SMART POULTRY FARM IN SRI LANKA USING IOT

22_23-J 35

Individual Project Proposal Report

W.A.L.H.P.K. Perera

B.Sc. (Hons) Degree in Information Technology specialization in Information Technology

Department of Information Technology

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DECLARATION, COPYRIGHT STATEMENT AND THE STATEMENT OF THE SUPERVISOR

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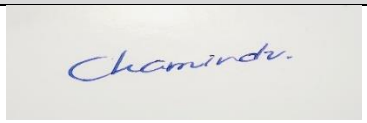
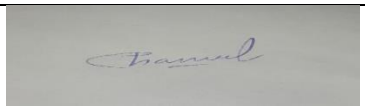
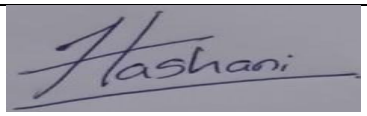
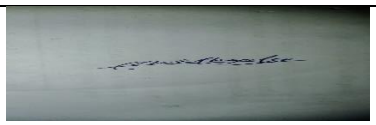
Madushan M.A.C	IT19960128	
Ananda A.M.S.C	IT19958484	
W.A.L.H.P.K Perera	IT19953434	
B.M.W.S Wijesekara	IT19958248	

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The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

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ABSTRACT

In Sri Lanka, the poultry industry is run as a self-employment and also as a large-scale business. But many poultry industries still manage poultry farms using traditional methods. Since this requires a lot of human labor and time, safety in the poultry farm is not given much attention in most poultry farms. Therefore, the farm is more prone to trespassing and animals falling prey to predators and poachers. The aim of this research is to build an automated security system using IoT and IM technology to secure the farm. The proposed system identifies the image of people coming to the farm using IM technology by ESP 32 and analyzes the information obtained from reading the RFID Card with the database, then the gate (door lock) is opened. After the person enters the farm, the gate (door lock) will be closed again within a limited time. If it does not match, an alert will be sent to inform the farm owner through the android mobile app. If any predator is lurking near the fence of the farm, it is detected by PIR and sends an alert to notify the farm owner through the android mobile app.

Key Words: ESP 32 CAM module, RFID module, PIR motion sensor, M.C node MCU, Internet of Things, Image Processing

TABLE OF CONTENTS

List of Figures

List of Tables

1. INTRODUCTION

1.1.Background & Literature survey

The poultry industry in Sri Lanka has been around for decades. The rapid growth of the poultry industry has been shown in the last 2 decades. About 70% of Sri Lanka's livestock sector contribution consists of poultry and eggs. [6] With consumer purchasing levels, the industry has the capacity to produce significant quantities to meet domestic demand for poultry and eggs. Even so, running chicken farms nowadays has become a very difficult task because the price of food and medicine for the animals is high, and for that reason, many businesses have collapsed. The price of chicken and eggs has also increased due to high production costs. Due to this, the brightness has also decreased. But with this method, we are trying to reduce the organizational cost to some extent and create a system that increases the convenience of the employees.

