Control the Water wheel with the Internet of Things

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Control the Water wheel with the Internet of Things

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Abstract. The waterwheel is a component of the spinning water that energizes the rotating axis. Waterwheel is a means to convert water energy into mechanical energy in the form of torque on the shaft of the mill. One of the functions of water is to improve water quality. But the use of waterwheels manually is inefficient, because the mill works continuously even though the water quality is good. So it takes intelligent algorithm to be able to produce waterwheels that can benefit the local community for the needs of high protein foods. By adjusting some variables in determining water quality to improve the water quality of shrimp habitat, consisting of: water pH, water temperature, disoolved oxygen and salinity. And in uncertainty input from existing parameters can form a probability distribution that determines water quality and the movement of the mill. The sensor reading results into a reference microcontroller in sending PWM signals on the boost converter as DC motor drivers to run waterwheels slowly or quickly based on inputs. And with the Internet of Things (IoT) technology will make it easier to control, more practical, effective and efficient.
Keywords. Waterwheel, Internet of Things, Moves

1. Introduction

Internet of Things (IoT) is a concept whereby internet connectivity can exchange information with each other with objects around them. Many predict that the Internet of Things (IoT) is "the next big thing" in the world of information technology. This is because a lot of potential that can be developed with the technology of the Internet of Things (IoT) tersebut. Tek Internet of Things (IoT) physical tools can be connected to the internet. In the case of waterwheels can be used in the needs of fish farmers can be controlled using a smartphone to turn off, turn on and other activities. With the Internet of Things (IoT) will further facilitate the activities of fish farmers in performing various daily activities. All activities can be done very practical and on the one hand there is a system of control because the connected devices cause activities will be effective and efficient.

1.1. Internet of Things

The concept of IoT is quite simple with work referring to 3 main elements in IoT architecture, namely: Physical Goods equipped with IoT module, Connection Tool to Internet like Modem and Router Wirless Speedy, and Cloud Data Center where to store application along with data base. the main objective of IoT as a means to facilitate the control and control of physical goods so the concept of IoT is very possible to be used almost on all daily activities. IoT has an important role in controlling electricity consumption, so that electricity consumption can be more efficient as needed from personal to industrial level, and also to monitoring system. IoT can also be useful to control real-time water conditions in reservoirs, irrigation for farmers for water debit information are numerous or few, making it easier for real sector actors to consider their needs more appropriately. Forest fires can also be prevented by integrated fire prevention systems, with hotspot report data from directly linked satellites to the water spraying system at the point where the fire location can be more likely to fire in extinguish more quickly. Of course IoT technology is very useful in overseeing equipment used for the company's operations so that the needs of these devices can be more measurable and optimal. go to Indonesia which will continue to grow srastis with the inclusion of IoT components to Indonesia. The benefits of the Internet of Things are plentiful for Indonesians, but a wise arrangement is necessary in order not to be negative either on an individual scale until the national level.

1.2. Waterwheels

Using a waterwheel as a means of air circulation in shrimp ponds that work continuously although the quality of pond water is good, this results in the use of energy inefficient and expensive. Aeration system of addition of air in water is needed to increase the oxygen content in water which can be done by using waterwheel. One way to increase contact with water is by mechanical equipment that serves to increase the value of oxygen that comes in the water. Because the waterwheel function in addition to adding oxygen directly into the water, circulating water surface with water base to ensure the oxygen content in the water is correct flatten and move the already aerated water rapidly to the surrounding area so that the unaerated area can be aerated. And the use of manual waterwheels is not effective so it takes intelligent water mill in shrimp ponds to improve the quality of ponds with variables: Dissolved Oxigen, Temperature, salinity and water PH.

1.3. Device Controller

A peripheral device connected to the CPU and memory system by an I / O controller. The main function of the device controller is to transfer information (programs and data) between the core of the system and the device. The device controller communicates with the device through the interface carrying the device signal. There are 3 signals between the device and the controller, namely: control signals, status signals and data signals.

a. The control signal is given by the device controller to the device requesting the device to perform a specific task.
b. The status signal is a feedback response signal from an I / O device that is sent to a device controller that reports a particular internal state or state that is encountered or is located on an I / O device.
c. The data signal is a signal that can be transmitted serially via a conductor carrying 8 bits or 1 byte of data at a time.

