

MONITORING SYSTEM FOR CHICKEN EGG INCUBATOR USING RASPBERRY PI BASED ON ANDROID

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ABSTRACT

Chicken egg breeders are one of the jobs in breeding living creatures, especially chickens. That way the breeder has a machine to incubate chicken eggs, but the tool is still working manually so it is not efficient. Efficient in the sense that there is still a need for an egg hatching process that has not been evenly distributed throughout the egg and cannot be monitored easily.

Therefore, chicken egg breeders in order to be more efficient in incubating the chicken eggs, designed and made a monitoring system on the egg incubator using a microcontroller. So that the egg incubator used to maintain the temperature of chicken eggs during the incubation process at a temperature of 39°C.

The prototype system that has been built consists of a DHT11 temperature sensor as a temperature and humidity detector, a HC-05 bluetooth sensor to connect from the incubator machine to the software that has been designed, and a Raspberry Pi microcontroller as a controller. The test results show that the temperature generated by the heating element in the egg incubator can be measured and controlled with a temperature of 39°C. That way the results of this prototype have been evaluated with the aim of the incubator machine functioning properly, and hoping to help chicken farmers in order to increase the success of the hatchability of chicken eggs.

Keywords: Machine, Incubator, Egg, Microcontroller, Raspberry Pi, IoT

I. PRELIMINARY

An egg incubator or better known as an egg incubator, is a tool used to adjust the state of a room according to the conditions in the incubation process carried out by brooders such as chickens, geese, ducks and quail. This tool is used to increase the productivity of poultry in breeding. When the broodstock incubates the eggs, the broodstock cannot lay eggs. So that with this tool the broodstock can continue to lay eggs and the eggs can hatch [1]. More and more egg incubators/egg incubators are being made either manually, semi-automatically or automatically. However, in our opinion, the existing egg incubator is still not optimal, because the incubator still has to regulate the temperature contained in the incubator. For that we need a technology that can overcome these problems, including by utilizing automatic control and monitoring technology based on IoT (Internet of Things).

Internet of Things (IoT) is a concept that aims to expand the benefits of continuously connected internet connectivity. Internet of Things (IoT) can be used on smartphones to monitor machines such as monitoring a chicken egg incubator directly from a smartphone, it is undeniable that rapid technological advances must be utilized, studied and applied in everyday life. [2].

The system that will be built based on the above problems can be used by chicken egg breeders to incubate their eggs using an egg incubator that has been designed. The process for hatching eggs will be designed for an egg incubator using a Raspberry Pi3 as a microcontroller, and based on Android for a monitoring system that can determine the temperature and age of eggs on the incubator machine so that egg breeders can hatch eggs in a directed and well-controlled manner. [3].

II. IDENTIFICATION OF PROBLEMS

Based on the background that has been stated, the authors formulate the problem as follows:

1. How to help egg farmers to be able to maintain good egg quality?.
2. How can the incubator be controlled properly and in a directional manner?.

Research purposes

The purpose of research on the problem that has been described in the background of the problem, as follows:

1. Design or design an egg incubator in order to maintain good egg quality.
2. Build an automatic egg incubator so that eggs can be controlled properly and in a directed manner.

Knowing the temperature in the incubator can be measured and controlled properly so that it is evenly distributed throughout the egg.

Benefits of research

The benefits of this research are expected to provide benefits, namely:

1. The design and manufacture of this tool is expected to function as a programmed automatic egg incubator, so that it can make it easier for farmers to incubate chicken eggs on a small or large scale.
2. Make it easy for chicken farmers to calculate the age of eggs until they hatch perfectly.
3. Makes it easy for breeders to control the room temperature of the incubator so that the temperature is maintained stably.

Research limitations

This research is only for attendance data management and is limited by the following:

1. Using Arduino IDE, MATLAB, Open CV, and Android Studio tools.
2. The study used native chicken eggs.
3. The monitoring system can only be used by users who use Android smartphones.

The incubator can only detect egg condition, egg age, and incubator temperature

Research methods

Research conducts research through experiments (trials). The purpose of this research is to make a chicken egg incubator that can be monitored based on IoT (Internet of Things) technology. This research was conducted on system design, with interface design (hardware) and software design (software).