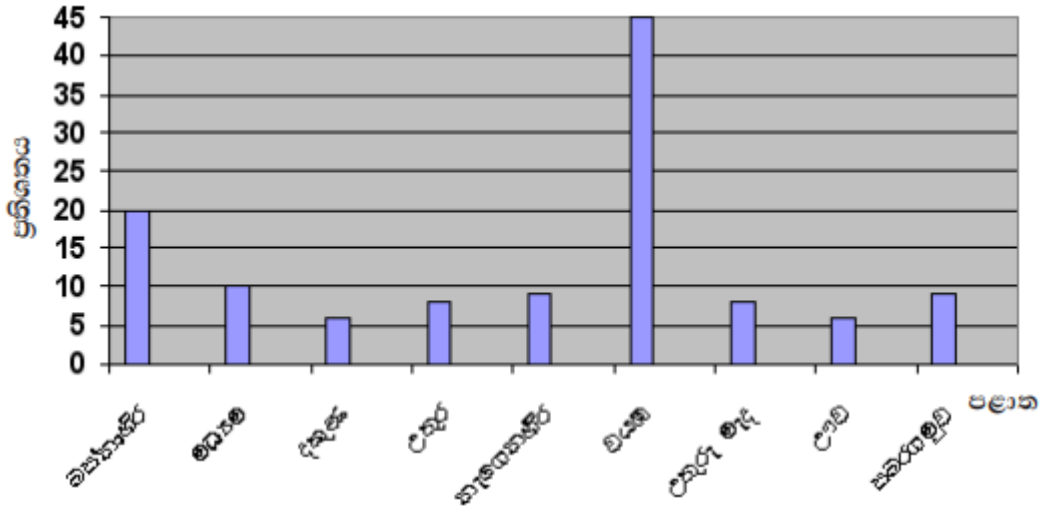

Figure 1.1. 1: Egg and Poultry Production in Sri Lanka in 2008

	2003	2004	2005	2006	2007	2008
බිත්තර (මිලියන)	737	728	1449	1243	1252	1380
කුකුළු මස් (000'MT)	80.31	77.77	86.27	85.25	100.06	102.

Table 1.1.1:How egg and chicken production in Sri Lanka has changed over the past few years.

	2003	2004	2005	2006	2007	2008
ඒක පුද්ගල බිත්තර පරිභෝජනය	67.5	80.40	73.70	62.55	63.00	67.51
ඒක පුද්ගල කුකුළු මස් පරිභෝජනය (kg)	4.16	4.00	4.39	4.29	4.98	5.01

Table 1.1 2:How eggs and meat per person have changed in Sri Lanka

	2003	2004	2005	2006	2007	2008
අපනයනය						
කුකුළු මස් හා කුකුළු මස් ආශ්‍රිත නිෂ්පාදන (MT)	140.70	80.20	36.07	48.10	113.80	116.10
බිත්තර(M)	1.50	1.20	0.69	0.93	7.58	6.40
ආනයනය						
කුකුළු මස් හා කුකුළු මස් ආශ්‍රිත නිෂ්පාදන (MT)	2787	2127	2239	534	1210	2665
බිත්තර(M)	-	-	-	-	-	-

Table 1.1 3:Amount of Eggs and Poultry Imported and Exported in the last few years.

From the details obtained by observing a poultry farm and the opinions of the farm owners and people about automating the poultry farm.