1.4. Driver

I / O drivers for a device have routines in performing multiple operations, such as read, write and so on. Each routine delivers the appropriate command to the I / O controller so that the device controller provides the required control signal to the device. To support the device in a system, there are 3 things needed:

a. A device controller that logically leads the device to the core of the system.
b. Interface cable device that physically connects the device to the device controller.
c. I / O drivers.

The device controller architecture must be introduced to the programmer to develop I / O drivers. Operating systems and other programs use the device driver routine to perform input / output operations.

1.5.Computer System Performance

Performance Computer system can be measured from the amount of time used in executing a program. Factors that contribute to the operating speed of the computer's performance are:

a. Taking instructions; memory access time.
b. Instruction translator; speed of control unit.
c. Calculate operand address; 1) GPR access time / memory access time 2) .Additional addressing time.
d. Taking operand; memory access time / GPR time.
e. Execution: extra time
f. Storage of results; main memory access time.

Two computers that work at the same clock rate (clock rate), the execution time for ADD instructions may be different if the computer has a different internal organization. Therefore, different types of instructions and the number of instructions executed by the CPU when running a program determine the time spent by a computer for a program.

There are 2 types of CPU-memory interfaces that are implemented in a computer system, ie

- Synchronous interface. In the sync interface, the time spent by memory for read / write operations is fixed and always the same. Therefore, there is no feedback from memory to the CPU indicating the completion of the read write operation.
- Asynchronous interface asynchronous interface). On the asynchronous interface, the memory notifies the completion of the writing operation by sending a status signal, memory function complete (MFC). This signal is also called Memory Operation Complete

1.6.Clock

The clock unit generates and supplies clock pulses sequentially and continuously. The clock signal has a priodic waveform. The clock signal is used as a timing reference by the control unit. The number of priodic waves that are repeated in units of time is called frequency (f). The unit of frequency is set in the cycle of persecond (cps = per second cycle) or Hz. The clock frequency indicates the internal operating speed of the processor. The time interval between the priodic signal and the next priodic signal is called the time period (T). The relationship between the frequency and the priode is the pulse width (tpw) indicating the pulsaclock duration. Another term corresponding to the pulse width is known as the duty cycle, where duty is the ratio (expressed percent) of the pulse width to the period. Illustration of the time period and pulse width (Syahrul.2010).

2. The Method Used

2.1.Pulse Widh Modulation Method

Setting pulse width modulation or PWM is one of the techniques used in the current control system. The wide range of modulation is used in a wide variety of areas, one of which is: speed control, power system control, measurement or instrumentation and telecommunication (Prabowo, Brilliant Adhi, 2009).

Waves can be varied to obtain a varying output voltage which is the average value of the wave. PWM is basically turn on (ON) and turn off (OFF) DC motor quickly. The key is to set how long the time ON and OFF.

Ton is the time at which the output voltage is at a high position or 1, and Toff is the time at which the output voltage is at a low position or 0. Suppose Ttotal is the time of a cycle or a sum between Ton and Toff, usually known as the "one wave period". The output voltage can vary with duty-cycle and can be formulated as follows, so from the above formula can be deduced that the output voltage can be changed directly by changing the value of Ton. By adjusting the pulse width on and off in one wave period by giving a large output reference signal of a PWM the desired duty cycle will be obtained. Duty Cycle of PWM can be expressed as:

Duty Cycle = ton / (ton + toff) x 100%. . . . . (2.1)

100% Duty Cycle means the motor control voltage signal is passed entirely. If the supply voltage 100 V, then the motor will be given 50% of the total voltage there, so so on.

2.2.Probability

A given experiment, S is the sample space of A in which A1, A2, ... denotes possible events. A set of functions that associate a real value with each A event is the probability or probability of a function set, and P (A) is called the probability of A if the following properties are met:

0≤P (A) for each A and P (s) -1.

And the probability of an event is the number of count events, the probability of A is written P (A) = n (A) / n (S)

3. Results And Discussion

3.1.Data, Symptoms and opportunities of waterwheels

Symptom data based on variable PH, dissolved oxygen, temperature and salinity based on water quality hypothesis that led to a moving waterwheel.

