DEVELOPMENT PROTOTYPE SYSTEM MONITORING CATFISH CARE WITH ALTERNATIVE ELECTRIC POWER IN BUDIDAYA BAKTI MANDIRI

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ABSTRACT

At present the use of Internet of Things (IoT) technology has been widely applied in various fields of industry, urban areas and even for cultivation. The concept of IoT is very much needed especially in the field of catfish farming. the owner cannot monitor the state of the pond at any time because it has other activities which result in limited time to check the condition of the pond and frequent feeding is not timely. By utilizing IoT technology to conduct online monitoring, it will certainly make it easier for owners and officers to monitor cultivation ponds. By using the prototype method as the basis for the development of this catfish care monitoring system, it provides information on water pH and temperature, automatic feeding according to schedule, direct water filling in ponds and alternative electric power. The results of trials through this system show that monitoring the state of pond water using a pH sensor and water temperature is better compared to using a thermometer and litmus paper, feeding more terurur, water used when filling the pond is 80% more efficient than filling manual because the system will display a notification to the owner to turn off the water and alternative electric power to repeat when a power outage occurs.

Keywords : Catfish, Monitoring, Prototype, IoT , Technology

1. Preliminary

Catfish cultivation in using ponds continues to grow and has enormous benefits as the yield of catfish cultivation increases from year to year. One of them is Budibaya Bakti Mandiri which is owned by the father of Asep Dani. It is a catfish farm located in the Central Cigugur area, according to the owner of Asep the pool water temperature is good for catfish cultivation between 23 ° C - 30 ° C and pH of water good between 6.5 - 8, if the water temperature and pH of the water are less or exceed the specified limit, it can cause catfish to become stressed and not eat the feed given to cause death in catfish, to overcome the cultivation owners usually mix water with ponds the temperature and pH of the water are normal to stabilize it. In terms of filling the pool water is still not controlled for the volume of water needed, sometimes when filling pond water the pool owner leaves it because it takes a long time and when filling catfish ponds the volume of water is excessive so it must throw some water to make the volume according to what is needed by father asep.

The maintenance of catfish ponds by the father of Asep always checks directly into each catfish pond to check the condition of the temperature along with the pH of the water during the day before night to ensure the temperature and pH of the water in each pool is in a normal condition. This requires the father of Asep to always be at the location of catfish cultivation to continue to monitor it. Another problem that cannot be resolved is feeding on each catfish pond, so that the growth of fish sometimes becomes slow, feeding is usually given three times a day at 8am, 1pm and 5pm but feeding at any time.

Sometimes it is not on time because officers have other activities besides supervising the cultivation pond, which is handling packing to shipping catfish seeds to consumers and because in the area there is often a rotating power outage to mitigate it, add alternative electricity using solar panels and storage devices electric power if there is a power failure, it will automatically use the alternative electric power.

By using Internet of Things technology to monitor a situation that needs special handling from related parties by using the internet to send data and conduct control without any distance restrictions with the help of Arduino microcontrollers, so that it can be implemented in a remote monitoring system that will be applied to the pool catfish farming to accommodate monitoring of water conditions in catfish ponds by sending information on monitoring results such as information on time, water temperature, water pH, feeding status, volume of pond water filling and monitoring history that will

provide information to the owner so that it can be done fast handling.

Based on the existing problems, a catfish pond monitoring system was built so that the owner of the cultivation using the internet, android and website as a medium that will integrate with other devices in order to monitor and provide information quickly so that handling can be done appropriately. The system design will be outlined in the form of a final project report entitled" Development Prototype System Monitoring Catfish Care Whit Alternative Electric Power In Budidaya Bakti Mandiri".

1.1 Formulation of the problem

Based on the description in the background, the problems examined in this study are as follows:

1. How to do direct monitoring without having to come to catfish farming ponds?
2. How do you know the condition of water temperature and the pH content of water in a pond in catfish farming?
3. How to prevent a lack of timeliness in feeding catfish?
4. How do you know the volume of water when filling water in a pond in catfish farming?
5. How to deal with rotating power cuts in the area?