Figure 1.1. 2:Photos of the farm

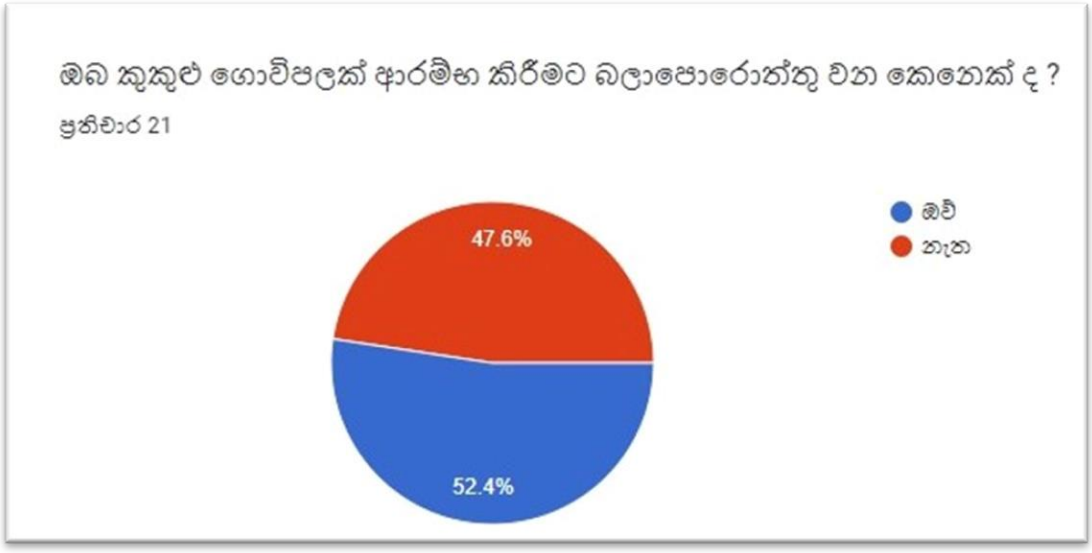

Figure 1.1. 3: Are you looking to start a Poultry farm

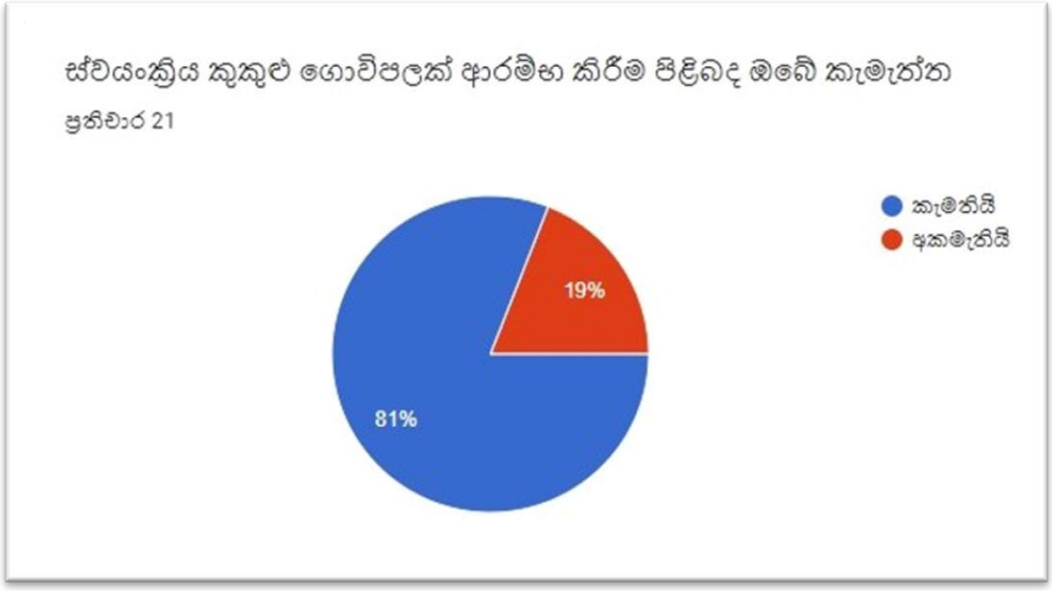

Figure 1.1. 4:Your interest in starting an automatic Poultry farm

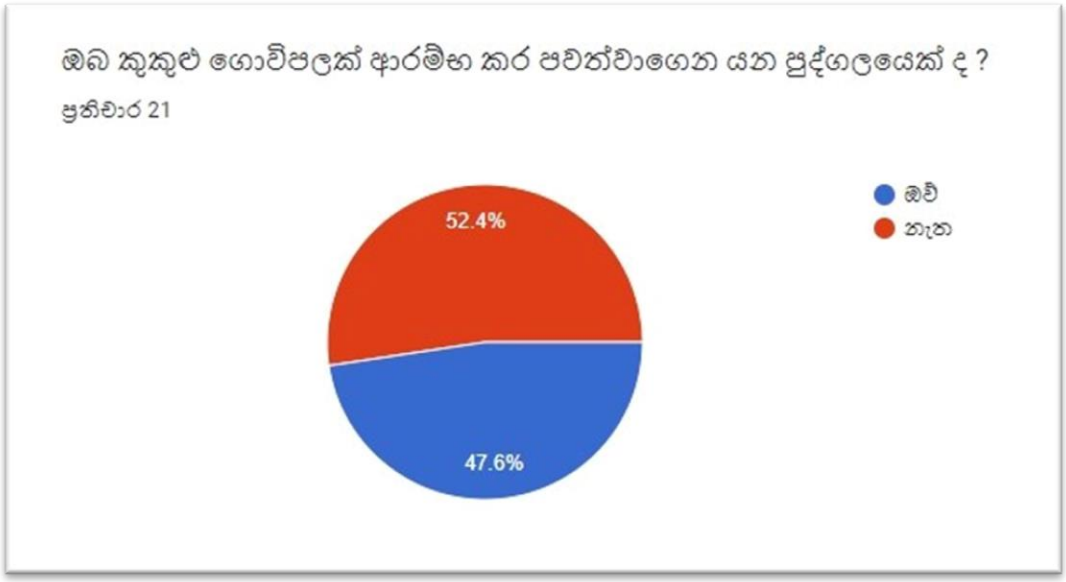

Figure 1.1. 5:Are you a person who starts and runs a Poultry farm

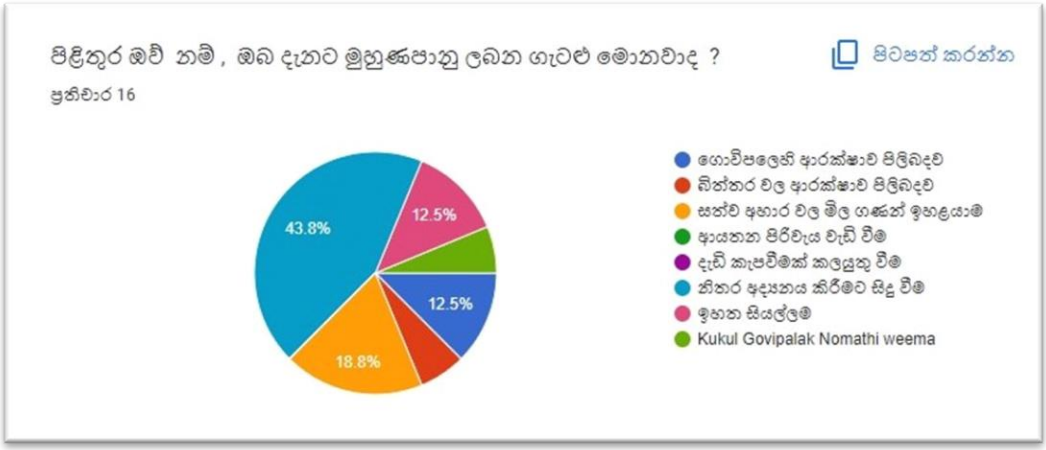

Figure 1.1. 6:If yes, what problems are you currently facing

As highlighted in the section above, fully automated systems can be used to avoid high operating costs. Conventional locks on poultry houses are not as secure as anyone can gain access by breaking these locks. Therefore, a security door lock and fence can be used in the poultry house with this method

In this current system of the project to lock the door, there are several points of view. A traditional door and key locking system that combines the latest smart locking technology. Modern survival is largely dependent on technological improvements, such as the ability to open doors and control modern appliances and devices. People want their devices to make them feel comfortable and safe. The main reason for creating smart locks is people's needs. In this part, we'll talk about a few of these systems.

Internet of Things

Over the past few years, the Internet of Things (IoT) has attracted attention in the academic and industrial worlds. IoT is a concept that describes a scenario in which everyday objects are connected to the Internet, recognize, and communicate with other devices [1]. These interconnected devices are called smart devices. Each of these smart devices is a physical component with communication functionality, a unique identifier, some basic computing capabilities, and a way to respond to various physical phenomena around [2]. From a global IoT market perspective, the population of IoT devices will reach 26 billion by 2020, up from only 900 million in 2009.

Image Processing

Over the past 49 years, extensive research on various facets of human and computer facial recognition has been carried out by psychologists, neuroscientists, and engineers. Many of the theories and concepts proposed by scholars in these fields have been centered on extremely small collections of images. However, many of the results have important implications for engineers who design algorithms and Computer recognition of human faces. [4]

Face recognition has gained increased attention and has improved scientifically over the past 14 years. Many commercial systems are now available for identification of still faces. Major research efforts have recently been concentrated on video-based face modelling/tracking, identification, and integration of systems. New datasets have been developed and analyses of recognition strategies have been carried out using these databases. It is not an overstatement to suggest that face recognition has become one of pattern recognition, image analysis and comprehension's most active applications. [4]