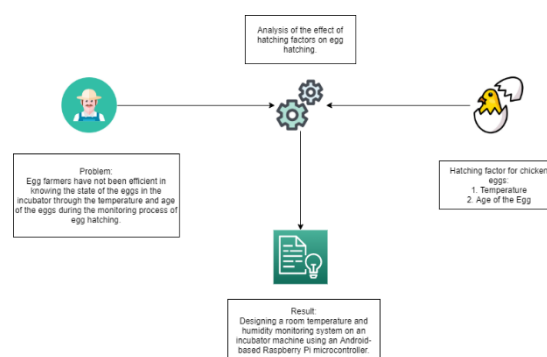


Figure 1: IoT (Internet of Things) Workflow System

III. STUDY OF LITERATURE

Incubating machine

The process of monitoring the state of chicken eggs was carried out in this study using an Android-based Raspberry Pi. Smart Egg Incubator is an application that uses an incubator machine assisted by an Android-based Raspberry Pi microcontroller to assist chicken farmers in incubating chicken eggs in the near future. There are two ways of hatching eggs, namely through natural hatching (mother hen) and through artificial hatching

(incubating machine). This incubator used to incubate eggs is basically a crate or cupboard with a construction made in such a way that the heat inside is not wasted. [4].

Smart egg incubator with IoT

The Smart Egg Incubator is a livestock farming system with integrated IoT applications and tools to be able to monitor the hatching conditions of chicken eggs and assist the hen in incubating her eggs which have been set automatically according to the conditions of the hatching room. This system was built by developing an Android-based Raspberry Pi. Utilization of the Smart Egg Incubator utilizes IoT (Internet of Things) technology [5]. IoT (Internet of Things) is an object data structure where humans have an exclusive identity and the ability to process data through a network without requiring two directions between humans, namely source to destination or human-to-computer interaction. [6]. This is very promising in the world of technology to optimize life through smart sensors and devices that already work together over the internet[7]. One of the previous studies by Bora Gupta showed that color can be used as a reference value to separate objects from the background image background[8].

Temperaturesensor DHT-11

The system is built using the Raspberry Pi operating system and the DHT-11 Sensor to display temperature and humidity sensor levels in a room by complexly throwing a calibrated digital signal output. Exclusive digital signal and temperature and humidity sensing technologies ensure high reliability and excellent long-term stability. This sensor includes several things that need to be measured humidity levels and temperature measurement components NTC connects a high performance 8-bit microcontroller which provides good quality and cost estimates [9]. However, the Smart Egg Incubator must also be able to deal with system failure events when the device is working, such as power outages, egg farm income, improvements in the form of programming that must be improved. In the current era of modern communication and information, people are accustomed to using computers and computer applications. But the use of mobile applications is usually a new sector that has a global positive impact on mobile applications [10]. Mobile applications in developed countries have become easier and people can improve themselves to create new types of IT infrastructure [11]. Therefore, it takes the ability to solve these problems. Some things that need to be considered in development to overcome these problems in the future:

1. Provide socialization guidance to chicken farmers on how to produce hatching chicken eggs according to procedures.
2. Breeders will be advised if there is a problem with their incubator machine if there are problems such as power outages, prepare backups for unexpected possibilities such as failure of temperature settings or humidity resets as at the beginning.
3. Information about when to start the point the egg incubator is turned on until the point the eggs will hatch based on a predetermined time span.

System analysis

System analysis is needed to explain the results of observations from the literature that have previously been carried out. So that the analysis stage is used as the initial stage before entering the testing stage.

Problem analysis

Chicken egg incubators are generally used for large-scale egg farmers. The machines used are of various types and the egg incubator is still manual to automatic egg incubator. With various types of egg incubators that have been created, they still have shortcomings for chicken egg breeders. Although the incubator felt by the breeder was enough to lighten his job, the farmer still checked the incubator by monitoring it directly every few days until the eggs hatched. So here the breeder must control it regularly enough so that the temperature on the machine remains in a stable state.

Flowchart system diagram

The workflow of the chicken egg incubator system that can be monitored based on the temperature and age of the eggs in the incubator and connected to a mobile application which will be described in the form of a flowchart as follows:

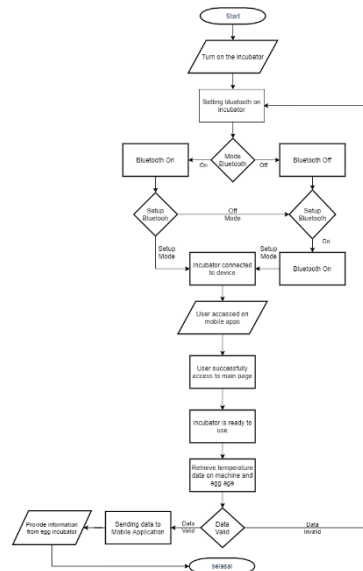


Figure 2. Flowchart of Chicken Egg Incubator

The user turns on the incubator first via a smartphone. If the response fails, it will return to the main page, if successful it will be directed to the Main Menu page. In the main menu, the user gets several menu features such as information on temperature, day, hatch schedule and egg age.

