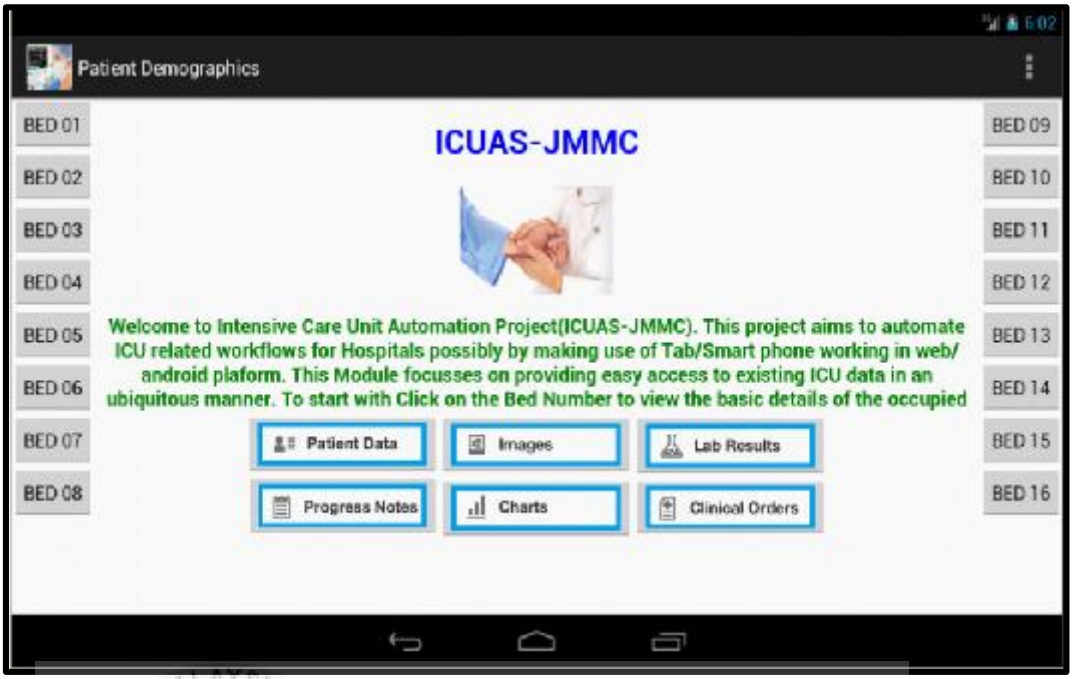

Figure 2.5 A View of Patient Data Application

This window-based application offers a set of advantages for the clinical staff, since they can move around and perform various tasks and at the same time use the device at their point of service. It will reduce the effort involved in clinical data entry, thereby allowing them to provide better patient care. The system will automatically provide more accuracy, swiftness and flexibility to their work flow.

The development of online monitoring system will be use a window based application which is more precisely a computer based application, that run through, because web based application runs from a web, through a browser may not be relevant implemented in Endau-Rompin landscape area which has difficulty with coverage communication system. Windows based application has to accessed by the particular computer and particular ranger is more suitably used in conservation centre compared to web based application as can be used by different user accessing the same program, hence mobility is more. Speed is comparatively faster for windows based application that may contribute to involvement of ranger instantly compared to speed that is slow for web based application. Therefore, window based application by using visual basic is developing in online monitoring system for monitor the mobility and the number of tigers in Endau-Rompin landscape.

2.5 Tools for Online Monitoring Architecture.

Tools architecture for online monitoring may monitor continuous and provide online investigation in real-time and offering the important events and occurrences written on them, in acceptable time. The purpose of the continuous and online investigating s is to study the contents and getting aware of the news and new events registered in them.

One of the approach of the architecture monitoring system is Java. In a simple word, the Java programming language similar to C + + programming language and it can act in a variety of diverse applications, especially stand-alone application or web-base. Besides functioning as a programming language, application development environment and development, it also acts as the launch environment (deployment). In addition, java development technology offers features that are important in the development of programming such as the compiler, interpreter, documentation generator, class file package, and others.

On the other hand, java programming language can be perceived as significantly slower and more memory-consuming than naturally compiled languages such as C or C++ as its advantages [7].

Besides that, LabVIEW is also one of the powerful programming software that can accomplish multi-processing and multi-threading. In today's society, user experience becomes more and more important even for programmer. LabVIEW provide graphical interface that can make the program clearer to read. The accessories of LabVIEW that can accomplish various tasks would let LabVIEW becomes more popular in research labs. However, price of the software is one of the disadvantages of LabVIEW [8]. A Full Development System with a single year license will cost 2,699 dollars. On TIOBE Index which shows the popularity of programming language, LabVIEW is not in the Top 50, and the major reason is high price.

However, Visual programming method allows developers to graphically construct software. Compared with traditional textual programming method, visual programming provides more efficient and easier way of producing software. Several visual programming. With visual basic, graphical user interface (GUI)can be design without the draw for thousand coding.

In the monitoring side, raw data from receiver will be compiled, analyzed and generated into graphical user interface (GUI) using Visual Basic 6.0. By using GUI application display, every single variance occurs at the mobility of tiger's and the total numbers of tigers will be interpreted into graphical interface and appeared in the monitoring server [9]. The major advantages of VB are a powerful and complete Windows application development system that enables us to use built-in functions and subroutines for dozens of different tasks. It also provides capability to produce custom libraries and objects that can be loaded at run time or bound into the distributed application. It is also a hugely successful product preferred by millions of developers at virtually all skill levels. VB is very flexible and user-friendly as it is a GUI (Graphic User Interface).

Figure 2.6: Example of Monitoring System by Using Visual Basic Application

Visual basic provide user with many function that required in the GUI and all the object can be add into the software with just one click and add a few command necessary [10]. Therefore, visual basic provides guidelines for creates a user friendly software interface easily. In this project, visual basic is implemented to in order to visualized the number of tigers around that certain area. The result obtained can be stored and analyzed by conservation rangers.

2.6 Interface Mechanism

Compared to PIC, a micro-controller that differs from microprocessor (CPU), input and output ports, memory for program and data storage, an internal clock, and one or more peripheral devices such as timers, counters, analog-to-digital converters (ADC) and serial communication facilities [10]. A micro-controller board is used for analyzing the signal from the transmitter and track the mobility of the tigers and causes the monitoring system to give an alert to the rangers that work for the surveillance system. The PIC16F84 does not support USART, therefore it cannot perform serial communications such as RS-232 (comport) communications unless very unconventional attempts are made to create it in firmware (software programmed into the chip).

Arduino is a set of development boards that come with pre-tested hardware and software libraries. The Arduino boards are built around the AVR microcontroller as the base. Programming for Arduino board is to write program for an ATMEL AVR micro-controller, only difference being that the program for Arduino is written in its own language called the **Arduino programming language**. This language is the same familiar C programming language except that everything is ready for us to use [11]. The program for reading and writing an EEPROM memory has already been written. For theses reason, Arduino UNO is used to perform serial communication for The development of online monitoring system in tiger conservation centre.

2.7 Development for Monitoring System Connection

In telecommunication and computer development, serial communication is the procedure of sending information one bit at once, consecutively, over a communication. This is as opposed to parallel communication, where a few bits are sent all in all, on a connection with a few parallel channels [11].

The online monitoring system develop the communication component – USART (Universal Synchronous Asynchronous Receiver Transmitter) located within the PIC. It is a universal communication component (Synchronous/Asynchronous), which can be used as transmitter or as receiver that allow communication between PIC to PIC or between PIC to a personal computer.in order to communicate with external components such as computers or micro-controllers, the PIC micro uses a component called **USART - Universal Synchronous Asynchronous Receiver Transmitter.**

This component can be configured as:

- a Full-Duplex asynchronous system that can communicate with peripheral devices, such as CRT terminals and personal computers
- a Half-Duplex synchronous system that can communicate with peripheral devices, such as A/D or D/A integrated circuit, serial EEPROMs, etc.

However, the USART is good for transmitting the information from PIC to PIC, and not enough to transmit from PIC to computer. Therefore, in order to transmit to a computer, we have to add another component, which will allow the transmission in the RS232 protocol and convert between the levels of voltage of the USART to the RS232. The USART logical signal levels are from 0 to 5 volt. However, in the case of RS232 we will need to different levels of voltage.

RS232 uses voltages below (-5V) to represent a logical level "1", and voltages above (5V) to represent a logical level "0". Therefore, to use this protocol we need voltage level conversion. This is possible using the device such as the MAX232. MAX232 is simple component, which operates on 5V [12].

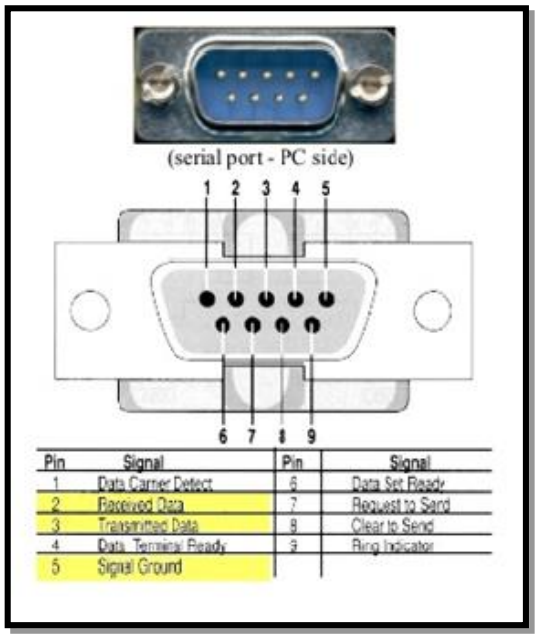

Figure 2.7: Serial Port

Wireless communication is more relevant nowadays to exchange of data between two or more point. Expanded versatility is by a long shot the greatest attraction that wireless networking holds for generally organizations. Having the capacity to sit at any terminal, anyplace in the building and get to the server is an incredible point of preference. At the point when tablets were produced, due to the new portability comfort consider that they brought inside them, this gave added catalyst to the advantages of having the capacity to work anyplace within range of the wireless network signal [12]. It implies that not just can representatives now get to data from the server, wherever they are in the premises, however it likewise empowers partners to team up and share data in gatherings held anyplace; either in a side of the workplace, a bespoke meeting room, or even the staff bottle. It empowers absolute mobility.

