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Smart Feeder Monitoring Devices with Mobile Application

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Abstract: The Smart Feeder Monitoring is an Internet of Things (IoT) system that has real data sensor, capture data and analysis the pellet consumption. Smart Feeder Monitoring is designed to feed fish automatically depending on the time set by the entrepreneur and it has the function to manually feed the fish according to the needs. The development of this project is to focus on the small industrial entrepreneur breeder where they are having difficulties of shortage man power and no centralize data on the monthly consumption on the fish pellets. The methodology used for the development is agile method and Arduino UNO is used for main component to build the hardware and Firebase as the database. This paper is to address the effectiveness of having the Smart Feeder Monitoring over the manual ways to feed and to store data.

Keywords: Automatic fish feeding, Arduino, IoT

1. Introduction

Agriculture has increases every year and according to the Dept. of Statistics (2015), 6.6 per cent increases from the year 2015 to 2016 which had growth resulted total of 97.7 thousand tonnes marine landings. In the aquatic ecosystem, fish are the major and the most occupy in the topic cascade (Saikia, 2015). The increasing amount in the statistics means it increases the man power (Wei et al., 2017) to feed the fish. The development of fish feeder is crucial to be embed to eliminates the manual feeding (Nirwan, Swarnakar, Jayarajan, & Shah, 2017). Most development regarding fish feeder were lacking of the monitoring part. It has the automatic feeding features, but it has no monitoring on the pellets inside the feeder, whether it is on low supplies or empty. The fish owner or breeders need to check inside the feeder and fills it. The existing feeder is focusing on small tank or small aquarium which has less fishes. However, large area of agriculture, the traditional manual feeding will certainly face difficulty in managing entire feeding schedule. Problem occurs if the fish breeders been busy or forgot to go to the fish ponds to feed the fish. It will be such a waste if fish died because of the owner is too busy to feed the fish.

As such, this paper is to investigate the previous fish feeder that already being developed and enhance the functionality in order to follow the current trending technology by using mobile devices. The Smart Feeder Monitoring is a product that was design to feed fish at a predetermined time. This project was divided into two parts which are developing a Smart Feeder Monitoring Applications and Smart Feeder Monitoring Device. This project was based on Internet of Things (IOT) project which is we were using Arduino UNO, ultrasonic sensor, Stepper motor Nema 17, Node MCU and many else. This product provided two ways to feed the fish which are automatically and manually. The project also monitors the pellet level and notifies the owner to alert the pellet is in low supplies. This project has a database which is consist breeder's registration information and report calculation of pellets consumption by monthly basis.

In this paper, we will be discussing more on the development of the Smart Feeder Monitoring from the view of hardware and configuration to use the application. The paper consists of literature review, methodology used to develop the application, the functions in the application, interface and conclusion.

2. Literature Review

This section will be discussing on the previous development of fish feeder and their features. In the article of Hasim, Ramalingam, Ernawan, & Puviarasi (2017), the fish feeder system is being built by using the Raspberry Pi. The usage of Raspberry pi is to act as intermediate between the feeder and the web interface. The database is to store the authenticate user and it is save within the Raspberry pi. Figure 1 shows the home page for fish feeder system. The fish feeder system is being built by using the material of plastic container, servo motor and also web camera. The web camera is to serve as monitoring tool to see whether the fish feeder has correctly functional as it is should be.

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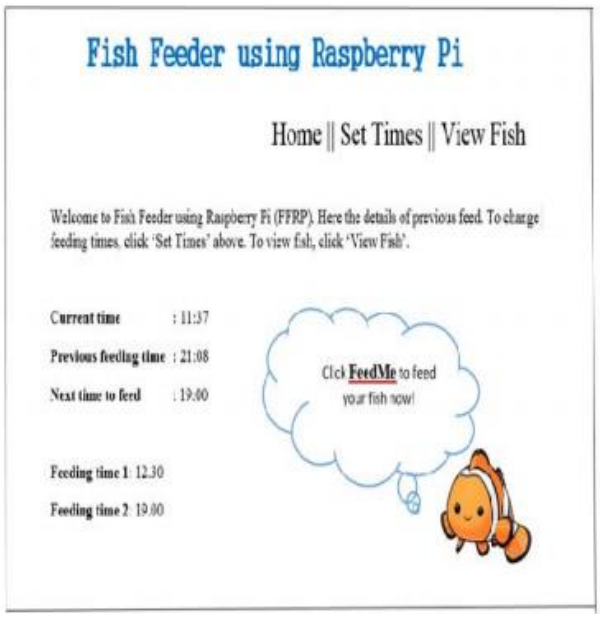

Figure 1: Fish feeder system home page (Hasim et al., 2017)

Another fish feeder that is developed is from the article of Premalatha, Maithili, & Nandhini (2017) where the system is being monitored by using the Global System for Mobile Communication Modem (GSM). It will send notification via Short Message Service (SMS). The fish feeder process uses the electro mechanical feeding, microcontroller, ultrasonic sensor and seed sprayer model. Figure 2 shows the working model for development of fish feeder.