Table 3.1 Symptoms and Hypotheses

Gejala	**Kualitas Air**	
	X1 Low Water Quality	**X2 High Water Quality**
PH (Acid)	1	0
PH(Neutral)	0	1
PH (Base)	1	0
Temperature(Cold)	1	0
Temperature (Medium)	0	1
Temperature (Panas)	1	0
Salinity(Low)	1	0
Salinity(Medium)	0	1
Salinity(High)	0	1
DisolvedOxigen(Small)	1	0
DisolvedOxigen(Medium)	0	1
DisolvedOxigen(Large)	0	1

Rumus :

P(B|A)= B / (A-1)+C+D………………………………………………………………….. .. (3.1)

P(A dan |B) = P(A).P(B|A)……………………………………………………………..(3.2)

Dari tabel 3.1 dapatdihitungbesarpeluangkincirair untukbergerak= 6/12 x100% = 50%.

x1 (kualitasrendah)	x2 (tinggi)
1	0
0	1
1	0
1	0
0	1
1	0
1	0
0	1
0	1
1	0
0	1
0	1

P(H1|E1)=P(E1|H1)*P(H1)/((P(E1|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)+(P(E2|H1)*P(H1)=(1*0.5)*(0.5)/(1*0.5)*(0.5)+0+(1*0.5)*(0.5)+(1*0.5)*(0.5)+0+(1*0.5)*(0.5)+(1*0.5)*(0.5)+0+0+)+(1*0.5)*(0.5)+0+0

=0.025/(6*0.025)

=1/6

=0.17

Total untuk H1terhadap gejala yaitu (6* 0.17)/6 =1,02/6 =0.17 *100%=17 %.

3.2.Data Rule

The data rule used e of these variables is as follows:

Rule:

1) IF PH Acid ANDS Cold And Low Salinity Low AND Disolved Oxygen Small THEN Low Water Quality AND Swivel Waterwheel Moving.
2) IF PH neutral ANDS Temperature medium AND Salinity medium AND Disolved Oxygen medium THEN Medium Water Quality AND Slipper Water Slope Moves Slow.
3) IF PH base ANDS Temperature medium AND Salinity medium AND Disolved Oxygen medium THEN Low Water Quality AND Range of Waterwheel Moves.
4) IF PH base ANDSheat temperature AND Salinity medium AND Disolved Oxygen medium THEN Water Quality Low AND Round Waterwheel Moving.
5) IF PH alkaline ANDSHEAT AND ANDTHE MORE THIN AND DISINEDITED Oxygen medium THEN Low Water Quality AND Fingerless Waterwheel Round.
6) IF PH alkaline ANDSHEAT AND ANDTHE MORE THINITY AND DISINEDED Oxygen medium THEN Low Water Quality AND Swivel Waterwheel Moving.
7) IF PH alkaline ANDSHEAT AND high salinity AND Disolved Oxygen ManyTHEN Low Water Quality AND Round Waterwheel Moving
8) IF PH neutral ANDSheat heat AND High salinity AND Disolved Oxygen ManyTHEN Water Quality Low AND Round Waterwheel Moving
9) IF PH neutral ANDSETUAL neutral AND High salinity AND Disolved Oxygen Lots THEN Low Water Quality AND Round Walking Waterwheel
10) Neutral IF neutral AND NE neutral AND neutral salinity AND Disolved Oxygen Many THEN Low Water Quality AND Swivel Waterwheel Moving
11) IF neutral and neutral neutral PH AND neutral salinity AND Disolved Oxygen Many THEN good water qualityand ironscent waterwheel rotation

12) IF PH neutral AND Thermal temperature AND Salinity neutral AND Disolved Oxygen Lots THEN Low Water Quality AND Round Waterwheel Moving
13) IF PH neutral ANDSheat heat AND High salinity AND Disolved Oxygen Lots THEN Low Water Quality AND Rounding Waterwheel Moving
14) IF PH neutral ANDSheat heat AND High salinity AND Disolved Oxygen being THEN Low Water Quality AND Turning Wheel Waterwheel
15) IF PH base ANDSHEAT temperature AND High salinity AND Disolved Oxygen being THEN Low Water Quality AND Turning Wheel Waterwheel

3.3. Pulse Width Modulation

Input influences the value of the Pulse Width Modulation and produces a positive pulse width to negative pulse width or vice versa in fixed signal frequencies. Total Pulse Width Modulation pulse period usually uses a positive pulse-to-pulse ratio. Magnet is an open circuit when given a high voltage for the rotation of the waterwheel and when the magnetic sensor is given a low voltage rotation of the water wheel stop At duty cycle = 0% and the resolution used is 8 bits then the value of the duty cycle is represented by the numbers 0 to 256 so that the value of PWM is 0. And Duty cycle = 0%. Thus, PWM = Duty Cycle x Large PWM resolution

PWM = 0% x 255
= 0 %.