In order to produce wireless communication that may transfer information or power between two or more points that are not connected by an electrical conductor, Bluetooth technology was conceived as a wireless alternative to data cables by exchanges data using radio transmission. Bluetooth technology was created as an open standard to allow connectivity and collaboration between source of product [12].

CHAPTER 3

METHODOLOGY

3.1 Overview

The Wildlife Conservation Society (WCS) has the mission to save the inevitably wildlife animal especially tigers and the landscape through which they roam at Endau Rompin, Pahang. In conjunction with this effort, an online monitoring system for Tigris Conservation is proposed. In this presented system, the prototype will identify the tiger's mobility in the specified area and monitor the updated total number of tigers' population at that area using a PC-based. The design for online monitoring scheme in Visual Basic is developed for surveillance system. The development technology has delivered online PC-based monitoring system for the population of tiger at National Park Endau Rompin through wireless application, the assigned authority will monitor the tiger's location information via PC-based monitoring system in control room station. User will enable to remark the updated tiger's location and get notified alert for any mishaps.

3.2 System Design

The software development demonstrates a Visual Basic layout design as a view panel for PC-Based monitoring system in control room, to monitor the mobility and the total number of tiger in Endau-Rompin landscape.

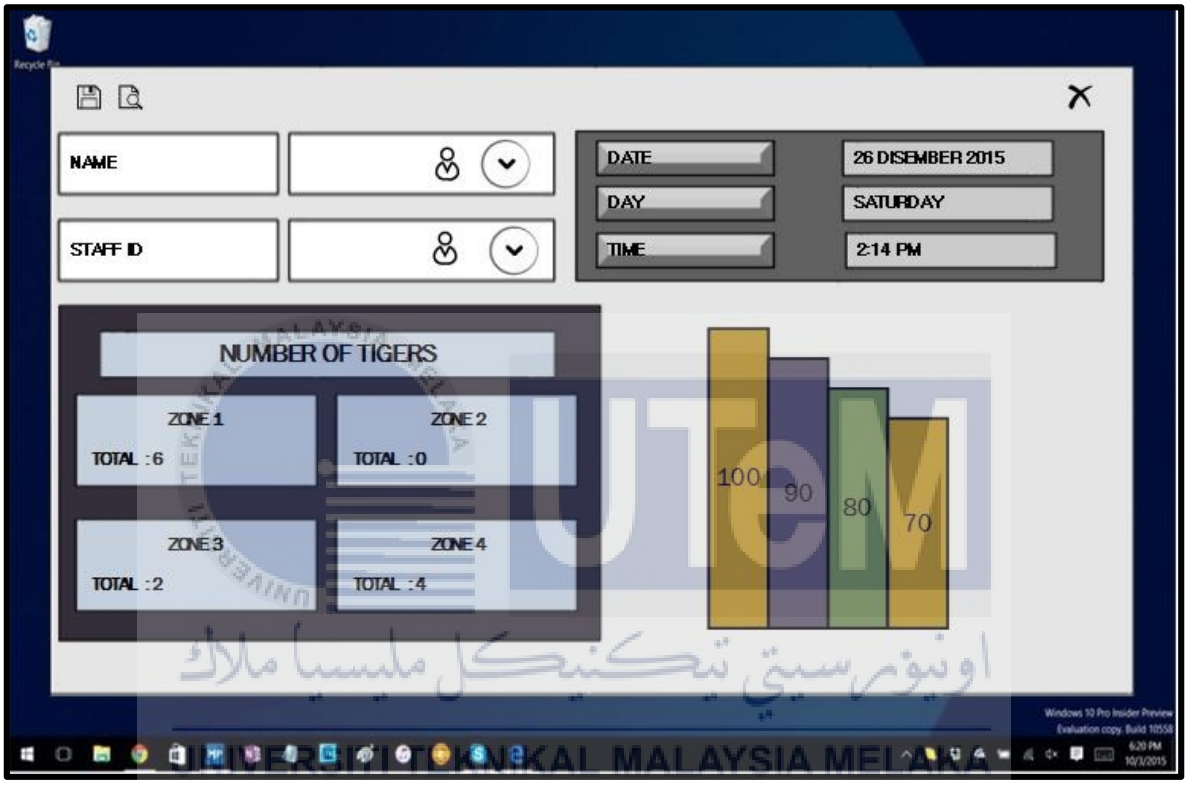

Figure 3.1: Display Design for Monitoring View Panel

The design layout demonstrates the criteria and various parameter for online monitoring system via PC-based at Endau-Rompin landscape. The criteria such as name of the officer on duties and ID number are important information to identify the person incharge during the monitoring activity. The date, time and day is the important indication data for real-time monitoring system.

In order to demonstrate the effectiveness of the approach, the number of tigers is displayed through four divided landscape zone. These zones are in conjunction, the mobility of tiger around the Endau Rompin area and it is pre-defined into four zones. However, in practical it shall divide into more zones.

Moreover, the graph acts as the easiest way for the ranger to visualize the number and the mobility of tigers. The online monitoring system will send the number of tiger inhabitants at National Park Endau Rompin through remote application to the assigned authority whom will monitor the tiger's location statistics at the PC-based monitoring system in control room station. The end user will enable to remark the update tiger's location in real-time monitoring

3.3 Software Development for Online Monitoring System via Visual Basic

Visual Basic is an incorporated situation for creating programming. Essentially it is utilized by the product designers for creating diverse programming items, utilities and sites. It is created by the product monster Microsoft. Visual Studio gives far reaching devices bundle to the improvement of programming items.

Figure 3.2: Visual Studio 2010

Visual Basic delivered a dialog to demonstrate the cluster of projects that will be developed. The GUI of Visual Studio is exceptionally straightforward. A project explorer is rested at the upper right corner which records the scheme you have in your design plan. The properties window empowers you to pick diverse properties for your undertaking like the outskirt sort, shading and tone setting.

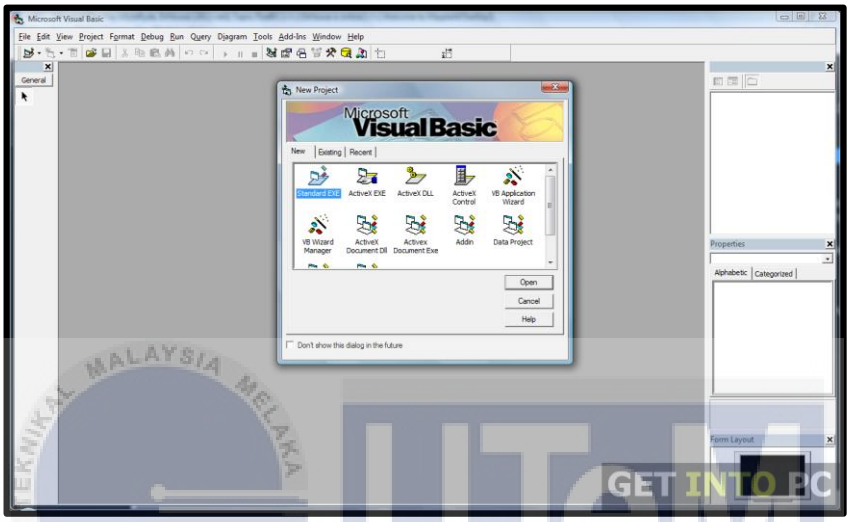

Figure 3.3: Visual Basic Set-Up

On the left hand side is the toolbar with some helpful instruments that can be utilized as a part of the scheme like pencil, brush, and content tools. All things considered Visual Basic is an overwhelming tool for creating programming system. Some of elements of Visual Studio are perceptible components for Visual Studio:

- Simple to utilize.
- Create programming items and sites.
- Basic however powerful interface.
- Scheme that demonstrates every segment element
- Coding window for composing codes.

3.4 PC-Based Display Set-Up for Surveillance System Via Visual Basic

Window-based application is widely used these days and most personal computers come with this available complete specification. It can be utilized for a variety of purposes, for example, surveillance system and energy monitoring system. The development of software visualization monitoring required to be setup an effective way to monitor the significant landscape.

Visual Studio Technical Setup Details as below:

- Working System: Windows 98/XP/Vista/7/8
- Memory (RAM): 256 MB of RAM required.
- Hard Disk Space: 100MB of free space required.
- Processor: a Pentium processor.