The main disadvantages of a common door lock are that by duplicating or stealing the key, anybody can unlock a conventional door lock, and it is simply impossible if we want our friends and family to reach our house without actually being there. Therefore, why not just eliminate these issues? So, we need to change the door to simply transform this regular door lock into a smart lock that can unlock the door anytime we turn up in front of the gate or want it to open for anyone else without being physically present. So, there came an age where devices can engage with their users and, at the same time, maintain their protection and continue to improvise

RFID based access control system

In the proposed system, a magnetic door lock is controlled by an RFID reader, which initiates the authentication and validation of the user or in other words regulates the access. Furthermore, the systems track each user's entry and exit records through a log record for each entry. To avoid unexpected events, the administrator of the central subsystem can revoke the validity of any user at any time. [3]

1.2.Research gap

According to the literature survey made above, it appears that the method of creating an automatic gate (door lock) and fence for the security of the chicken farm is a very necessary action because only a few researches have been done for that purpose. In the research conducted so far under a security gate (door lock) and fence, we see that they cover the following domains.

- Password-Based Smart Door Locking System
- Smart Door Lock and Lighting System using Internet of Things
- Smart Door Lock
- Smart door lock system with automation and security

This table briefly compares the existing system with the proposed system.

Features	Password-Based Smart Door Locking System	Smart Door Lock and Lighting System using Internet of Things	Smart Door Lock	Smart door lock system with automation and security	Proposed system
Identifying people using face recognition technology.	No	No	Yes	No	Yes
Identifying people roaming around the fence.	No	No	Yes	Yes	Yes
Creating the RFID card	No	Yes	No	No	Yes
Automatic door lock opening and closing using iot technology	Yes	Yes	No	Yes	Yes
Create an android application and notify the user through it.	Yes	No	Yes	Yes	Yes

Table 1.2 1:Comparison between individual function of the research and existing projects

1.3. Research problem

- Unwanted people and predators enter the farm causing damage to the farm. Therefore, there is a problem of farm and animal safety.

- There is a problem with monitoring the overall condition of the farm from the outside.

2. OBJECTIVES

2.1. Main objectives

Poultry Farm Designing a safety door lock to the Poultry Farm that prevents unwanted entry and allows only necessary people to enter the farm and monitor and display the overall status through a mobile application.

2.2. Specific objectives

- To develop an unlocking system based on facial recognition and RFID card.
- To develop a system that notifies the presence of unwanted people and predators around the chicken coop.
- Create and display the entire situation through the mobile application.

3.Methodology

3.1. Architecture

Our system is able to provide the data of the people who try to come to the farm without permission and the people roaming around the farm and the predators to the user's mobile phone through the android application.

The data required for this mobile application can be obtained from the system designed to protect the farm. That is, the door is unlocked after the face of the people present is recognized through the camera installed on the door of the poultry house and the RFID tag is read. If there is a difference between the data of the person who came and the RFID Tag, the door lock will not open. Then the user's phone will be notified through the mobile application. A separate RFID Tag has been created for an external person who needs to enter the farm. Through the PIR motion sensor, the user's mobile application informs the data center about unwanted people and predators around the farm.