Figure 2: Smart Fish Feeder working model (Premalatha et al., 2017)

The Smart Fish Feeder needs to use power supply to turn on the hardware circuit board. The system prompts the user to enter their mobile number in order to send notification via SMS. In the working model, there are five buttons and to set the timing for feeding, the user needs to set the predetermined time. The SMS will be triggered once the food level is low.

3. Methodology

Methodology is the systematic, theoretical analysis of the methods applied to a field of study, or theoretical analysis of the body of methods and principles associated with a branch of knowledge. Methodology refers to more than a simple set of methods; rather it refers to the rationale and the philosophical assumptions that underlie a particular study relative to the scientific method. This is why scholarly literature often includes a section on the methodology of the researchers. We decide to use Agile Model for Smart Feeder Monitoring. This agile method contains requirements, design & architecture, development & coding, quality assurance & software testing, implementation and maintenance. Fig 3 shows the agile method that we implemented to develop this Smart Feeder Monitoring.

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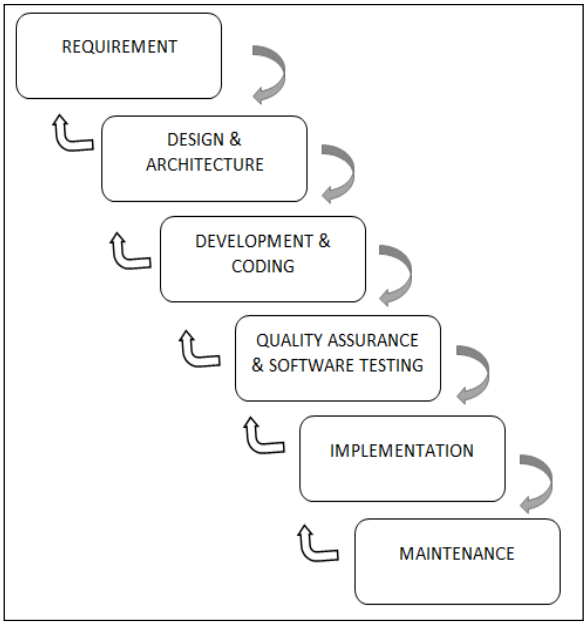

Figure 3: Agile Methodology

The requirement phase required a problem statement and solution on how to deal with the project objective. By collecting related data to the system proposed, it helps us to

gather information and doing a depth discussion among team. The topic from our past discussion has meet a next step to gather data about the various project that related to Smart Feeder Monitoring application by doing some differences and tools that being used.

Design and architecture phase is to specifying the hardware and software requirements, and help in defining overall system architecture. After we gather all the data and information then only the system can be built and constructed. This project was be conducted by using two separate parts which are software and hardware parts. It is important to know about the feature and components of the controller in order to control it. Microcontroller acts as the time controller whereby it distinguishes the appropriate feeding time to poultry. The project consists of two different parts that are interrelated to each other. The first part that must be highly considered is the hardware. The specifications of the system need to be determined according the problem statement. This system will act like human to feed the fish

The development and coding phase required a process of developing the database platform using firebase. Next, for user interaction towards the application, the interface and the coding are creates by using Android Studio 4.0. We need to integrate the database between the Smart Feeder Monitoring Application.

After creating and developing database platform and application, at this stage we manage to investigate and polish the quality and performance of the application to reduce the software bug (errors or other defects) and verifying the software element that fit for use. Besides that, we concern with the performance of the input respond and the functionality. As a result, software testing typically attempt to execute a program and application with the intent of finding the software bugs.

4. Smart Feeder Monitoring Development

4.1 Application Functions

There are a few functional for tank and fish requirements for this Smart Feeder Monitoring. Firstly, feed a pond of fish. Secondly, fish pellets in a closed container to keep fresh and dry. Thirdly, dispense fish pellets twice a day. Fourthly, tank is placed beside the pond. Lastly, works for any type of fish pellets because it is using 2 inch polyvinyl chloride (PVC).

There are a few functional for operational requirements for this Smart Feeder Monitoring. Firstly, automatically feed a pond of catfish by setting time controller. Secondly, manually feed a pond of catfish by using Smart Feeder Monitoring application. Thirdly, dispense proper amount of pellets per serving. Fourthly, registration and login form for user. Lastly, ability to resolve and avoid food clogging because it is using 2 inch polyvinyl chloride (PVC).

