

SMART Poultry Farm in Sri Lanka Using IOT

Project ID

Individual Project Proposal Report

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B.Sc. (Hons) Degree In Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology Sri Lanka

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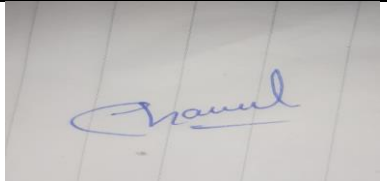
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Declaration

I declare that this is my own work and this proposal does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

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The supervisor/s should certify the proposal report with the following declaration.

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

Signature of the supervisor:

Date:

ABSTRACT

Today, the poultry industry is one of the fastest growing sectors of the agricultural sector. In today's poultry industry, human labor is essential for the day-to-day activities of the farm. Generally, the eggs are collected and counted by humans. As the aim of this research, to solve this problem, we proposed a technique that is more cost-effective and easily adaptable for farms to collect eggs properly and safely, to calculate the amount of eggs collected. This will reduce manual egg collection and counting and also reduce time and labor costs. It is more time efficient than the traditional manpower method while reducing egg damage and increasing profits. A small vibration given to the eggs laid by the chickens moves the eggs safely onto the conveyor belt and the eggs are counted by a laser sensor. It also allows the chicken farm owner to control the process through a mobile application or physically. The automatic egg collection and counting system with low cost and less time can be an effective alternative to the existing traditional method.

Keywords: Internet of things , Egg collecting , egg counting , poultry

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INTRODUCTION

Background

Poultry farming is mainly aimed at meat and eggs. More than 60 billion chickens are slaughtered for annual consumption in the world. Poultry farming has a special place among animal businesses in Sri Lanka. Although it was a rural business in the past, it is now a profitable business. It has spread in urban areas. For the year 2019, chicken meat has contributed 0.38% to the gross domestic product, which is 64% of the total contribution of Sri Lanka. In 2006, (Economist), 2020) [1] chicken meat was even declared as an essential food. Sri Lanka's poultry industry has seen a decline of 9% this year. Ussec Sri Lanka consultant Atula Gamage told Asian agribiz that with many farms closing down, the permanent industry is feeling the biggest impact. (Gamage, 2019)[2] And the maintenance of farms is very expensive. In most poultry farms in Sri Lanka, the day-to-day operations of the farm are carried out by humans. This requires a lot of labor and time. When these processes are carried out by humans, the farm's efficiency, productivity

In this test we try to reduce the overall cost of the poultry farm to some extent and increase the convenience of the farm owner and workers as well as increase the efficiency, productivity and overall profit of the poultry farm. Automation plays a very important role in today's world. This project focuses on automation of poultry farms using wireless sensor network and mobile communication systems. Internet of Things (IOT) technology is used for automation.and the overall profit of the farm are greatly affected.

Farm automation using IOT technology to reduce the overall cost of the farm, save assets, increase production productivity, improve efficiency and increase profit are the benefits for the farm owner. The process of egg collection and egg quantity calculation is the main process in the poultry farm. Generally, a healthy hen must lay one egg per day, and most hens finish laying eggs by 10 am. (.P. Jacob, 2019)[3] It is best to collect the eggs as soon as possible after laying the chickens. Keeping the eggs in the cage can lead to contamination, cracking of the eggs and damage to the internal quality. It is mandatory to collect the eggs at least once a day in the chicken farm. It is advisable to collect eggs at least twice a day, especially in high weather temperatures. The use of IOT technology is very important for this. Management and monitoring of farm works can be done from anywhere anytime through IOT based system.