In order to demonstrate the surveillance system, several details for visual basic is described as below:

- Programming Full Name: Visual Basic
- Setup File Name: Microsoft_Visual_Studio
- Full Setup Size: 617 MB
- Setup Type: Offline Installer/Full Standalone Setup:
- Similarity Architecture: 32 Bit (x86)/64 Bit (x64)
- Most recent Version Release Added On: 1998
- Designers: Microsoft

3.5 System Operation

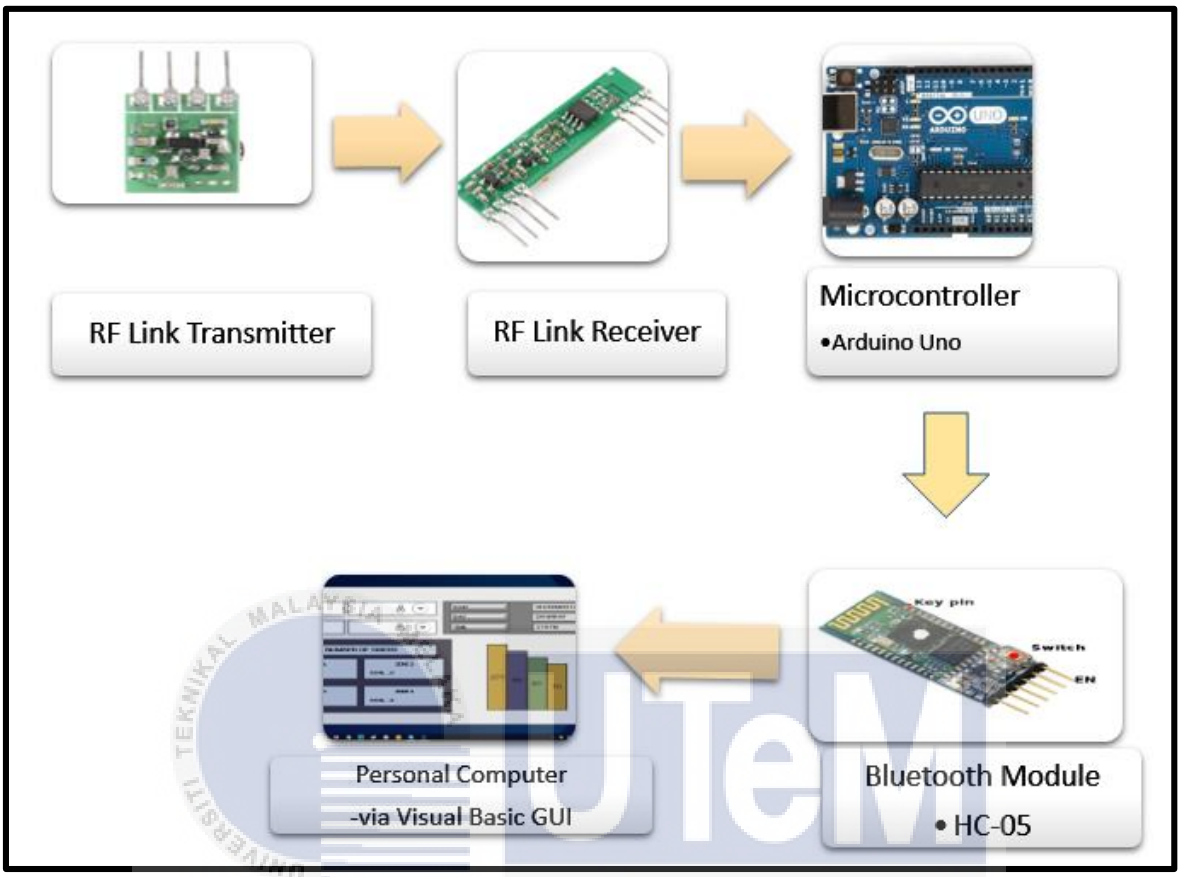

Figure 3.4: System Operation

From the Figure 3.4, shows the block diagram of the circuit. The block diagram described the overall structure for the online monitoring system. The system use applies a unique RF signal by using transmitter and receiver as communication module. The microcontroller (Arduino) act as a brain for the whole system that carry programmable input/output peripherals. The Arduino have sent the data to the personal computer to display.

The easiest and economical way to go wireless in an embedded system is through a Bluetooth module. The serial communication goes wireless by using HC-05 module. These module works as a serial (RX/TX) pipe and can be passed seamlessly from the Arduino to PC at 9600bps. The remote unit can be powered from 3.3V up to 6V for easily battery attachment.

The graphical user interface of the Visual Basic software provides intuitively interesting views for the management of the program structure in the large and the various type of entities such as the number of tiger for each zone. Visual is a component integration language which is a tuned to **Microsoft Object Model (COM).** COM component write in different language that is Arduino IDE and then integrated using Visual Basic. The approach will reflect the objective of the online monitoring system via Visual Basic display monitoring at PC-based.

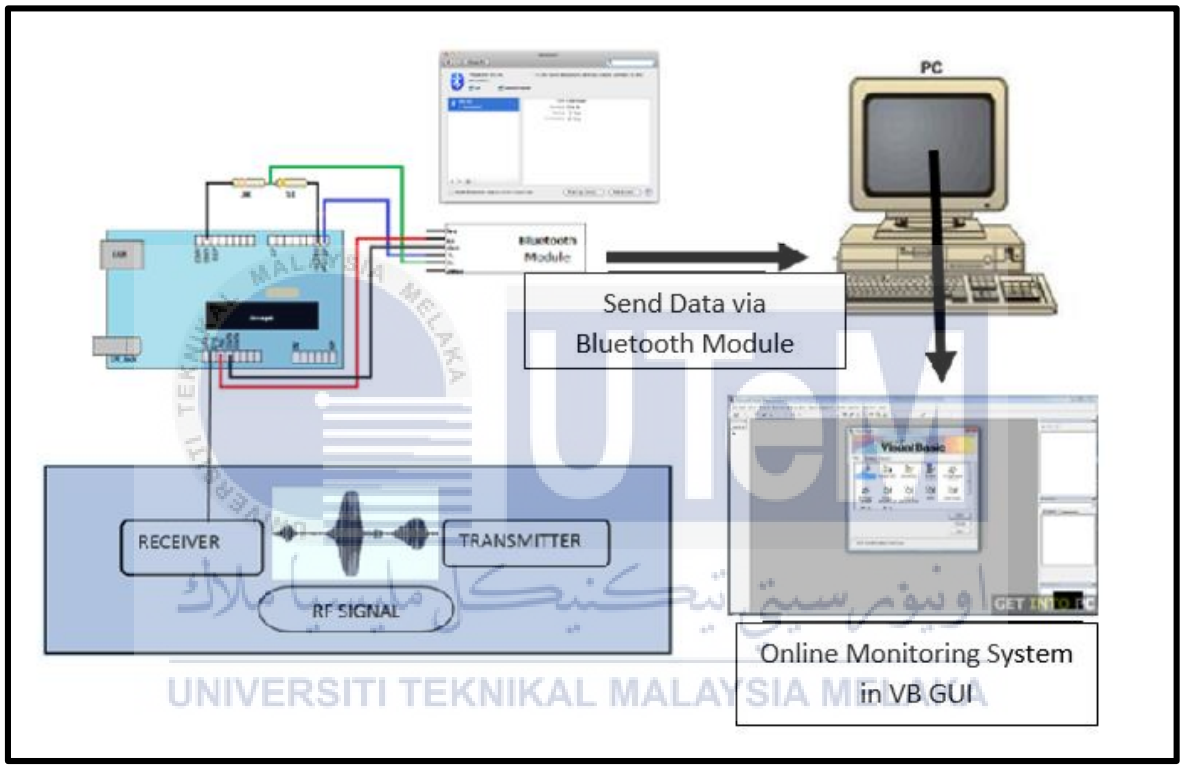

Figure 3.5: Project Development Illustration

3.6 Project Development

In order to demonstrate the effectiveness of the proposed approach, a flowchart of the project have been fully designed, including the combination of hardware and software development.

