PROJECT PROPOSAL

Smart Poultry Brooding System

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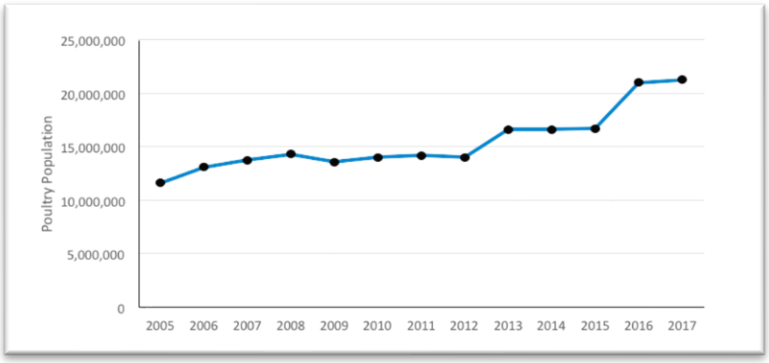
Introduction

In layman's terms, a poultry brooder is considered as the chick's first home. Ideally it should provide all the nurturing as a mother hen would. However, providing all that care and nurturing is not an easy task, as it requires consistently monitoring the growth of the chicks and adjusting the environmental parameters to suit for the comfort of the poultry. The smart poultry brooding system aims to relieve some of that burden from the farmer's hands by automating a few tasks and monitoring the environmental conditions, notifying the farmer accordingly.

Background and context

The poultry sector holds an important place in the Sri Lankan economy due to its contribution to the GDP of the nation [1]. After the 2008-2009 period, the poultry production in the country has seen a considerable rise. The availability of diverse chicken breeds adds to the potential of the industry. To sustain this growth and meet increasing consumer demand, efficient poultry brooding systems become essential. These systems play a crucial role in ensuring optimal conditions for young chicks, promoting healthy growth and productivity in the poultry sector. Investing in modern, efficient brooding systems can help the industry capitalize on its potential and meet the demands of a growing market.



Poultry population in Sri Lanka over the 2005 to 2017 (Source: National Livestock Statistics 2005 – 2017, Department of Census and Statistics, Sri Lanka)

There have been instances where IoT-based solutions have been implemented in poultry farms to monitor environmental parameters [2]. Most of these solutions focus on providing farmers with adequate information to take informed actions. However, they have not been tailored to the Sri Lankan context. Therefore, there exists a need within the Sri Lankan community, to develop an efficient poultry brooding solution.

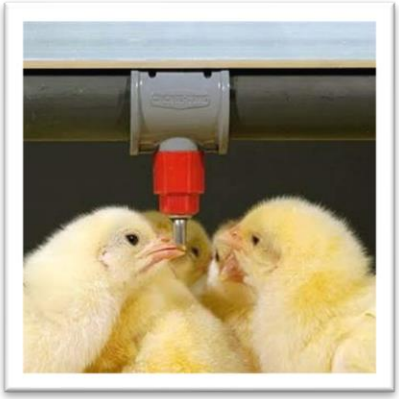
Objectives

The smart poultry brooding system improves environmental control by monitoring temperature and humidity. If these parameters deviate from their ideal levels, the system implements necessary control actions. Our goal through these actions is to boost the productivity and efficiency of the poultry brooding process via automation and optimization. This allows the poultry keeper to focus on other important tasks at hand, such as improving sanitation facilities within the brooder.

Additionally, the system monitors water intake and feed intake by the chicks, providing valuable insights to the farmer. These insights are useful for identifying whether the chicks are in a healthy state, receiving proper nutrition, and whether there are abnormalities in water and feed intake patterns, which will help in the early identification of disease outbreaks and environmental stressors.

Project Scope

Brooder units come in all forms and sizes, housing nearly up to even thousands of chicks. Our unit, on the other hand, is a scaled-down version of that, which could only hold a handful. It consists of three sensors: one to measure the water level inside the water tank, another to measure feed intake by weight, and a temperature/humidity sensor. Out of these three sensors, we plan on creating our own water level measurement sensor from scratch.



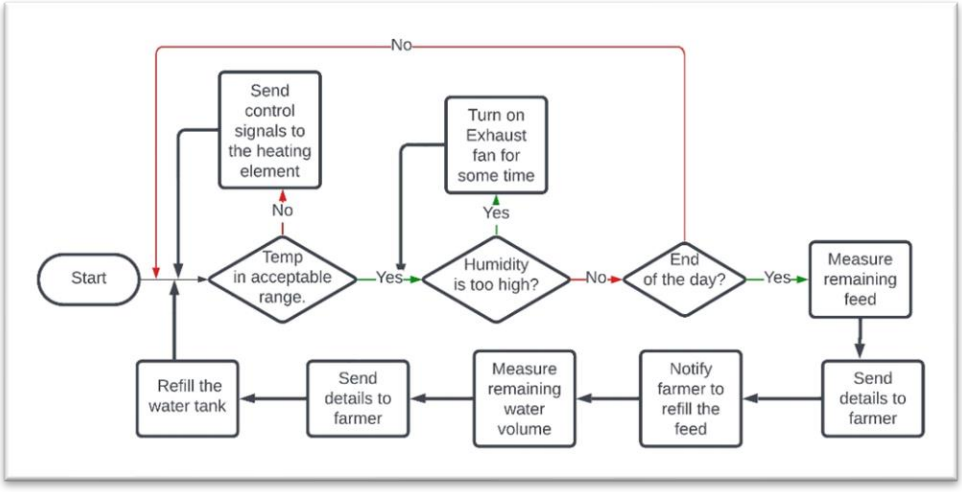
A group of chicks drinking water from a nipple drinker