Literature Survey

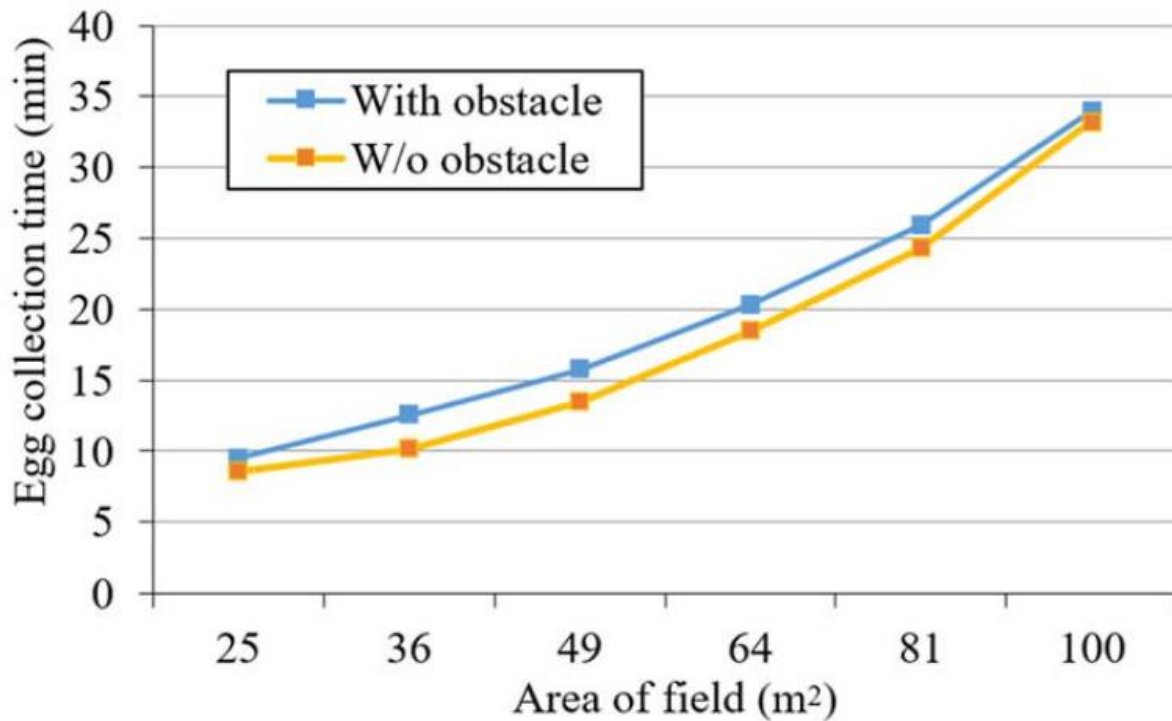
Poultry farming is a sector that has been around since ancient times. In the past, these poultry farms were controlled by humans and nowadays, with the advancement of technology, the daily activities of the poultry farm are being automated. When the tasks of the chicken farm are done by humans, it requires a lot of labor cost and time. Therefore, investigations are being done since the past to solve this problem.

(Smart Poultry Robot) The robot can also

pick up and sort eggs without damaging them. An egg feature extraction method with automatic thresholding is employed to detect both white and brown eggs, and a behavior-based navigation method is applied to allow the robot to reach the eggs while avoiding obstacles. The robot can move

towards the position of each egg via visual tracking. Once the egg is within the collection area of the

robot, it is gathered, sorted and stored in the tank inside the robot. Experiments are carried out in an outdoor field of size 5 m×5 m under different climatic conditions, and the results showed that the average egg recognition rate is between 94.7% and 97.6%.The robot can also Experiments have shown that this robot can retrieve at least four eggs. The probability of collecting more than four eggs is only 34%. The disadvantage of this robot is that when it is used continuously, its efficiency decreases and the chances of damaging the eggs increase. Also, as the farm area increases, it can be seen that it takes more time to collect eggs. The figure below shows the time taken to collect eggs as the area of the farm increases. (Chung-Liang Chang, November 2020)[4]



(EggStream egg collection system) The modern egg collection systems supplied by TEXHA will make poultry farming operations more efficient and profitable. Lengthwise egg collection system operates on the level-by-level basis. The crosswise conveyor adjusted for specific battery level actuates the respective lengthwise belts, so the egg is transported to the conveyor. Then the egg moves along the inclined conveyor portion and arrives at the stacking table. When out of operation, the crosswise conveyor rests at the upper level in order to avoid interference with the personnel activities. The lengthwise belts may operate at different speed rates. The speed rate is selected by the poultry farm personnel depending on the egg-laying performance of the flock and the crosswise conveyor utilization level. In order to prevent egg contamination during handling at the egg collection belt, the equipment incorporates a dedicated lengthwise belt cleaning brush with the waste container. The lift-based egg collection system may be integrated into the general egg-handling system of the poultry farm. (TEXHA, 2020)[5]

This device consists of a helical spring. When rolling this spring over the floor, contact with an egg will open the spring and let the egg in. Collect-ed eggs can be unloaded to the side of the device, facilitated by the rotary movement of the spring. Design parameters were optimized systematically by maximizing the success rate of collection. The optimized device was able to collect 96.8% of all floor eggs. (K. S. Dhauth, 2000)[6]