1.2 Purpose and Objectives

Based on existing problems, the purpose of the research that will be carried out is Development Prototype System Monitoring Catfish Care Whit Alternative Electric Power In Budidaya Bakti Mandiri. The purpose of this study is :

1. Monitoring remotely using a website and android application that is attached to the internet.
2. Check the temperature and pH of the water using a sensor that can be known for 24 hours.
3. Perform automatic feeding of fish based on the schedule.
4. Check the volume of water using a sensor when filling water in the pond.
5. Using alternative electrical power as a solution when there is a power outage so that the tool can provide information continuously.

1.3 Methods of Software Development

The method of software development uses a prototype model. This method is suitable for use as a reference for developing a device that will be developed again. This method begins with gathering user needs. Then make a quick design which will then be re-evaluated before being applied correctly. The prototype is not something that is perfect, but something that must be evaluated and modified again. All changes can occur when the construction of a prototype begins to meet user needs and at the same time allows developers to better understand user needs [1].

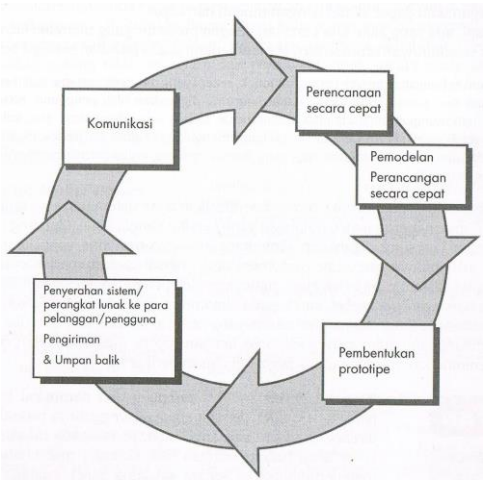

Image 1 Prorotype Model

1. Initial communication and data collection is an analysis of the needs of users (owners of independent service).
2. Design quickly, namely making a design based on analysis based on user needs in general for further development.
3. Rapid design modeling, which is to do prototype modeling based on an analysis of general user needs to be developed again.
4. Formation of prototypes, namely the construction of prototype devices included in testing and refinement.
5. Submission of the system, namely producing the device correctly so that it can be used by the user (the owner of an independent service).

2. RESEARCH CONTENT

2.1 Theoretical basis

The foundation of this theory explains the material used in conducting research.

2.1.1 Fish cultivation

Aquaculture is one of the efforts to breed various types of freshwater fish with the aim of making the business or maintaining the preservation of certain types of fish so that they are not extinct. Cultivating freshwater fish is not difficult if you already know the nature and predilection of fish to be cultivated [3]. Catfish is one type of fish native to Indonesian waters that many live in waters with calm currents such as lakes or dams, catfish have a body shape (body) elongated and flattened (flat) in the back (base of the tail). The head is flat, relatively large in size [4].

2.1.2 Alternative Electrical Energy

Electricity is a series of physical phenomena associated with the flow of electric charges. Electricity can cause various known effects, such as static electricity, electromagnetic induction and electric current. electricity can also cause and receive electromagnetic radiation such as radio waves. While alternative electrical energy is a source of electrical energy that is used to replace the main energy source (PLN) without unexpected consequences of this [5].

2.1.3 System

Sutabri provides a system understanding as a set of elements that are closely related to one another, which function together to achieve certain goals. In another sense, the system is defined as a set of components, elements, or variables that are organized, interdependent with each other [6].

2.1.4 Monitoring

Monitoring is also defined as a step to assess whether the activities carried out are in accordance with the plan, analyze the problems that arise so that they can be handled immediately, assess whether the work patterns and management used are appropriate to achieve the goals, know the relationship between activities with the aim of obtaining a development [6].

2.1.5 Internet of Things (IoT)

Internet of Things is a technology that enables communication, control, cooperation with various hardware, sharing data, virtualizing everything in the form of data sent using internet assistance [2].