There are a few non-functional operational requirements for Smart Feeder Monitoring. Firstly, should dispense pellets at a set intervals which the value is every 12 hours in a day. Next, the ultrasonic sensor will detect if the food is less than 20% to send notification through the Smart Feeder Monitoring application.. Besides, the ultrasonic sensor also will detect the percentage of the fish pellets in the container to display the percentage through the application. The last function is the automatic calculation for pellets consumption in a monthly basis. Figure 4 (a) shows the registration page, figure 4(b) shows the main page, figure 4(c) shows the automatic timing for pellets and figure 4(d) shows the calculation pellets.

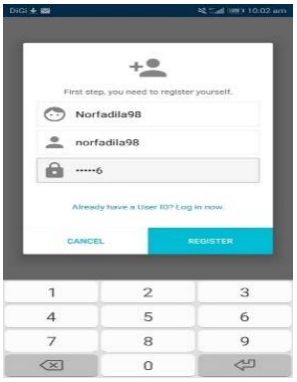

Figure 4: (a)

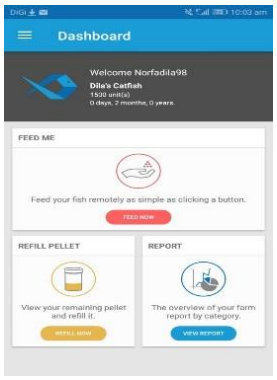

Figure 4: (b)

Figure 4: (c)

Figure 4: (d)

4.2 Application Functions

A system configuration defines the computers, processes, and devices that compose the system and its boundary. More generally, the system configuration is the specific definition of the elements that define and/or prescribe what a system is composed of. This chapter will explain the system configuration for Smart Feeder Monitoring. Fig 3 shows the Smart Feeder Monitoring hardware setup.

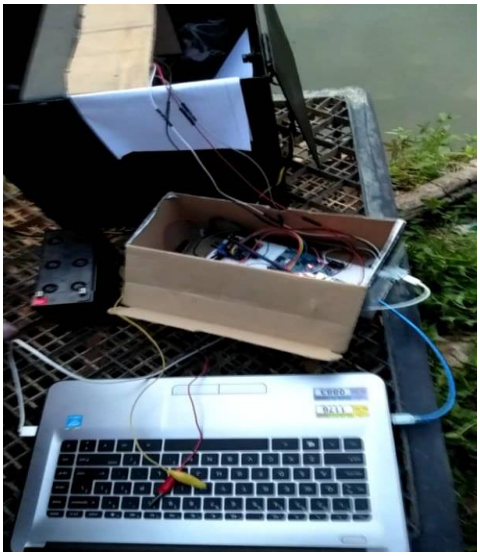

Figure 3: Hardware setup

Firstly, user needs to make sure that Arduino and node MCU esp8266 Wifi module has been connected to the laptop.

Secondly, user needs to make sure that smart phone and esp8266 WiFi module has been connected to the WiFi hotspot. Table 1 show the hardware and software requirements to develop Smart Feeder Monitoring project.

Table 1: Hardware and Software Requirements

Hardware	Software
Sheet Metal	Android Studio 2.2.3
Pipe PVC	Android adb Driver
Screw Conveyor	Arduino IDE 1.6.9
Arduino UNO Microcontroller	Board ESP8266
Female to female Jumper Wires	Firebase
Male to Female Jumper Wire	
Male to male Jumper wire	
HC-SR04 Ultrasonic Sensor	
Stepper motor-MAS 95R 0028M	
L298 Motor Driver Module	
NodeMCU wifi ESP8266 Module	

5. Conclusion

As a conclusion, The Smart Feeder Monitoring help people fed their fish automatically but ensure that their pet fishes are fed in a healthy way. It is supported by the article of Baxter, Hastings, Law, & Glass (2008) and Mohapatra, Sarkar, Sharma, & Majhi (2009), where fish feeder improved the feed efficiency and it reduced the man power. It is being proved in the paper of Ogunlela & Adebayo (2016), where the efficiency by using the automatic feeding is higher (20.9%) compares to the manual feeding (18.6%). It is very highly recommended to use the features of automation in the agricultural practice in the rapid growth of technology. Apart from that, the project design that looks sophisticated and follows the current trending by using the mobile devices. The Smart Feeder Monitoring can be controlled by using the application with the Smart Feeder Monitoring hardware. Furthermore, it helps people and used to save or conserve electricity usage.

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