Research Gap

To solve the problems faced by the poultry farmers in the poultry industry, many experiments have been done since the past. Many experiments have been done to automate the daily activities of the poultry farm but when we compare this configuration of our system with other systems, there are many differences and advantages. Various methods have been used to automatically collect and count eggs. There are many tests such as using a smart robot to collect eggs, collecting eggs with a robotic arm, and collecting eggs with a smart trolley. But we can see that there are some problems with these experiments. (Development and Performance of a Mechanical Egg Collection System Versus the Hand-Operated Dutch Nest, 2015)[7] , (Hamza, 2022)[8]

The main feature of our system compared to other egg collection and egg counting systems is the use of a conveyor belt. The main reason for using this belt is that there is a high risk of egg damage and contamination during egg collection in existing systems, so this method allows the eggs to be moved to the collection bin very safely and without contamination.

Also, as an additional feature, the farm owner has the ability to know exactly how many eggs are being collected. Furthermore, the farm owner has the ability to control the functions of egg collection and counting of collected eggs through a mobile app. After the chickens lay eggs, the eggs go into the bin after the farm owner activates the switch through the mobile app. Once 10 eggs have been added to the egg collection belt, the process of moving the eggs to the bin will automatically end.

	Development and performance of a mechanical egg collecting system	Redesign of grain feeder, distributor and egg collector system in poultry farm," SASTech-	Visual Guidance and Egg Collection Scheme for a Smart Poultry Robot	Proposed System
Safety of eggs	No	Yes	No	Yes
Farmer can control	Yes	Yes	Yes	Yes
Mobile application	No	No	No	Yes
Egg are not dirty	Yes	Yes	Yes	Yes
Low Cost	Yes	No	No	Yes
Efficiency and Productivity	Yes	No	No	Yes

Table : Comparison between my part of the research and existing projects

Research Problem

Even today, most of the daily activities in poultry farms are done by humans. Egg collection and counting of eggs collected are also done by human labor. This process requires a lot of labor and time. Therefore, the farm owner spends a lot of time and money on these tasks. This directly affects the efficiency, productivity and profitability of the farm. In addition, these tasks are performed by humans and There are many chances of damaging the eggs. Also, due to the foul smell and chicken waste inside the chicken farm, there is a possibility of the farm workers contracting various diseases. Such diseases include respiratory diseases, skin diseases as well as salmonellosis , campy , lobacteriosis, and avian influenza viruses. Diseases can be introduced. The task of collecting eggs is a task that needs to be done every day and the chickens laid eggs. Due to not collecting the eggs on time after laying, there is a possibility that the eggs will be damaged by the chickens and the eggs will be spoiled and the eggs will be used by the chickens for keeping the eggs. Automatic egg collection and counting process by a machine will avoid these problems for the farm owner and increase the efficiency of the farm. productivity as well as profit can be improved.

OBJECTIVES

Main Objectives

The main purpose of this automatic system is to facilitate the farm owner to carry out the daily activities of the chicken farm easily and quickly. This system automatically collects chicken eggs and automatically calculates the amount of eggs collected. In this way, the farm owner spend a lot of labor cost and time in the process of collecting and counting eggs. This can solved problems like time and labor. addition to that this will help the farm owner to collect and count the eggs safely. An Android based mobile app is also developed for this process. This mobile app will automatically calculate the amount of eggs the farm will use. Facilitates the farm owner to have accurate information and remotely control the egg collection process.

Specific Objectives

- Eggs are safely moved to the collection bin and securely packing.
- Displaying the correct information about the amount of eggs collected to the farm owner through the mobile application.
- Preventing impurities such as chicken droppings from smearing the eggs.
- The mobile application facilitates the farm owner to control the egg collection process.