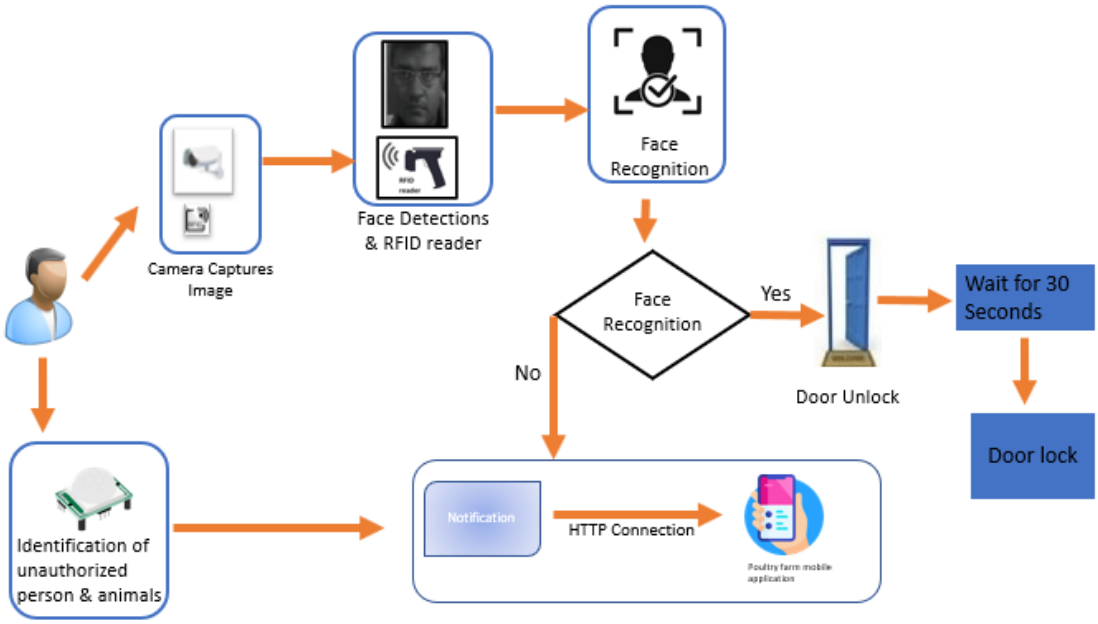

Figure 3.1 1: Architecture according to smart door lock security system

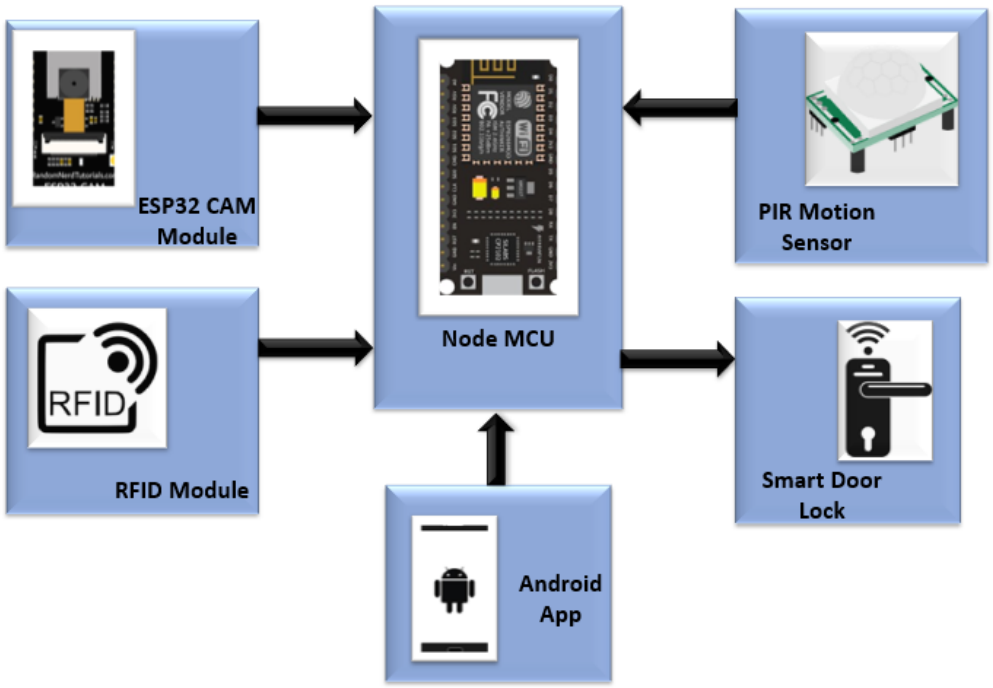

Figure 3.1 2: Block diagram

3.1.2. Software Architecture

SDLC is a strategy used to ensure that products developed based on a set of requirements are optimized for their users. It is a very common strategy in software development projects. The SDLC includes several steps shown in Figure 3.1.2: requirements gathering, analysis, system design, object design, testing, and implementation. Each step ensures developers are ready for the next one and the approach tries to minimize development time by having predefined expectations for each step. By following this process, developers ensure that their finished product truly meets the needs of their users.