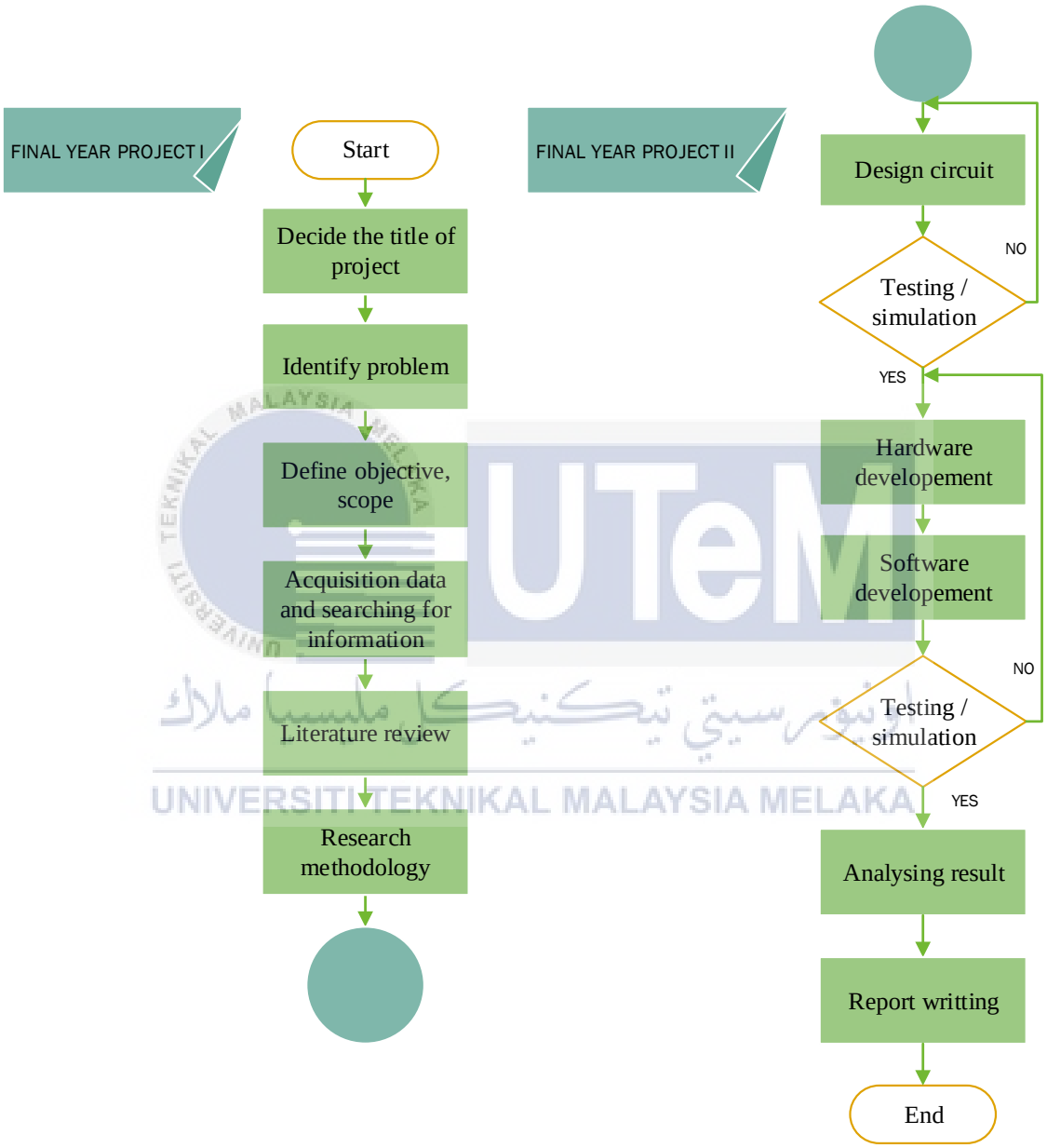

Figure 3.6: Flowchart Project

In the process flow, the title is very important and need to certainly detail in order to decide an appropriate title for the project design. Besides that, identifying project objectives and the problem statement of the project is also essential. The next step shows the important of analyzing the project and gather information, also analyze the requirement of the materials. The information obtains from various of books, journals, internet, magazine and others. Learn and implement the microcontroller as the brain of the system and to communicate with personal computer through wireless networking module is one of the methodology to design hardware. On the next step, it is important to find solution to connect with PC interface. Visual basic is chosen and be tested to determine its effectiveness, or the functionality performance for monitoring and collecting data.

3.6.1 Circuit Connection System

In order to show the efficiency of the proposed approach, an example for a real-time monitoring and control circuit connection have been fully illustrated, including display of real-time monitoring in order to monitor the mobility and the number of tigers at certain area.

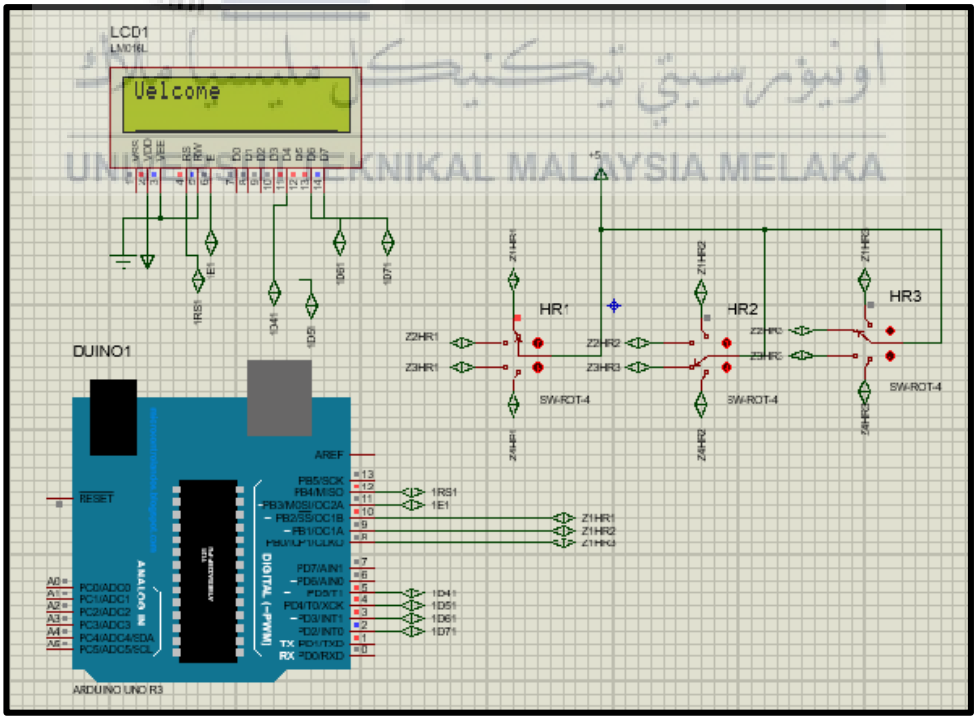

Figure 3.7: Circuit Connection

3.7 Experimental Set Up

The prototype development for online monitoring system to surveillance the mobility and the total of tiger show the capability of the proposed methodology, variety of continues monitoring and control operations have been completely defined, including system association, setting of programmed control, presentation of continuous operation, and so on.

The landscape of Endau-Rompin National Park will be divided into four zones. A pole for receiver element will be located at each zone to detect the signal from tigers which tagged with collar that carries transmitter. In conjunction, the data of appearance of tiger will display at end user as the total number of tiger by zone.

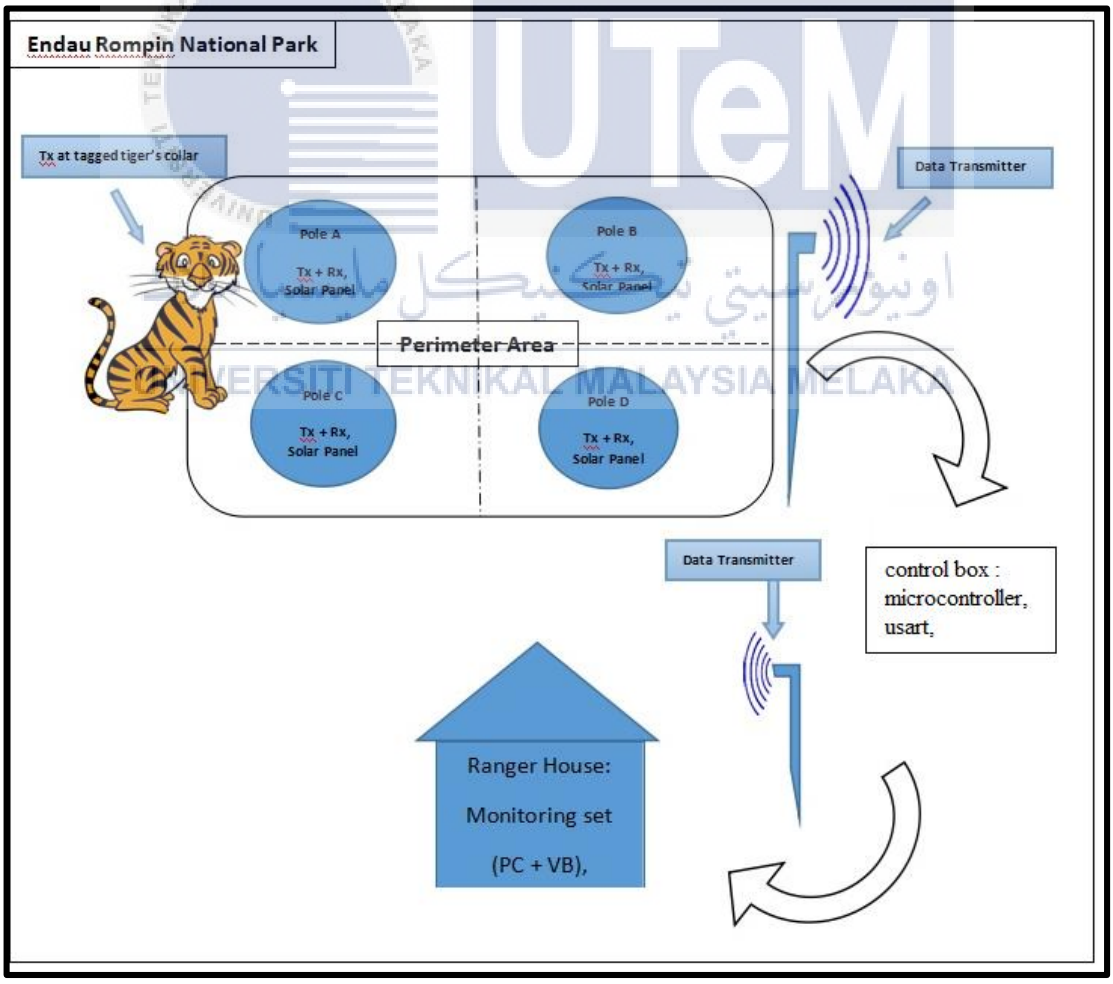

Figure 3.8: Landscape zone as experimental set up

3.8 Project Gantt Chart

Table 1: Gantt Chart for the Final Year 1 and Final Year 2

Project Task	Final Year Project 1					Final Year Project 2				
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Mei	Jun
Discussion with supervisor related to FYP title										
Search Journal and Literature Review about street light energy saving										
Understand the theory and operation of previous work										
Progress Report - Introduction & Literature Review										
Progress Report – Methodology, Preliminary Result & Conclusion										
Doing Model Simulation using Arduino software										
Make a circuit design of Street Lighting System										
Hardware Implementation										
Hardware Testing										
Analysis & Discussion										

CHAPTER 4

RESULT AND ANALYSIS

4.0 Introduction

This chapter briefly discusses and presents the result in the development of online monitoring system prototype for tiger's conservation center. In this chapter, the result is divided into several parts, including testing result which is conducted deliberately to test the objectives of this project.

