Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF LIVESTOCK FEEDING AND TEMPERATURE MONITORING SYSTEM USING LORA IOT PLATFORM

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SITI KHATIJAH BINTI MAT INTAN

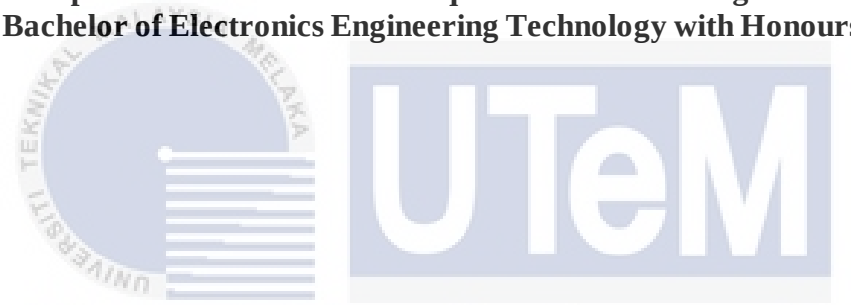
Bachelor of Electronics Engineering Technology with Honours

2021

DEVELOPMENT OF LIVESTOCK FEEDING AND TEMPERATURE MONITORING SYSTEM USING LORA IOT PLATFORM

SITI KHATIJAH BINTI MAT INTAN

A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honours



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FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : Development of Livestock Feeding and Temperature Monitoring System Using LoRa IoT Platform

Sesi Pengajian :2021/22

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Tarikh: 9 JANUARY 2022

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DECLARATION

I declare that this project report entitled "Development of Livestock Feeding and Monitoring System Using LoRa IoT Platform " is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Student Name : SITI KHATIJAH BINTI MAT INTAN

Date : 9 JANUARY 2022

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APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Engineering Technology with Honours.

Signature : 

Supervisor Name : TS DR. MOHD SYAFIQ BIN MISPAN

Date : 9 JANUARY 2021

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DEDICATION

To my beloved mother, Latipah binti Ibrahim and father, Mat Intan bin Adam, and to dearest brothers and sisters.

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ABSTRACT

The livestock sector is one of the important sectors in Malaysia and over the world for supplying food. To provide high quality and quantity of this sector especially for chicken livestock, the food, temperature, and environment need to be maintained optimally for getting the best quality of chicken especially their size and ideal weight. It also help to prevent from chicken deases. Therefore, in this project we proposed a LoRa IoT-based livestock feeding and temperature monitoring system has been built to keep track of the livestock. RFID in a feeding system is utilising to keep track of whether or not the chickens eat. For loadcell, used to monitor the status of the food container. Once the mass of food in container is below 100g the servo motor turn ON and the food automatically refill. The ultrasonic used to monitor the status of the food storage and it is will send the notifications to the used for restock the food in food storage. To obtain the greatest grade of chicken, the chicken must consume a specified amount of food. Chickens are delicate creatures that require a consistent temperature and humidity in their cage to live a long and healthy existence. As a result, the is utilised to monitor and manage the chicken's temperature and humidity. MQ2 will be used to detect ammonia and carbon dioxide levels. It is used to determine whether or not chicken food is fit to eat. It also ensures that the amount of ammonia is minimal, as large levels of ammonia harm the chicken's respiratory system. The DC fan is used to remove unclean air from the chicken cage. All of the systems were built with LoRa IoT and connected to a NodeMCU ESP8266 for data transmission and reception. The Blynk app is used to display all of the data received.