2.1.6 Arduino microcontroller

The microcontroller is a chip or integrated circuit (IC) that can be programmed using a computer, while Arduino is an elekrtonik platform that has an open source that contains the main components. The purpose of implanting a program on the microcontroller aims for electronic circuits to be able to read inputs from sensors, process these inputs and then produce output as desired. So the microcontroller as "brain" input, output and process in an electronic circuit [7].

2.1.7 Water temperature

Water temperature is an important factor in cultivating fish because the temperature of the water that is not suitable can cause fish to lose their appetite and be more exposed to the disease. Conversely, if the temperature is too high the fish can experience respiratory problems and can cause permanent gill damage to death [8].

2.1.8 Hydrogen potential (pH)

Hydrogen potential (pH) is a number to express the acidity and basicity of a solution. PH measurement (Hydrogen potential) will find out if the water solution is acidic or basic. If a solution has the same number of acidic and basic molecules, pH is considered neutral. Very soft water is generally acidic and very hard water is generally alkaline, although unusual conditions can result in exceptions [9].

2.1.9 Water flow

Flow is the equilibrium process of the movement of a mass of water which causes horizontal and vertical displacement of water masses. The movement of water flows can be said to be the movement of the mass of water from a high place to a lower place The velocity of water flow will vary vertically [10].

2.1.10 Servo motor

The servo motor is composed of a DC motor, gearbox, potentiometer or variable resistor (VR) and control circuit. Potensiiometer aims to determine the maximum limit of the axis of the (axis) servo motor. Whereas from the axis of the servo motor is set based on the voltage on the servo motor control pin.

2.2 System Analysis

Construction of a Catfish Care Monitoring System with Alternative Electric Power in Bakti Mandiri Cultivation is a system that is used to monitor pH levels, water temperature in catfish ponds, can provide automatic feed to catfish according to predetermined scheduling and can also monitor filling of ponds currently done so that the water filled in the pool is not too excessive, all these functions can be monitored and controlled through the internet.

2.2.1 Analysis of Alternative Electricity Use

The use of alternative electric power will be built to divert the electrical power from the PLN when there is a power outage to the power storage produced by the solar panel and also the electrical power of each tool used.

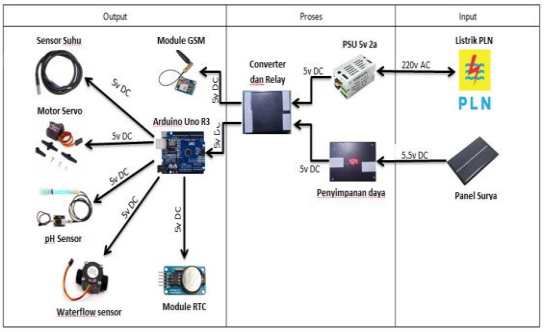

Image 2 The Concept of Alternative Electric Power

1. PLN electricity is the initial power on all devices, which are lowered from 220v to 5v by the power supply (PSU) 5v 2a.
2. Alternative electrical power produced by solar panels which will be stored first on the power storage containing lithium batteries.
3. Alternative electric power will be used when PLN's electric power is temporarily suppressed.
4. When there is a temporary outage, the relay located in the converter will automatically move the electrical power which initially comes from the National Electric Company (PLN) from the power plant generated by the solar panel.
5. Converter in addition to functioning as a transfer of electric power flow by using a relay, also functions as a distributor of electrical power on all devices.

2.2.2 Analysis of Built Systems

Explain the overall picture of the system. The system to be built has a hardware component in the form of a sensor that can provide the data needed by the system that is first connected to the Arduino microcontoler device. Where the read data will be displayed on the web and Android devices connected to the internet by utilizing Internet-based (IoT) -based technology and with the help of GSM module hardware which includes a SIM CARD, this GSM module is connected to an Arduino microcontroller for data communication.