The first objective is to monitor the mobility of tiger in National Park Endau Rompin while the second objective is to design online monitoring scheme that equipped with GUI display via Visual Basic software for monitoring purpose.

For mobility, wireless technology is a key empowering technology that allows establishment to extend their current network into areas where hardwiring would be costly or difficult. Its allow user to accomplish complete PC portability and location independence. Wireless communication has additionally made it much simpler for Information Technology department to install and maintain hardware. Beforehand, interfacing PCs, printers and different gadgets to the organization system required running lengths of cable all through the office, regularly requiring access to sub-floor or roof spaces, and a solitary terrible wire could trigger hours of work attempting to discover the imperfection.

Remote systems administration is much simpler to arrange, basically requiring designed repeaters set to develop the sign all through the workplace. Wireless network is also easy to access, the password, allowing the use of tablet PCs and other portable device without protracted configuration and setup. For these reason, the third objective of this project is achieved by developing online PC- based monitoring system for the population of tiger at National Park Endau Rompin.

4.1 Monitoring The Number of Tiger

Based on the study, the performance of online monitoring system using window-based application, may restrict the capability to monitor only to the pages within the window domain. This mechanism also serves to prevent unauthorized monitoring of the system monitoring.

In addition, all the components such as microcontroller, RF module is used for the construction of hardware, but before that, the simulation model has been made in advance.

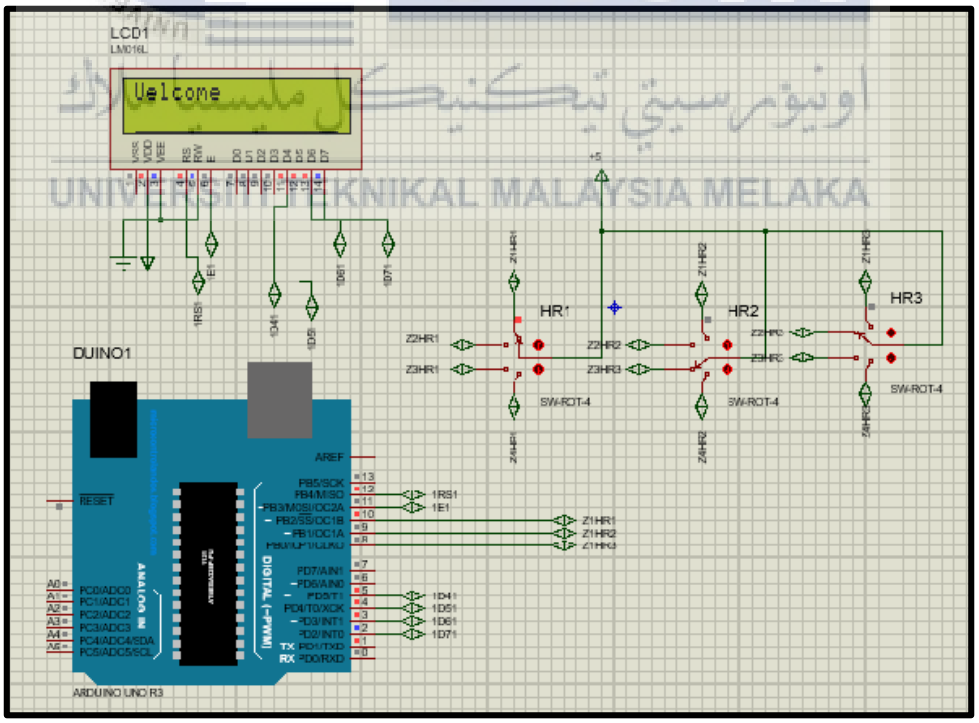

Figure 4.1: The Simulation for Online Monitoring System Using PROTEUS Software

Figure 4.1 shows the circuit that is constructed by represent the transmitter by switch. As for the circuit simulation, the LCD display the number of tiger that within a predetermined zone. Since the display unit connected to the processing unit, the Arduino, this circuit is powered by 5V dc power supply which represent 5V output produced by the Arduino output terminal. The circuit simulation is conducted to be implemented in tracking system parts for counting and identify the location of tigers. This circuit is simulated in Proteus software.

Based on the simulation result, the tracking system accomplish the objective and its carries the RF signal and been detected by the receiver was proven to be the suitable mechanism to monitor the mobility of tiger. The changes made by the switch transmitter is varies with the display unit across the microcontroller used. Thus, the tracking system which based on the RF communication system is implemented to track and monitor the number of the tiger is very relevant to be used on the input for whichever remote area. It's recommended that all frequency will be entered in microcontroller before the data is transfer to be displayed.

In the conjunction, the receiver equipped with continuous tone coded *squelch* system circuit locks out all signal except ones encoded with the correct frequency. Continuous tone coded *squelch* system can be regarded as a form of in-band signaling.

This result shows the performance of tracking system is improving by mobile data capability for tracking -to-base communications compared to current analyzing and monitoring by catalyzing and supporting effective on-the-ground ranger patrolling across the Endau-Rompin landscape. Some patrols are on foot in the backcountry while others use vehicles and boats.

4.2 The System Operation

This system starts with the tracking system that shows the mobility of tiger. The number of tiger is obtained from the RF signal by using transmitter and receiver as communication module. The signal is processed by the Arduino by converting the output into the number of tiger in the certain zone.

This output also programmed into the GUI display program. The number of tiger is then displayed continuously in GUI display via Visual Basic software for monitoring purpose and is ready to be recorded and plotted. The system operation is shown in Figure 4.2 below.

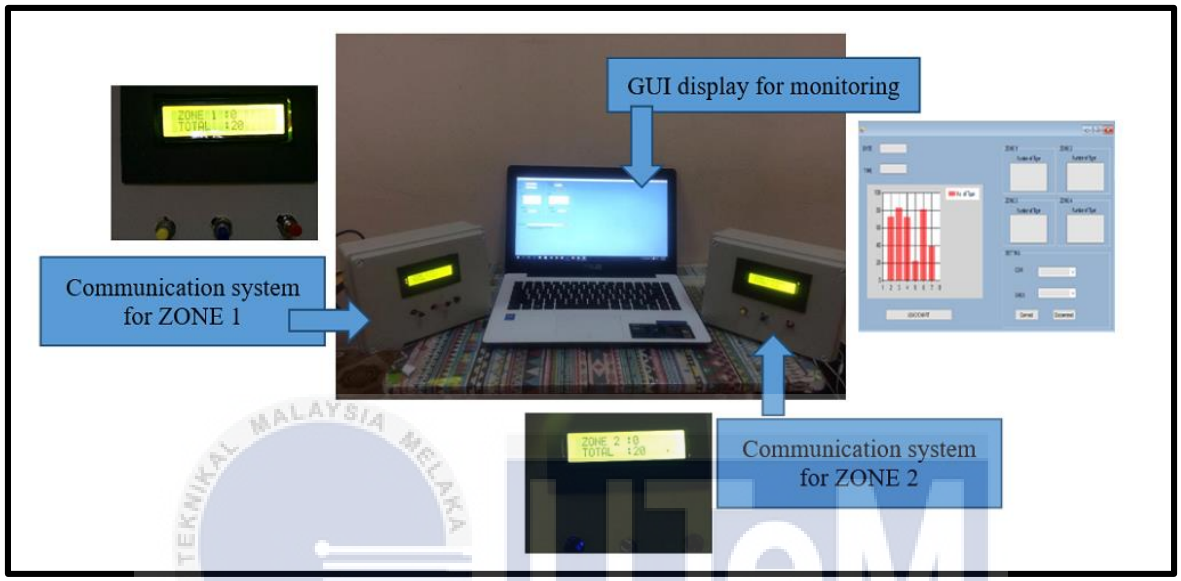

Figure 4.2: System Operation

4.3 Development of Online Monitoring System Display

The online monitoring system prototype is developing by implementation of Visual Basic system monitoring, which displays the number of tiger in Window form, similar to the performance page in the Task Manager. However, this effective system is also needs to record the system data in the background, to monitor the records, and trigger some action for any mishaps.

The monitoring system is developing by using the Microsoft Visual Basic 2010. This application defining code to control command received by Arduino and action taken to the display. The service control manager includes to start, stop, pause, resume, and configure your service. This application receives input to prepare data and state for a task. An application usually need to display the output to indicate results.

This application displays the number of tiger within the specified area and all the reading from the time it is connected to the Arduino together with the time that is reading is taken. These output reading are shown in the result section of the application.

Besides that, the main setting of the system is also provided in the application. The main setting will provide the setting such as the COM port where the Arduino as the processing unit is connected to and its baud rate.