IV. RESEARCH RESULT

Interface design

In designing a monitoring system prototype on a chicken egg incubator using an Android-based Raspberry Pi, he created an interface design. Interface design design is one of the most important parts in designing a tool because from the interface design design it can be seen the overall working principle of the set of tools to be designed. So that the overall design of the interface design of a system that is made can form a functioning system or system that works according to the design. Raspberry Pi is a microcontroller that is not equipped with a Bluetooth module in it. So the Raspberry Pi will be connected to the Bluetooth sensor module device HC-05 and the DHT-11 Temperature sensor can be seen in Figure 3.

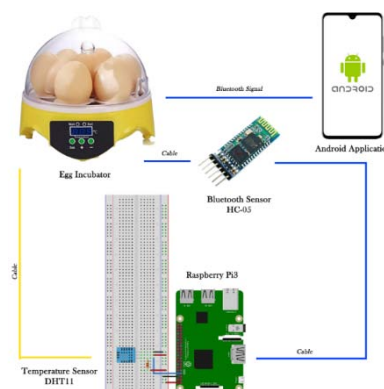


Figure 3. Interface Design

Userinterfacedesign

The user must first enter the ecubator application so that the user can monitor the temperature conditions on the incubator machine and the age of the eggs that will hatch. The following is an interface design for the chicken egg machine monitoring system in the ecubator application.

Main Page User Interface

On the main page the user will see the main display before the user can use it

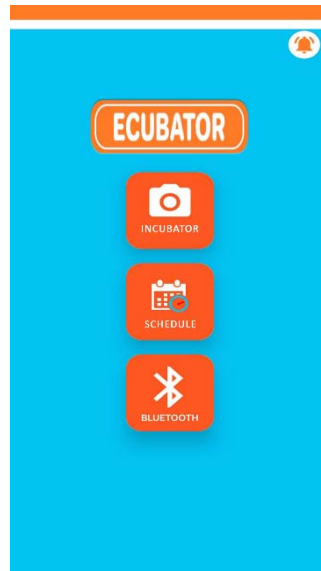


Fig.4 : Main Page Interface Design

User Interface Incubator Page

Users on this page function to find out information on the incubator machine, such as temperature and egg age



Fig.5 : Incubator Interface Design

User Interface Schedule Page

On the schedule page view the user can find out when the eggs will hatch at the appropriate time waktu

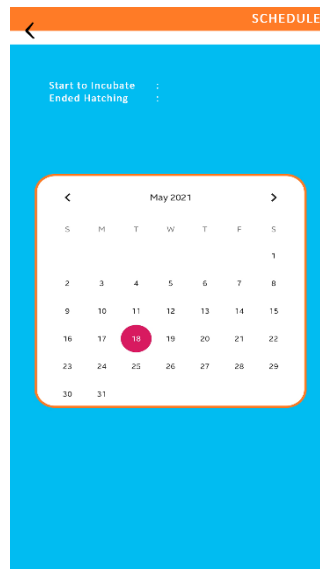


Fig.6 : Schedule Interface Design

User Interface Bluetooth Page

Before the user can monitor the incubator machine that has been designed, the user will first activate the bluetooth and connect the bluetooth that has been installed on the incubator machine.

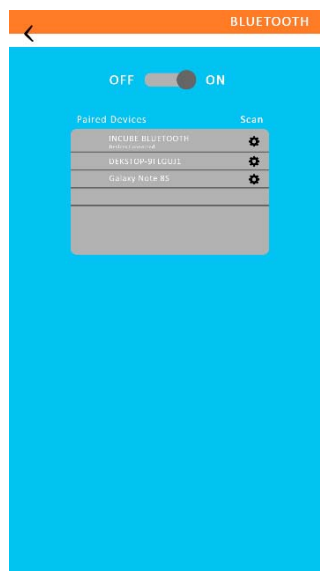


Fig.7 : Bluetooth Interface Design

V. CONCLUSION

From the results of the design of the monitoring system for the chicken egg incubator, the following conclusions can be drawn:

With the design of a monitoring system on the chicken egg incubator machine, it can help chicken egg farmers in small and large scale hatcheries.

Egg farmers can monitor the hatching process easily and efficiently.

Suggestion

1. There needs to be a better development and maintenance of the system that has been made, so that the system can be used as needed.
2. Improving the quality of hatching eggs in egg breeders.
3. Improve or develop the system so that it can be widely used by every chicken egg breeder.

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