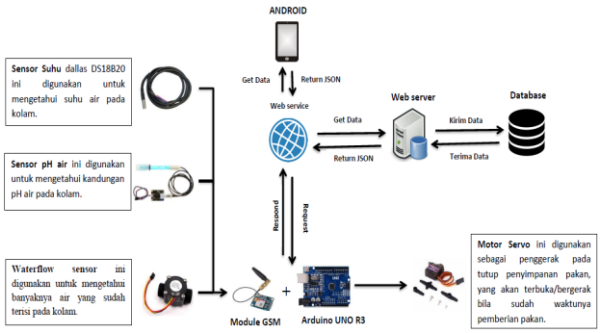

Image 3 System Architecture

1. The system on an android device will display data obtained from the ph sensor and water temperature every 15 seconds, the feeding status of catfish 3 times a day and tells the volume of water that has been filled in the pool when the officer wants to fill the pond with new water.
2. The GSM module will send cultivation data to the web service then the web service will send data to the android device.
3. Android will receive cultivation data via a web service connection from the GSM module. Then the android will request cultivation data to the web service, the web service will send cultivation data from the GSM module.
4. Arduino microcontrollers will send pH sensor data, temperature sensors and waterflow sensors via a GSM module.
5. The GSM module will send cultivation data to the web service then the web service will send data to the web server then it will be stored in the database.
6. The database will send cultivation data to the web server then the web server sends data to the web service.
7. Web service will send cultivation data to the GSM module.
8. The water pH sensor will assess the pH content of water in catfish ponds by sending analog signals to the Acquisition Module and turning them into digital values.
9. Sensor Water temperature will read the temperature in pond water by capturing it with a temperature detection device whose end result is digital data.
10. The servo motor will open the feed shelter when the feeding schedule is on time and close again closed for a few seconds.

2.2.3 User Needs Analysis

Analysis of user needs is an analysis that is intended to find out who are the users who can run or operate the application system of catfish care monitoring system prototype.

Table 1 User Needs Analysis

User		Kemampuan	Tugas
Admin	Website	1. Mengerti cara menggunakan website. 2. Bisa melakukan CRUD. 3. Bisa mengolah data yang ada.	1. Memonitoring keadaan suhu dan *pH* air pada kolam. 2. Memasukkan jadwal pakan. 3. Memasukkan jumlah pakan. 4. Mengetahui volume air yang terisi pada kolam 5. Mengetahui daya listrik alternatif. 6. Mengelola data user. 7. Mereset data ketika sudah tidak dibutuhkan.
Petugas	Website	1. Mengerti cara menggunakan website.	1. Memonitoring keadaan suhu dan *pH* air pada kolam. 2. Mengecek jadwal pemberian pakan dan status. 3. Mengetahui volume air yang terisi pada kolam. 4. Mengetahui daya listrik alternatif.
Petugas	Android	1. Mengerti cara menggunakan aplikasi android.	1. Mengetahui keadaan suhu dan *pH* air pada kolam. 2. Mengetahui status pemberian pakan dan pakan yang ada. 3. Mengontrol waterflow untuk mengukur volume air. 4. Mengetahui daya listrik alternatif.

2.2.4 Functional Needs Analysis

Analysis of functional requirements is planning, drawing and making sketches or arrangements of several separate devices into a unit to achieve certain goals. Analysis of the functional requirements of the system to be discussed in this study is divided into two parts, namely the Functional Web Needs Analysis and Functional Needs Analysis of Mobile.

2.2.4.1 Web Functional Requirements Analysis

Web Functional Needs Analysis includes Context Diagrams, Data Flow Diagrams (DFD) which are divided into several levels and process specifications that function to explain the flow of data being processed.

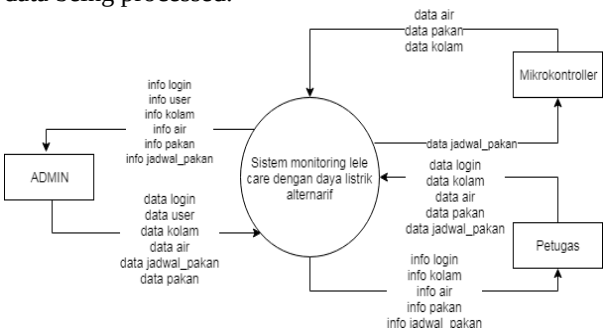

Image 4 Data Flow Diagram Level 0.