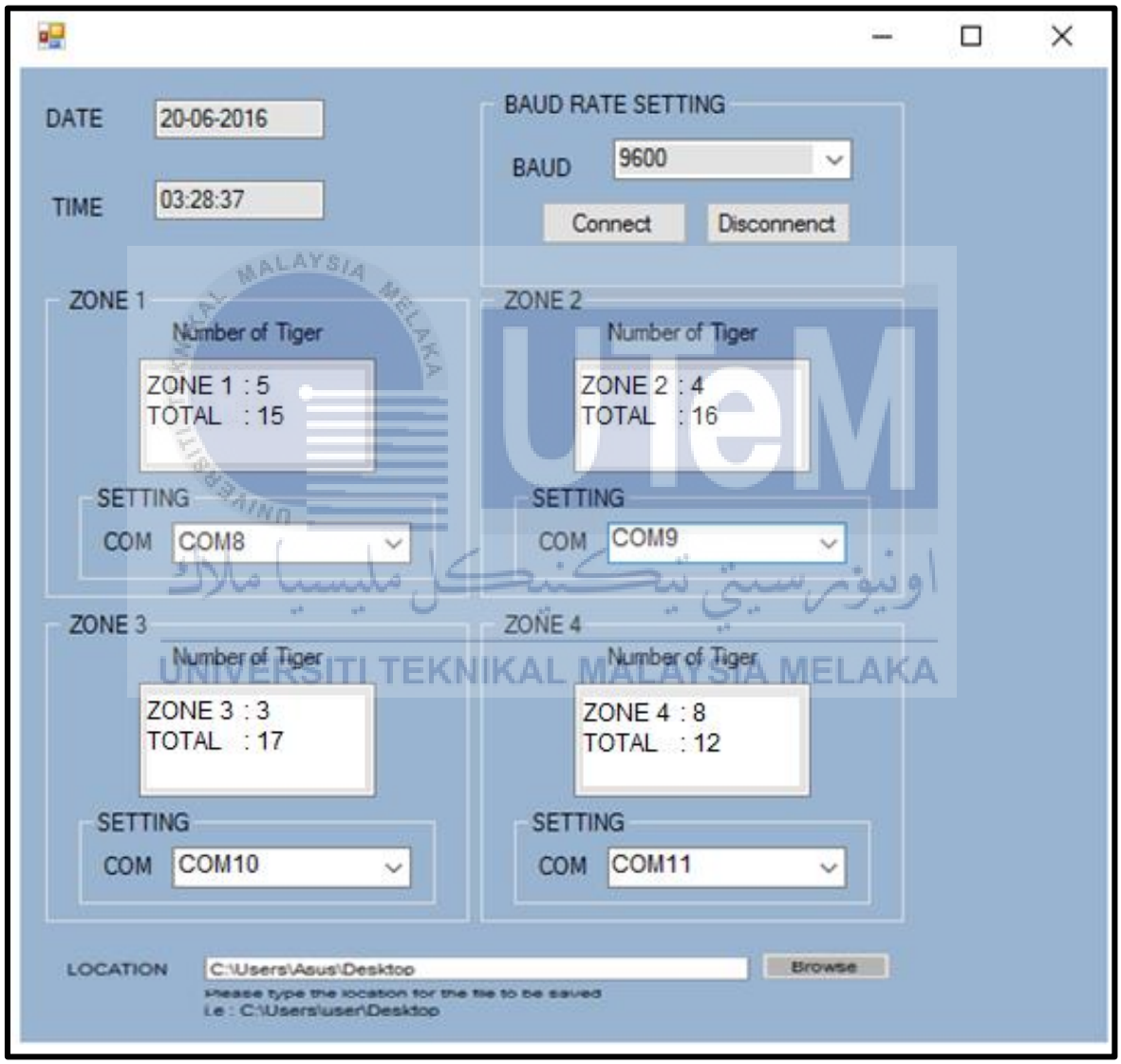

Figure 4.3: Monitoring Scheme Via Visual Basic

As Figure 4.3 shows, the data is obtaining from receiver signal. The frequency meets from the transmitter that connected to the tiger and when it reaches the receiver to the predetermined zone, the number of tiger will display the number of tiger per zone and the total number of tiger in the National Park. The data shows the mobility of tiger in the specified area per zone. The total number of tiger that equipped by the transmitter is 20. The result shows that the subsection of tiger is recorded. Zone 1 consist of 5 tigers while Zone 2 subsist as 4 of tiger. Zone 3 and Zone 4 accommodate as 3 and 8 number of tiger respectively. Total, defines the location of the total number of tiger in the other zone stated. The browse button is implemented to save the data as the user needs. User will enable to remark the update tiger's location and action may be taken for any mishaps.

4.3.1 Data Logging System

The data logging system for the online monitoring system enables user to record data over period of time or in relation to location via external instruments and sensor. Cumulative, but not entirely, they are based on window application.

Number of Tiger						
Date:Monday, 20 June, 2016 Time:4:34:47 AM						
**********						
Zone 1		Zone 2		Zone 3		Zone 4
ZONE 1 : 5		ZONE 2 : 4		ZONE 3 : 3		Zone 4 : 8
TOTAL : 15		TOTAL : 16		TOTAL : 17		TOTAL : 12

Figure 4.4: The data collected and save in Microsoft Excel Application

The Figure 4.4 shows the data obtained from the Visual Basic application. The data then save as in Microsoft Excel application. The data logging system that available in this application record the reading with the time the reading is taken and plot it in graph. The

data shows 5 tigers are in the predetermined Zone 1 and 15 tigers are in the other zone, while Zone 2 consist of 4 tiger and the rest of 16 tigers are in the other zone. Zone 3 and zone 4 shows the number of tiger is 3 and 8 respectively and the total shows that the rest number of tiger are in the other predetermined zone.

Features such data logging is also implemented in this application. This application is able to save the reading data in a text file and plot the graph. Figure 4.5 shows the graph plotted that's carried out via Microsoft Excel 2016. All the data saved can be reviewed back by opening the file as usual, just like other application.

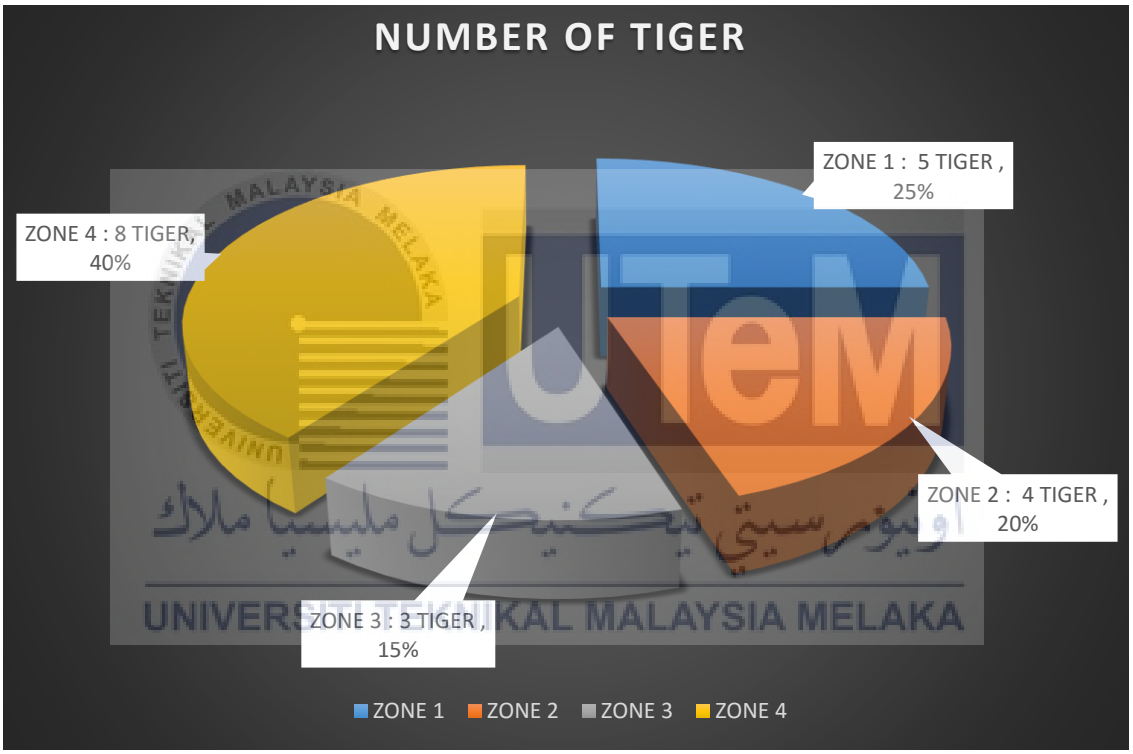

Figure 4.5: The Number of Tiger Within District Area Graph

The data plotting and the time log are the features that is very useful for the user to monitor the mobility of tiger and alert of the population of tiger in the National Park Conservation Center. Visual Basic was providing a graphical programming environment and a paint metaphor for developing user interfaces. Instead of worrying about syntax details, the Visual Basic programmer can add a substantial amount of code simply by dragging and dropping *controls,* such as buttons and dialog boxes, and then defining their appearance and behavior.

User will enable to remark the updated tiger's location and get notified alert for any mishaps. Furthermore, the indication of the tiger's location will be available on the field.

4.4 Development of Wireless Online Monitoring System

For mobility, wireless technology is a key empowering technology that allows establishment to extend their current network into areas where hardwiring would be costly or difficult. Its allow user to accomplish complete PC portability and location independence. For these reasons, the third objective of this project is achieved by developing the prototype version of online PC-based monitoring system for the population of tiger at National Park Endau Rompin.

Bluetooth technology is implemented in this project to enable for wireless transmitting and receiving serial data. It is a drop in replacement for wired serial connection allowing transparent two-way data communication. The Bluetooth module is used for serial port replacement to establish connection between embedded project and PC to data transfer.