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ABSTRAK

Sektor penternakan merupakan salah satu sektor terpenting di Malaysia dan Dunia sebagai pembekal makanan. Untuk mendapatkan kualiti dan kuantiti tinggi bagi sektor ini terutama untuk ternakan ayam, makanan, suhu, dan persekitaran perlu dijaga dengan optimum untuk menghasilkan kualiti ayam terbaik terutama sekali dari segi saiz dan berat badan yang ideal. Selain itu, ia juga dapat membantu mencegah daripada penyakit ayam. Oleh itu, *Lora IoT-based livestock feeding and temperature system* telah dibina untuk memantau sistem kawalan pemakanan dan suhu persekitaran reban ayam tersebut. *RFID* digunakan dalam sistem ini untuk mengetahui sama ada ayam itu makan atau tidak. *Loadcell* pula digunkan untuk memantau status bekas makanan. Apabila berat bekas makanan kurang daripada 100g, *servo motor* akan hidup dan makanan secara automatik ditambah. *Ultrasonic* pula digunakan untuk memantau status bekas penyimpanan makanan dan notiffikasi akan dihantar kepada pengguna supaya bekas penyimpanan makanan ditambah makanan. Untuk menghasilkan gred ayam yang terbaik, makanan yang diambil oleh ayam tersebut mestila dengan secukupnya. Ayam memerlukan suhu dan kelembapan yang konsisten di dalam sangkarnya agar hidup lama dan sihat. Oleh itu, *DHT11* digunakan untuk memantau dan mengawal suhu dan kelembapan ayam. *MQ2* digunakan untuk mengesan tahap ammonia dan karbon dioksida. Ia digunakan untuk menentukan sama ada makanan ayam tersebut masih sesuai dimakan atau sudah rosak. Malahan, ia juga memastikan bahawa jumlah amonia di dalam sangkar ayam itu adalah minimum, tahap amonia yang tinggi akan merosakan sistem pernafasan ayam. Dc fan mengeluarkan udara tidak segar dari bekas ayam. Semua sistem dibina dengan *LoRa IoT* dan disambungkan ke N*odeMCU ESP8266* untuk penghantaran dan penerimaan data. Aplikasi *Blynk* digunakan untuk memaparkan semua data yang diterima.

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ACKNOWLEDGEMENTS

Alhamdulillah, thanks to Allah's Almighty and countless favours, I was able to complete this research within the time frame allotted. First and foremost, I want to express my gratitude to my supervisor, Ts Dr Mohd Syafiq bin Mispan, for his guidance and unwavering support. Throughout the process of completing this report, his constructive remarks and recommendations were really helpful.

My grateful parents, Mr. Mat Intan bin Adam and Mrs. Latipah binti Ibrahim, deserve special mention for their assistance in completing my final year project.

Last but not least, I'd want to express my appreciation to my dearest friends, who have provided me with a lot of support and advise throughout the process of finishing this work. Also, thank you to everyone who helped me with my research.

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LIST OF SYMBOLS

kg	-	Kilogram
ft	-	Feet
$°C$	-	Degree Celcuis
ppm	-	Part per million
% RH	-	Percentage Relative Humidity

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LIST OF ABBREVIATIONS

App	-	Application
IoT	-	Internet of Things
LoRa	-	Long Range
RFID	-	Radio-Frequency Identification
WiFi	-	Wireless Fidelity

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CHAPTER 1

INTRODUCTION

This chapter presents the general introduction about this project including project background, problem statement, project objectives, project scope, and report organization.

1.1 Background

The livestock sector is one of the important sectors in Malaysia and over the world to maintain the food supply due to the increase of human population especially. Early in the 21st century, the basis of the economy in Malaysia are agriculture, forestry fishing, and livestock. To maintain the food supply either in Malaysia or other countries, the livestock sector needs to increase its production. In Malaysia, chicken meat is the highest demand due to its low price, low cholesterol, and balanced nutrition. Statistic said the chicken meat consumption per person per year increases from 3.46kg in 1960 to 34.3kg in 2005 (Erden, Kaya and Çamaşircioɨlu, 2015).