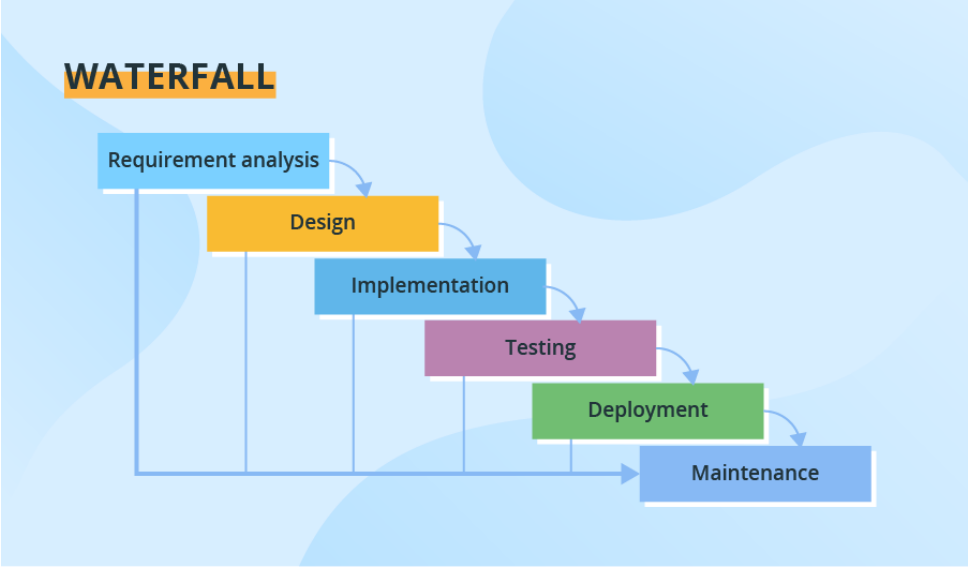

Figure 3.1.2 1: Software Development Life Cycle Phases

3.2. Research Area

In order to conduct this function, need to follow some image processing technology and internet of things technology.

Image processing

- Distinguishing individual faces

Internet of things

- Automatic door unlocking
- To detect people around the farm using a PIR motion sensor

3.3. Requirement Gathering and Analyzing

Requirements gathering is an important part of our research project. Before implementing our work, we consider the requirements to be met for a perfect solution. Therefore, through my research piece on the problem of preventing intruders from entering the poultry farm and keeping the farm owner aware of the people and predators around the farm, I propose to analyze them in order to solve them step by step. There are many ways to collect requirements in many ways. Some of them are given below.

- Read research papers related to my section
- To study the existing system in the world and in Sri Lanka
- Meeting Poultry Farm Owners

Reading research papers is the best way to get a clear idea about my research field because it describes how our current piece of research is done successfully. Studying the existing farm security systems is very useful to get a clear idea of the workflow of how to create our research piece by adding more competitive features and comparing them with these systems. By contacting poultry farm owners and workers we can know what are the most trending needs and problems today and try to develop our research section with solving those problems.

The next stage is to analyze the gathered requirements. Development and improvement of management operations in this phase. We implement new features in the proposed farm security system over the existing farm security systems. Various technologies have a successful output over the proposed project and gathering more requirements on new technologies requires how to be applied to the proposed research area.

3.4. Design

After collecting the complete requirements, we move to the design phase. We can specify hardware and system requirements and help design the overall system architecture during the design phase. A system design architecture has a collection of specific requirements and a set of specific requirements. Through these needs and requirements, we can create a perfect system at the design stage. So the design phase is the most important part of the waterfall model to design a good output.

3.5. Tools and technologies

Tools

- Visual studio code
- Jupiter note book
- Android studio
- Mongo DB
- Firebase

Technologies

- Python
- Flutter
- Node JS
- Java

3.6. Implementation

After requirements gathering, analysis, and planning, there is the implementation phase. In this step, the deliverable product was implemented. For the software part of our system, in this step, we converted the solution domain to source code, which included implementing the properties and methods of each object and combining all the objects that functioned as a single system.