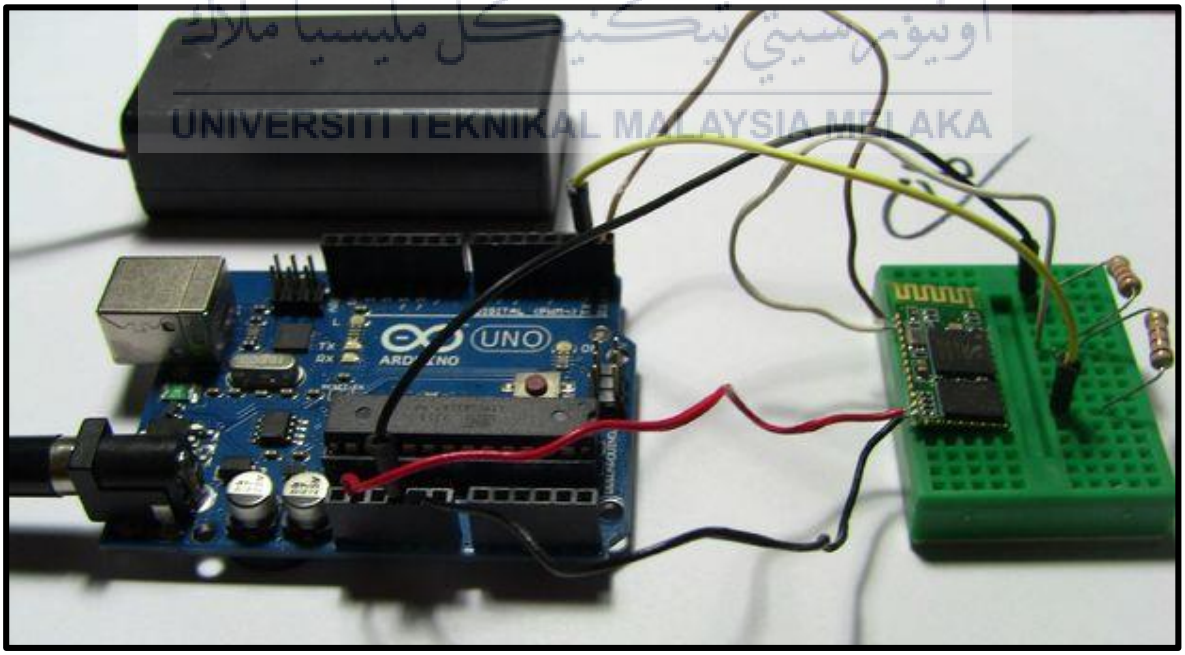

Figure 4.6: Bluetooth module connected to programmable Arduino

The Figure 4.6 shows the circuit connection for Bluetooth hardware connection system. The module commonly repeats the data achieved that on the output especially for the forest landscaped was used.

From this project, the collecting data system is elevating to the next level when wireless networking, method by which homes, telecommunication networks and business installation avoid the costly process of introducing cables into a predetermined area, or as connection between various equipment location.

Together with this effort, a development of monitoring system for wildlife animal is improving by implement the wireless technology. The presented system includes RF (Radio Frequency) and wireless technology for communication systems with very low power consumption, which can receive small signals at very long distances. The user can identify the tiger's mobility in the specified area and monitor the updated total number of tigers' population at that area using a PC-based software and networked base station located at the same area.

As the objective is achieved, for some of these systems (in particular manual monitoring), the presence of the rangers in the field tracking the animals causes disturbance to their natural behaviour. Analysis shows, this disturbance is likely to introduce bias into the obtained data. In addition, the network should adapt to node insertions and removals with zero configuration required from the user – the network should be a transparent method of information delivery, not a system which requires technical skill to operate and configure.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.0 Conclusion

In this project, the pre-development for online monitoring prototype at tiger conservation center is described which integrates new technologies, offering energy saving and ease of implementation and maintenance. This proposed system utilizes the high efficient of monitoring technology and the microcontroller based intelligent management of the project posts activities of the rangers and the surveillance for tiger mobility conditions. The proposed control is especially appropriate for the tiger conservation center for Endau-Rompin landscape. However, its setting is very universal, potentially as a valuable asset and will bring considerable economic benefits.

In conclusion, the data from the Online monitoring system prototype can be clarified as a good supportive management for the wildlife conservation project. It implicates the systematic and continuous collection of data useful for auxiliary analysis (review and evaluation) and for understanding decision-making.

Software is used to calculate the Arduino microcontroller and to display and store the data used in Visual Basic. GUI from Visual Basic is very easy to use. Display can be seen and shown clearly and can be used directly. User time or training is not required for use of software and devices. Therefore, this software is user friendly and can be received

even if a person with little knowledge of electronics and electricity and just need to know to read and understand the rules interface.

Together with this effort, a development of monitoring system for wildlife animal is created. The presented system includes RF (Radio Frequency) and wireless technology for communication systems with very low power consumption, which can receive small signals at very long distances. The user can identify the tiger's mobility in the specified area and monitor the updated total number of tigers' population at that area using a PC-based software and networked base station located at the same area.

Overall, the stated objectives have been achieved. Accuracy and speed of the system to get the data depends on the situation in the project. Among them are caused by the programming software used is slower and affect the ability of the data collection process.

5.1 Recommendations

In this part, the proposed improvements for this project is very important so that improvements are only to be used in the near future so that these systems become more advanced and more interactive.

To improve the designed system in the future, it is proposing to further the design of each power system monitoring to communicate with the computer by wireless transmission such as the XBee technology. Therefore, users can fully monitor and determine the population of tiger in the home and because the technology offer the low data rate (240kbits/s) and low power consumption. In the other hands, this technology is used to make a mesh-type sensor network; each XBee device can communicate with each other, and through each other via mesh to devices that are out of range.