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The main purposed of the livestock sector is to increase the quality and quantity with minimum cost, time, and negative impact on the environment and chicken healthy. Water vapor produced by the chicken could create a more humid environment, which can produce a high level of ammonia and carbon dioxide. A high level of ammonia and carbon dioxide leads to spoiling the food of chicken in storage and also causes harm to the chicken respiration system. It also provides additional perspectives for the farmer to gain better situational awareness of their livestock (Ikhsan *et al.*, 2019). To the chick will degrade the quality of chicken when they are growing up. Chick also needs a specific range of

temperature about 30°C to 33°C to maintain their body temperature because they lack feathers (Teddy Surya Gunawan, Mohamad Firdaus Sabar, Haidawati Nasir, Mira Kartiwi, 2019). Several sensors are used to detect the level of ammonia, carbon dioxide, and surrounding temperature. For ammonia and carbon dioxide, used MQ2 is a detector, and DHT11 is used to detect surrounding temperature. RFID is a widely used technology to monitor livestock, which provides basic identification information of the animal. So RFID was combined with a Loadcell used to monitor the feeding food system by detect the chicken come closed to food storage and produces pressure from food storage. The combination of LoRa IoT and NodeMCU ESP8266 used to transmit and received the data that was produced from all the sensors and link to the Blynk app. Blynk are used to show the data that were collected which are the data of chicken eaten, level of ammonia and carbon dioxide, and level of humidity and surrounding temperature.

1.2 Problem Statement

Malaysia's livestock industry is growing at a rapid pace. To meet the growing demand in the market, farmers must grow their livestock industry. Because the farm is usually distant from home, the farmer must recruit a large number of staff in order to get the best results while also cutting costs in terms of livestock health.

The chicken livestock sector in Malaysia is the main focus of this research. As a result, the purpose of the project is to develop a monitoring system for the feeding process and the specific surrounding temperature of their livestock in order to get the best possible outcomes.

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Therefore, this project is developed to help farmers minimize costs by reducing the number of personnel they hire while still achieving maximum results. A specific sensor is also used in this project to detect and control the temperature and humidity automatically. Farmers may monitor and control the system from their homes using Lora Technology and NodeMCU ESP8266 Indirectly, the farm can save money, energy, and time.

1.3 Project Objective

The main aim of this project are:

a) To design the feeding monitoring system by using RFID and Loadcell.

b) To develop the temperature and humidity system by using DHT11.

c) To integrate the livestock monitoring system with LoRa and Blynk App.

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1.4 Scope of Project

This project concentrates on the development of chicken livestock feeding and monitoring system using the LoRa IoT platform. There are consists of several components which are the microcontroller unit, RFID, Sensors, LoRa, WIFI module, and software programming. Arduino Mega 2560 REV3 is used as a microcontroller board. There are several types of sensors used in this project which are Loadcell, DHT11, and MQ2.

RFID in a feeding system is utilising to keep track of whether or not the chickens eat. For loadcell used to monitor the status of the food container. Once the mass of food in container is below 100g the servo motor turn ON and the food automatically refill. The ultrasonic used to monitor the status of the food storage and it is will send the notifications

to the used for restock the food in food storage. To obtain the greatest grade of chicken, the chicken must consume a specified amount of food. Chickens are delicate creatures that require a consistent temperature and humidity in their cage to live a long and healthy existence. As a result, the DHT11 is utilised to monitor and manage the chicken's temperature and humidity. The MQ2 is a gas sensor used to detect the level of ammonia and carbon dioxide gas which is the high level of ammonia that can damage the respiration system of chicks and detect food spoilage.

The Lora Technology is used to record all the data and share it with ESP8266 which is one of the NodeMCU ESP8266. All the data show in the Blynk app. The Arduino Board is the unit that responsible for controlling the different parts and act as the brain of the system. The software programming is based on the microcontroller instruction sets which contain a program in C++ language designed for feeding and monitoring system of the chicken livestock.