2.2.4.2 Mobile Functional Needs Analysis

The stages of modeling in system analysis that will be built include identifying the actor, making Use Case Diagrams.

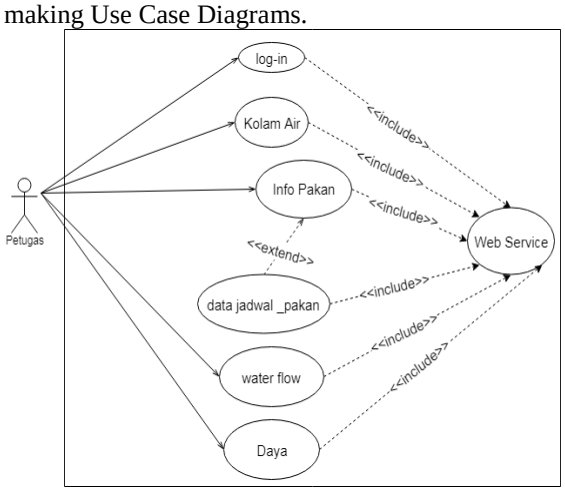

Image 5 Use Case Diagram

2,3 System Implementation

The system implementation phase is the implementation stage of the prototype catfish care monitoring system with alternative electric power in independent devotional cultivation. This stage is carried out after the system design and manufacturing analysis is complete.

2.3.1 Hardware Implementation

The hardware is used to implement the system.

Table 2 Hardware Requirements Specifications

No	Perangkat Keras(*Hardware*)	Spesifikasi
1	Handphone	
	Sistem Operasi	Lolipop
	RAM	2 GB
	Memoi Internal	16 GB
	Processor	Quad-core 1.2 GHz
2	PC	
	Sistem Operasi	Windows xp, 7, 8 ,10
	Processor	Intel Core 2 duo 533 MHz -1.333 MHz
	RAM	2 GB
	Memori Internal	500 GB
3	Alat yang akan di bangun	
	Mikrokontroler	Arduino Uno R3
	Sensor Suhu	Dallas DS18B20
	Sensor *pH* Air	E-201
	Water Flow Sensor	FS300A G3/4
	Servo	Servo MG90
	Real Time Clock	RTC DS3231
	Internet	Modul GSM 800L V2.0

2.3.2 Implementation of Built Tools

The following is the implementation of a series of components used in the system.

Image 6 mplementation of Tools Used

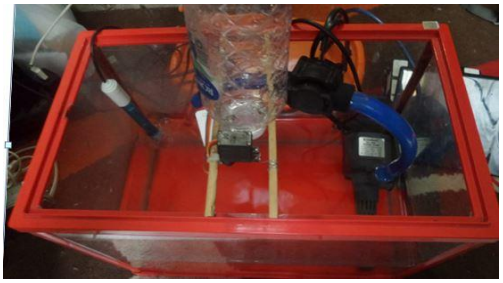

Image 7 Sensor Layout Implementation

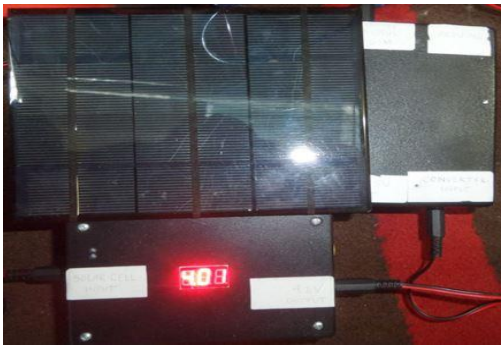

Image 8 Implementation of alternative electric power

2.4 System Testing

System testing is the most important thing that aims to find out whether the application has been made in accordance with the design and to find errors or shortcomings in the application.

2.4.1 Testing of pH and Water Temperature

Water pH sensor and water temperature are used to determine the pH content of water and water temperature in the aquarium.