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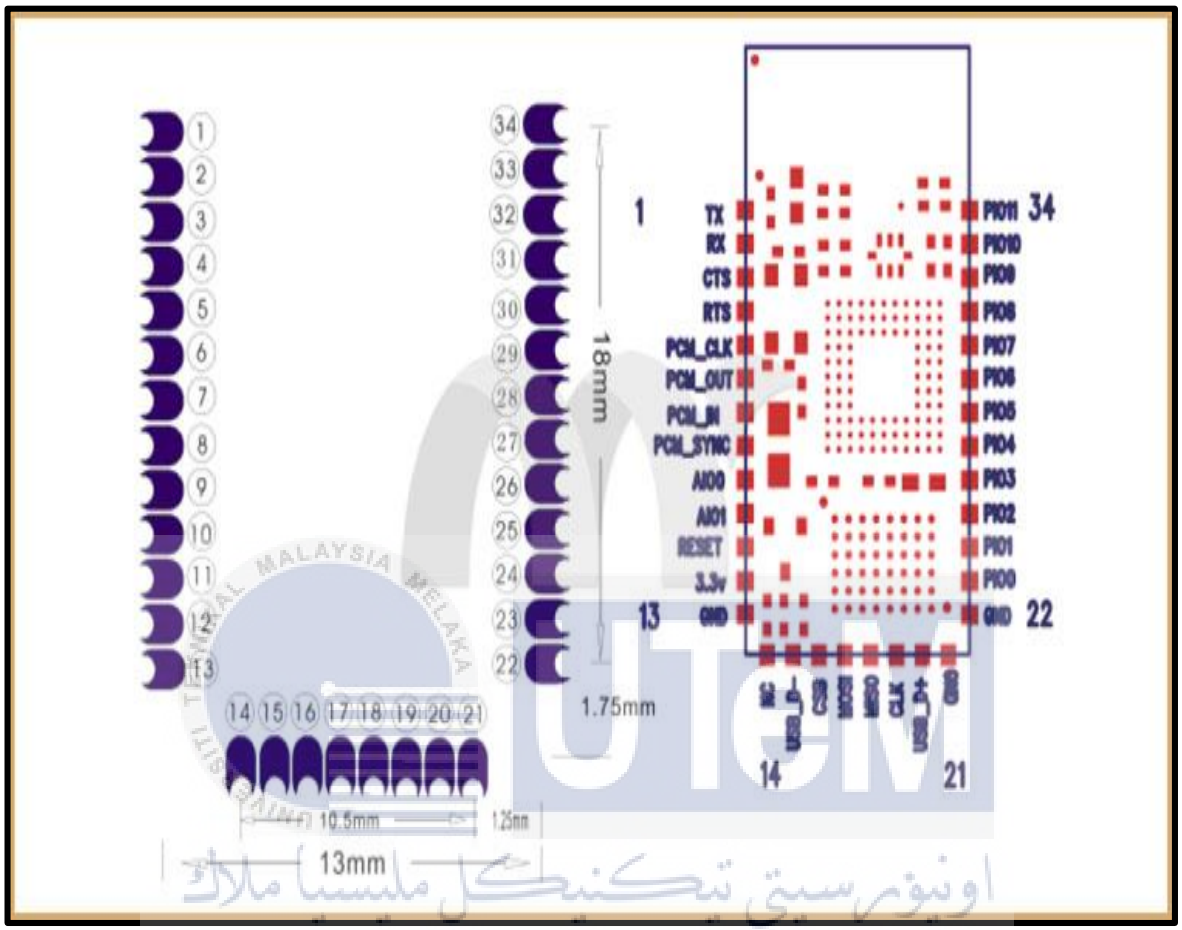
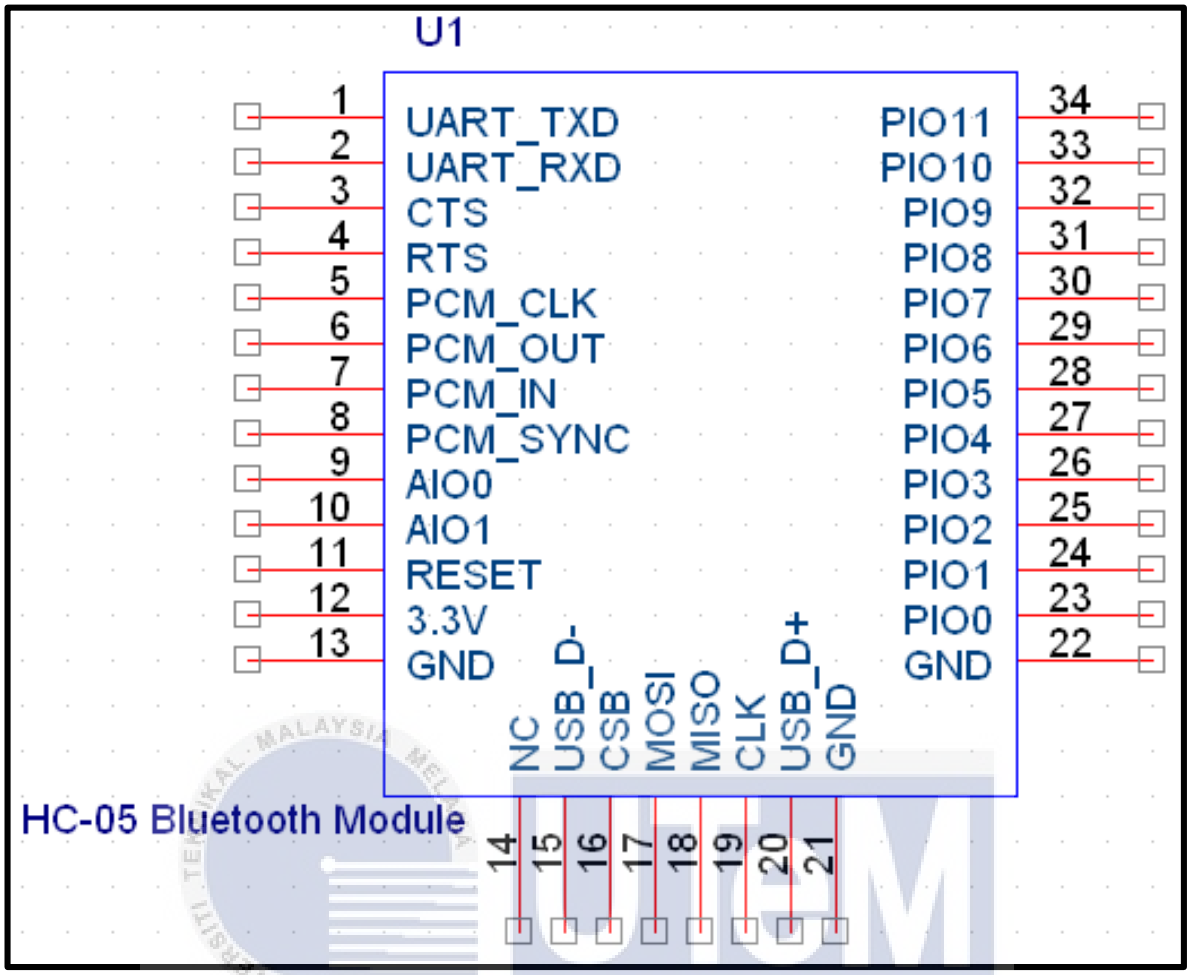
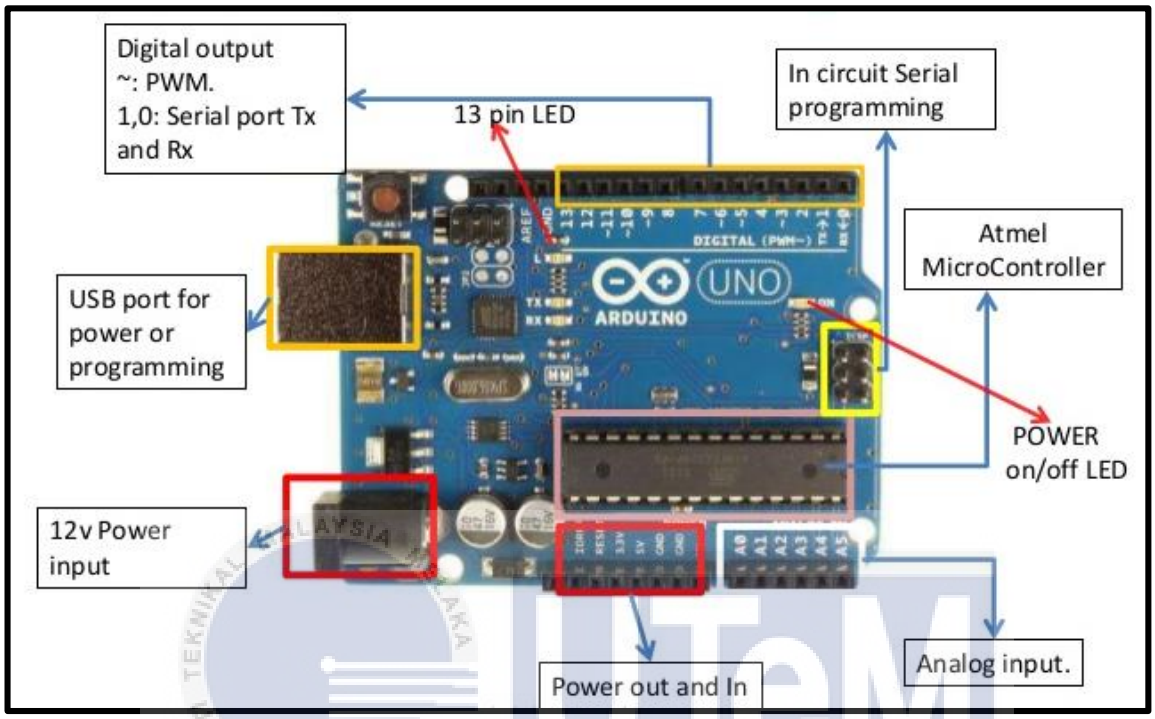
APPENDIX A







APPENDIX B

```
Imports System.IO.Ports

Public Class Form1
    Dim WithEvents sp As New SerialPort

    Private Sub GetSerialPortNames()
        For Each sport As String In My.Computer.Ports.SerialPortNames
            cmbPort.Items.Add(sport)
        Next
    End Sub

    Sub ShowString(ByVal myString As String)
        txtIn.AppendText(myString)

    End Sub

    Delegate Sub myMethodDelegate(ByVal [text] As String)
    Dim myDelegate As New myMethodDelegate(AddressOf ShowString)

    Private Sub Form1_Load(sender As System.Object, e As System.EventArgs) Handles
MyBase.Load
        Dim BaudRates() As String = {"300", "1200", "2400", "4800", "9600", "14400",
"19200", "28800", "38400", "57600", "115200"}
        cmbBaud.Items.AddRange(BaudRates)
        cmbBaud.SelectedIndex = 4
        Try
            GetSerialPortNames()
            cmbPort.SelectedIndex = 0
        Catch
            MsgBox("No ports connected.")
        End Try
        Timer1.Enabled = True
    End Sub

    Private Sub btcConnect_Click(sender As System.Object, e As System.EventArgs)
Handles btnConnect.Click
        Try
            sp.BaudRate = cmbBaud.SelectedItem.ToString
            sp.PortName = cmbPort.SelectedItem.ToString
            sp.Open()
            If sp.IsOpen Then
                btnConnect.Visible = False
                cmbPort.Enabled = False
                cmbBaud.Enabled = False
                btnDisconnect.Visible = True
```

```
            End If
        Catch
            sp.Close()
        End Try
    End Sub

    Private Sub btnDisconnect_Click(sender As System.Object, e As System.EventArgs) Handles btnDisconnect.Click
        Try
            sp.Close()
            btnConnect.Visible = True
            btnDisconnect.Visible = False
            cmbPort.Enabled = True
            cmbBaud.Enabled = True
            Exit Sub
        Catch
            MessageBox.Show("Some kind of problem.")
        End Try
    End Sub

    Private Sub Form1_FormClosing(sender As System.Object, e As System.Windows.Forms.FormClosingEventArgs) Handles MyBase.FormClosing
        If sp.IsOpen() Then
            MessageBox.Show("Disconnect before closing")
            e.Cancel = True
        End If
    End Sub

    Private Sub SerialPort_DataReceived(ByVal sender As Object, ByVal e As System.IO.Ports.SerialDataReceivedEventArgs) Handles sp.DataReceived
        Dim str As String = sp.ReadExisting()
        Invoke(myDelegate, str)
    End Sub

    Private Sub cmbBaud_SelectedIndexChanged(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles cmbBaud.SelectedIndexChanged

    End Sub

    Private Sub Timer1_Tick(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Timer1.Tick
        TextBox1.Text = Date.Now.ToString("dd-MM-yyyy")
        TextBox2.Text = Date.Now.ToString("hh:mm:ss")
    End Sub

    Private Sub Label3_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Label3.Click

    End Sub
```

```
Private Sub Label4_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Label4.Click

End Sub

Private Sub txtIn_TextChanged(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles txtIn.TextChanged

End Sub

Private Sub TextBox1_TextChanged(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles TextBox1.TextChanged

End Sub

Private Sub SETTING_Enter(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles SETTING.Enter

End Sub

Private Sub Label1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Label1.Click

End Sub

Private Sub GroupBox1_Enter(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles GroupBox1.Enter

End Sub

Private Sub TextBox3_TextChanged(ByVal sender As System.Object, ByVal e As System.EventArgs)

End Sub

Private Sub TextBox3_TextChanged_1(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles TextBox3.TextChanged

End Sub

Private Sub GroupBox2_Enter(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles GroupBox2.Enter
```

```
    End Sub

    Private Sub Chart1_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Chart1.Click

    End Sub

    Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button1.Click

    End Sub

End Class
```