3.7. Testing

Testing is a key part of the software lifecycle. Two types of tests here are called fiction tests and non-functional tests. Testing starts at the beginning of the life cycle and will continue at various stages till the end of the life cycle. Small components are tested during functional testing while components are tested during non-functional testing. Non-functional testing is done for a safety system which is used while performing functional testing

3.8. Gantt Chart

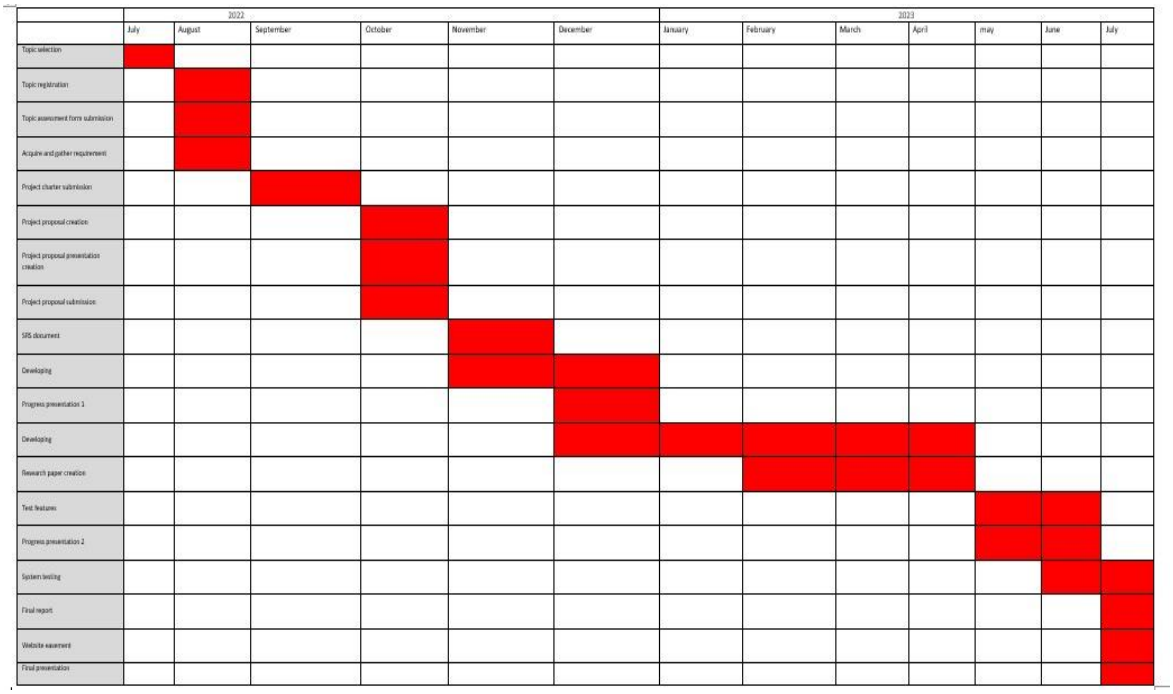

Figure 3.8. 1:Gantt Chart

4. DESCRIPTION OF PERSONAL AND FACILITIES

Member	Component	Function
W.A.L.H.P.K. Perera	Identification and verification to identify allowed persons and owner then the can get access granted state. Then only persons can take in to the smart farm through Security gate	Face recognition using ESP32 module and Image Processing technology. Identifying people and predators roaming around the farm using PIR motion sensor. Circuit implementation using Node MCU, RFID module, PIR motion sensor, ESP32 CAM module. Creating an android application

Table 4. 1: Description of personal and facilities

5. BUDGET

Recourse	Price
Mechanical implementation	15000
Sensors implementation	20000
Documentation and print cost	2000
Stationery	2000
Travelling cost	8000
Educational survey cost	3000
Internet	2500
Total	52500

Table 5. 1: Overall Budget

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