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1.5 Thesis Organization

The thesis of this project is organized into three chapters which are Introduction, Literature Review, Methodology, Result, and Conclusion. Chapter 1 introduces briefly the idea of the project. It includes the project background, problem statement, objective project, and scope of the project. Next, chapter 2 is explained more about the literature review and theoretical has been done from the previous article. In chapter 3 is presents explain the methodology of the project. It is consists of all the method that used in the previous article including the design, algorithm, hardware, and software. The result and discussion are

explained in chapter 4 and the last chapter which is chapter 5 will conclude the overall project.

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CHAPTER 2

LITERATURE REVIEW

This chapter provides the research topics and its details from the source such as journals based on the chosen research area that related to the proposed project; development of livestock feeding and temperature monitoring system using LoRa IOT platform. It also includes the previous works that are related to the proposed project.

2.1 Wireless Communication Technology

Nowdays, Wireless and telecommunication have become essential tools for people to communicate with one another in any region of the world. Wireless communication technology uses electromagnetic waves such as infrared, radio frequency, and satellite to transmit data over the air. GPS, Wi-Fi, satellite television, wireless computer parts, wireless phones with 3G and 4G networks, and Bluetooth are just a few examples. The most of today's telecommunication is wireless. It entails the transfer of data over a short distance or across the world without the need of wires, cables, or any other electrical conductors. Because of the various commercial benefits, wireless communications is reaching new heights. Wireless technology provides network efficiency, flexibility, and speed. It has evolved into a valuable tool for the tech-savvy age because it allows for easy information sharing and increases productivity. One has the ability to go wherever they choose without worrying about losing their internet connection.

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2.1.1 Short Range Communication

For very small distances, a variety of wireless methods have been developed. Short-range wireless communication is the term for this type of communication. Signals may be transmitted at distances ranging from a few centimetres to many metres.

Signals in medium-range wireless communication, on the other hand, travel up to 100 metres or so, but signals in wide-area wireless communication can reach hundreds of kilometres. Bluetooth, infrared, near field communication, ultra-band, RFID, and Zigbee are all examples of short-range wireless communications.

2.1.2 Long Range Communication

As an alternative to other fixed wireless, cellular networks, or satellite Internet access, long-range Wi-Fi is used for low-cost, unregulated point-to-point computer network connections. The frequency, transmission strength, antenna type, the area they are utilised in, and the surroundings all restrict the range of Wi-Fi networks. A typical indoor point-to-multipoint wireless router utilising 802.11n with a stock antenna could have a range of 50 metres (160 feet) or less. With the use of directional antennas, outdoor point-to-point setups may be extended over several kilometres (miles) between stations.

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2.1.2.1 LoRa

Long-range radio (LoRa) is a low-power wireless technology that allows for long-distance communication. Long range, low power consumption, and secure data transfer are

all advantages of LoRa devices for IoT applications. These technologies exceed cellular networks in terms of capabilities and may be used by public, private, or hybrid networks. It simply connects to existing infrastructure and provides low-cost IoT applications that are powered by batteries. It's possible that it'll work even if you don't have internet connectivity.

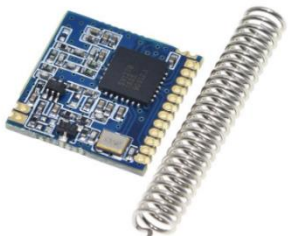

Figure 2.1 LoRa

2.2 Radio- Frequency Identification (RFID) Technology

Electromagnetic fields are used in radio-frequency identification (RFID) to automatically recognise and track tags attached to items. A radio transponder, a radio receiver, and a transmitter make up an RFID system. The tag transmits digital data, usually an identifying inventory number, back to the reader when triggered by an electromagnetic interrogation pulse from a nearby RFID reader device. This number can be used to keep track of your inventory. RFID tags are divided into two categories which are:

i) The RFID reader's probing radio waves provide energy to passive tags.

ii) Since active tags are battery-powered, they can be read from a wider distance from the RFID scanner, up to hundreds of metres.

In my project, i used the passive RFID because it is more cheaper than active RFID. It also more relate to my project because passive RFID tags are used to access control, file tracking, smart labels and so on.

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