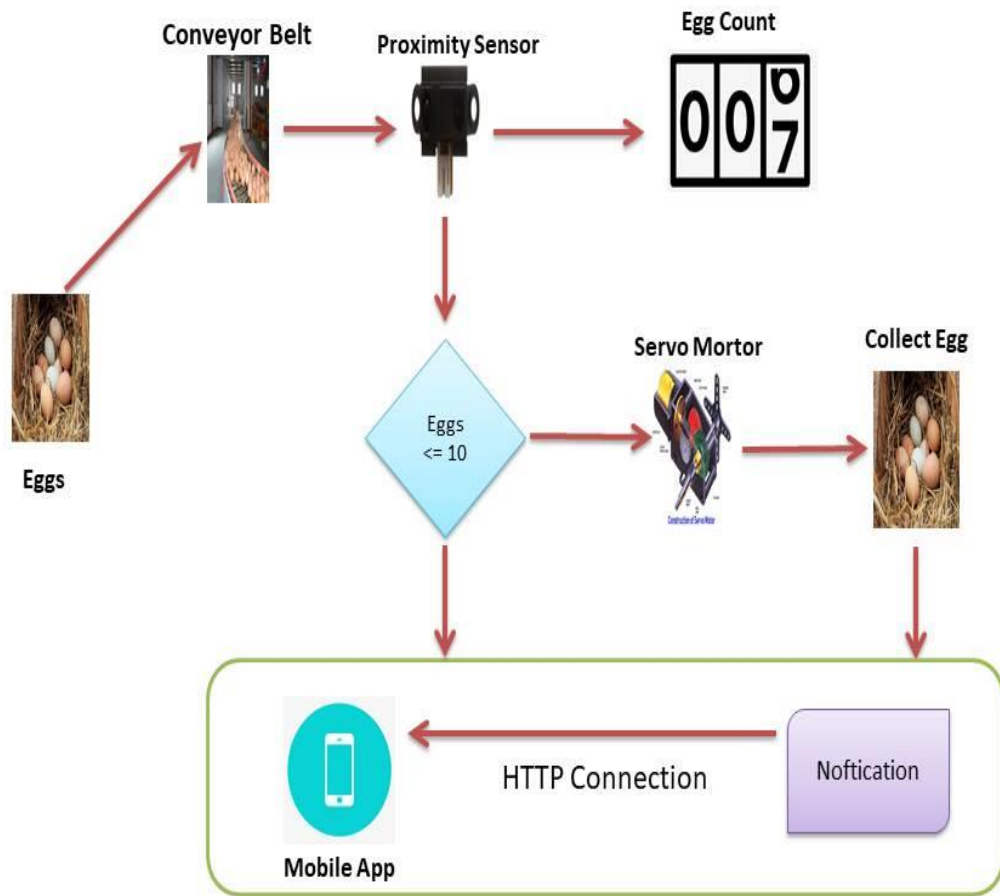
METHODOLOGY

After several sessions with our supervisor we came to a final conclusion to improve the egg collection and egg counting component. We did a background and a literature survey on this. We planned to monitor the chicken farm where we wish to implement this system and after discussing this with the owner of the chicken farm, we received information from him and we planned to improve our system according to the requirements given by him. Accordingly, the requirement we have identified to improve this is,

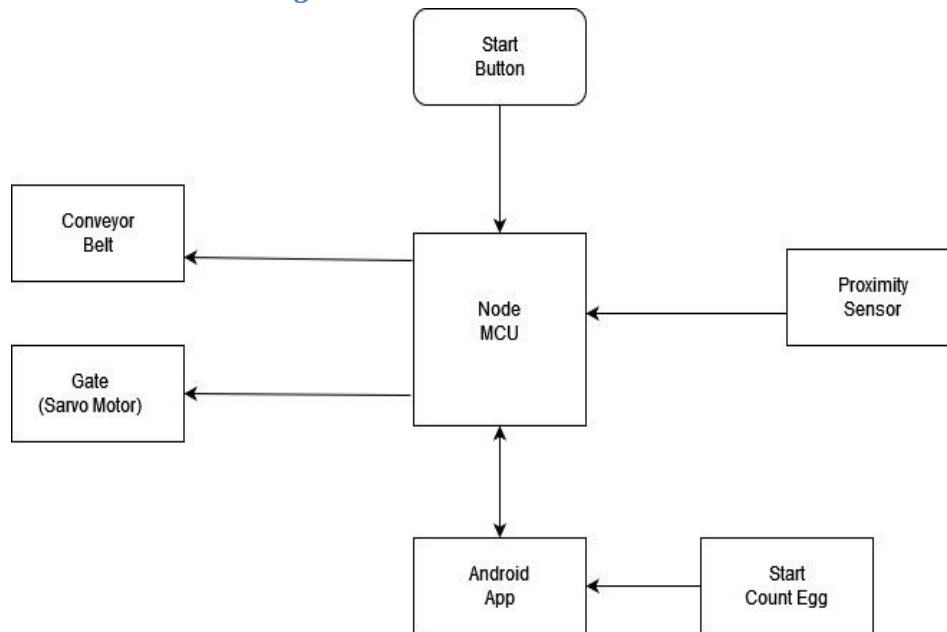
- * Collecting eggs without any damage to the eggs.
- * The farm owner can remotely control the egg collection and egg counting process.
- * Being able to monitor the process anytime from anywhere through a mobile application.