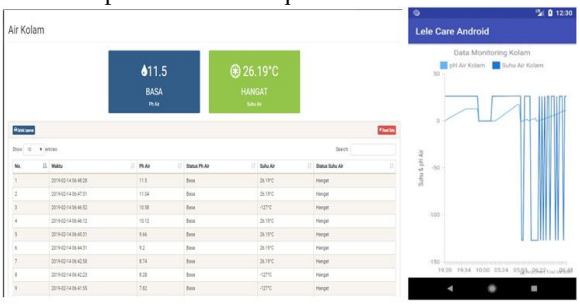

Image 9 Testing of pH and Water Temperature Sensors

2.4.2 Servo Motor Testing

Automatic feed uses the help of a servo motor to open and close the feed cover which will move according to the schedule.

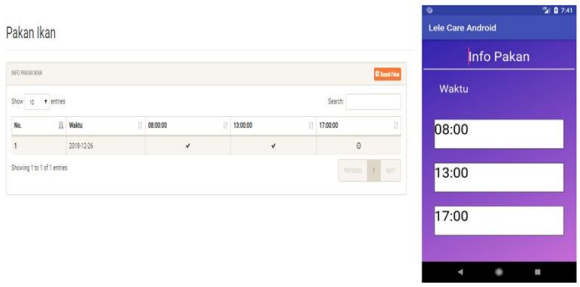

Image 10 Testing of Servo Motors

2.4.3 Waterflow Sensor Testing

Waterflow Sensor is used to determine the volume of water that has been filled in the aquarium.

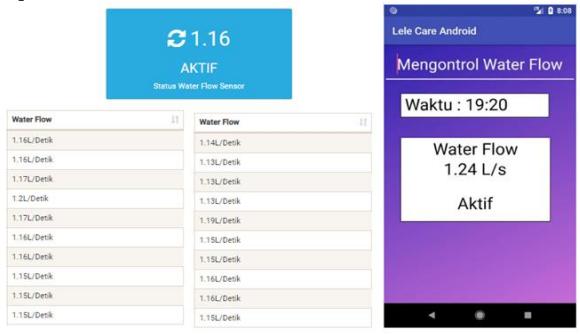

Image 11 Testing of Waterflow Sensor

2.4.4 Testing of Alternative Electric Power

Alternative electricity is used when there is a power outage from PLN, using solar panels and lithium batteries.

Image 12 When Not Charged

In image 12 shows the power contained in the storage and there is an indicator light that will turn on when there is charging at the storage area.

Image 13 When Charged

In image 13 when the solar panel is exposed to direct sunlight, the indicator light on the storage area will light indicating that it is charging.

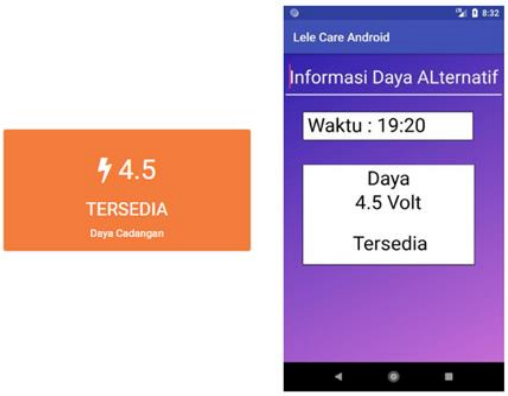

Image 14 Testing of Alternative Electric Power

In Image 14 shows the web and android power applications contained in the storage and the status is available for use.

6. CLOSING

3.1 Conclusion

From the results of the catfish care monitoring system with electric power in independent service, the authors draw the following conclusions:

1. The prototype of the catfish care monitoring system still does not meet all the needs needed by the owner of the farm.
2. You can check the pH and water temperature in the tank.
3. Still not able to provide automatic feed according to schedule.
4. Already know the volume of water for filling water in the aquarium.
5. You can already use alternative electric power as a solution when there is a power outage.

3.2 Suggestion

To develop a catfish care monitoring system with electric power in self-service cultivation, the authors provide suggestions that are expected to be realized and form the basis of further research. The suggestions from the author are: 1. Implement this system into the original catfish pond. 2. Consider the size of the pond with the tools used. 3. Add a tool to close the water flow to be automatic. 4. Enlarge the power of alternative electricity storage so that it can be used longer.

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