In addition to the sensors, we have also planned to implement an exhaust fan, which will be used to regulate the humidity within the brooder based on the feedback from the humidity sensor. It will also include a heating element that adjusts its heat output to provide the chicks with ideal temperature conditions.

A controller will be connected to the water tank to regulate the amount of water allowed inside the brooder. The water tank will be a miniature version that will house our water level measurement sensor. At the end of the day, it will measure the level of water consumed by the chicks and signal the controlling unit to allow water for refilling the tank. The feed will have to be replaced manually as there is a certain requirement to regularly sanitize the food plate.

We are utilizing DAQ cards for sensor data acquisition, with processing to be conducted through LabVIEW. Power to the system will be supplied by a programmable DC power supply, and Raspberry Pi boards are also integrated into our setup.

Methodology



Flow of instructions based on sensor outputs depicted in a flow chart

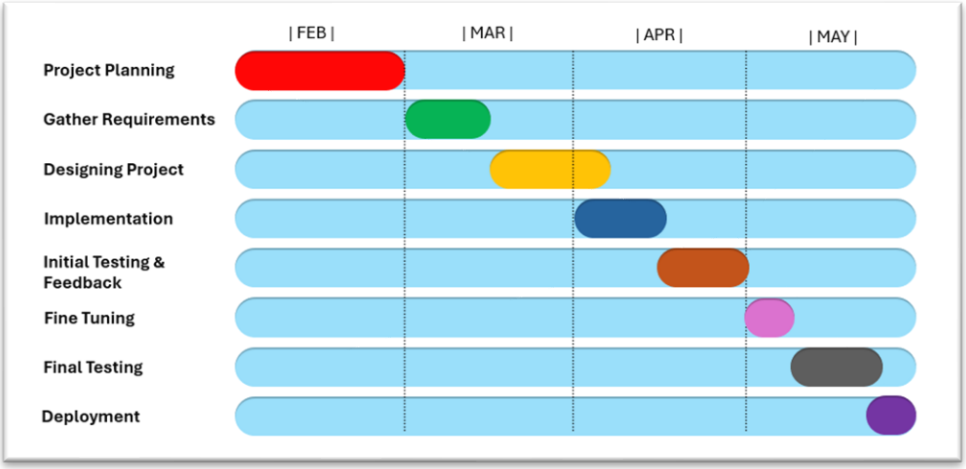
In the process of hardware selection for the smart poultry brooding system, careful consideration was given to prioritize cost efficiency without compromising on system accuracy.

During sensor integration and calibration, we take great care to make sure the sensors in our smart poultry brooding system give accurate readings. We check and adjust them carefully under controlled conditions at different spots in the brooder to capture any changes in the environment.

During calibration, we expose the sensors to controlled conditions similar to those found in typical brooding environments. This helps us make precise adjustments to ensure the sensor readings match the actual conditions. Calibration is essential for reducing errors and making sure the sensor data accurately represents the brooding environment.

After calibration, we deploy the sensors in small-scale real environments to validate and improve their performance. This ongoing process of testing and adjustment helps us continuously refine the sensor calibration, improving the smart poultry brooding system's ability to maintain optimal conditions for chick growth and welfare.

Timeline



Conclusion

The numerous benefits provided by our smart poultry brooding system will significantly reduce the chick mortality rates. Hence it is a timely requirement that will definitely help the local farmers to boost their poultry production in the long run. Even though the project in discussion is a small scaled one, it can be further developed by incorporating more sensors that will help in monitoring the environment within the brooder in a more fleshed out manner. With proper planning and testing, this could be a commercially viable solution that will ultimately have a positive impact on our country’s economy.

References

[1] P. Manjula, H. I. Wijayanandas, C. Gajaweera, D. Lakmalie, S. H. Lee, & J. H. Lee, "A Brief Review on Poultry Sector and Genetic Resources in Sri Lanka," 2018.

[2] S. I. Orakwue, H. M. R. Al-Khafaji, & M. Z. Chabuk "IoT Based Smart Monitoring System for Efficient Poultry Farming," *Webology,* January 2022.