System Architecture

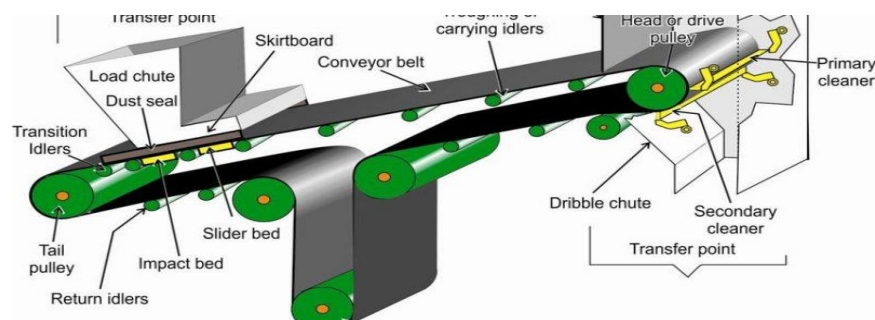
System Diagram



Block Diagram



IOT technology is used to create this system and we use a specific conveyor belt to carry the eggs from the chicken house to the egg collection bin. The main reason we use a conveyor belt for this purpose is to carry the eggs safely to the egg collection bins. for A conveyor belt is a a material handling system designed to move supplies, materials, and components using an efficient and effortless process that saves on time, energy, and cost. The design of conveyor belts includes two motorized pulleys with the conveyor material looped over them. The pulleys operate at the same speed and move in the same direction to activate the motion of the conveyor belt.



Conveyor Belt

In addition to that we use a proximity sensor to count the eggs. While the eggs are moving through the conveyor belt a proximity sensor counts the number of eggs. proximity sensor is a non-contact sensor that detects the presence of an object (often referred to as the “target”) when the target enters the sensor’s field. Depending on the type of proximity sensor, sound, light, infrared radiation (IR), or electromagnetic fields may be utilized by the sensor to detect a target. Proximity sensors are used in phones, recycling plants, self-driving cars, anti-aircraft systems,

and assembly lines. There are many types of proximity sensors, and they each sense targets in distinct ways. The two most commonly used proximity sensors are the inductive proximity sensor and the capacitive proximity sensor



Proximity Sensor

The farm owner can accurately monitor the number of eggs obtained by the proximity sensor through a mobile application. And the farm owner has the ability to start this process from any place at any time. After starting the egg collection process, the process will automatically end after 10 eggs have passed to the egg collection bin.

Project Requirements

Functional Requirements

- Should collect the eggs safely and transport the eggs to the collection bin without any damage to the eggs or contamination of the eggs.
- Should be able to accurately count the number of eggs collected in the bin while moving the collected eggs to the bin.
- The farm owner must be able to start and finish the process of egg collection and egg counting remotely and manually.
- The farm owner should be able to easily track accurate information about the amount of eggs being collected through the mobile application.

Non Functional Requirements

- Performance
- Scalability
- Portability
- Reliability
- Availability
- Maintainability
- Security

Software Requirements

- Software requirements are React Native, Node Server, Linux and IntelliJ Idea

DESCRIPTION OF PERSONAL AND FACILITIES

Member	Component	Task
Ananda A.M.S.C	Iot Based Egg Collecting and Egg Counting sytem	<ol style="list-style-type: none"> 1. Safe collection of eggs with the help of a conveyer belt 2. Accurate eggs count using proximity sensor 3. Making the farm owner control the process of the egg bowl using a servo motor 4. Allowing the owner to control and monitor the process of eggs collected and the eggs collection process

Table 4: Description of personal and facilities

BUDGET

Resource	Price
Travelling cost	8000.00
Education survey cost	3000.00
Sensor implementation part	20000.00
Internet	2500.00
Stationery	2000.00
Documentation and printing cost	2000.00
Total	50500

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