V out = *Duty cycle* x V in
= 0% x 12 *Volt*
= 0 Volt(the waterwheel motor does not rotate)

If, Graph Duty Cycle> 0%.

If Duty Cycle =50%.

T = Total.

Sehingga, PWM = *Duty Cycle* x Besar resolusi PWM

PWM = 50% x 255
= 127.

At the duty cycle = 50% and the resolution used is 8 bits then the value of PWM is represented with the numbers 0 to 255 so that the resulting PWM value of 127. And Duty cycle = 50%

V out = Duty cycle x V in
= 50% x 12 Volt
= 6 *Volt* (spinning wheel motor)

3.4. Utilization of the Internet of Things

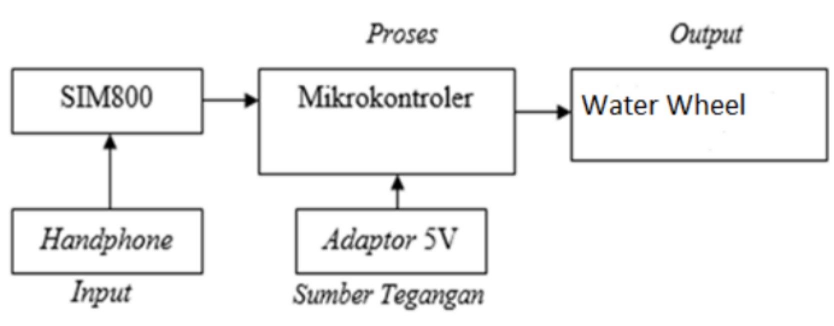

Figure.3.1 Block diagram Utilization of SIM800 and Microcontroller

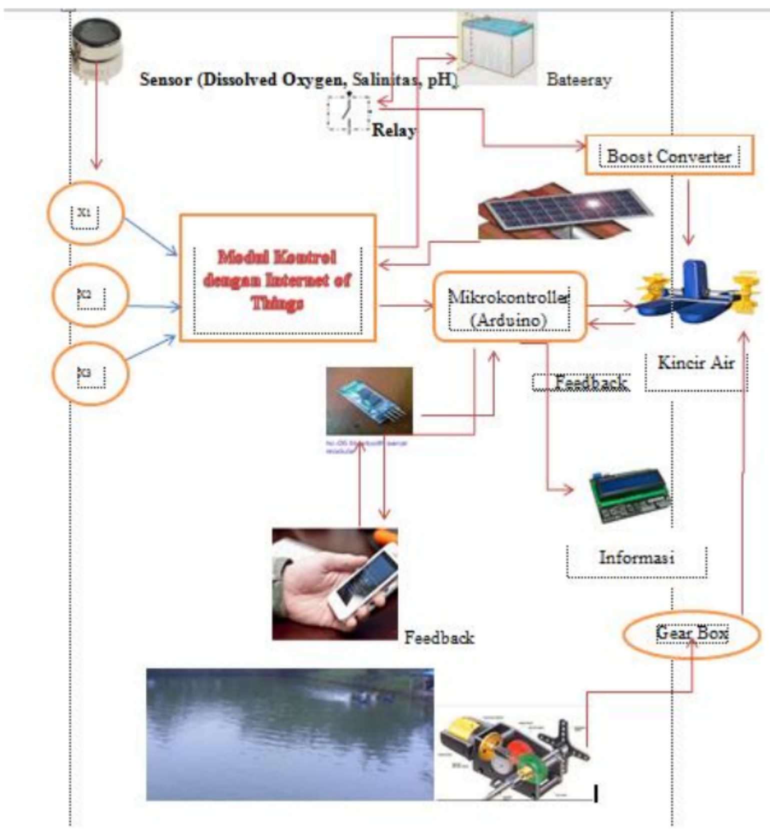

Figure.3.2 Block the waterwheel diagram with the Internet of Thing

4. Conclusion

The conclusions that can be taken in this research are as follows:

1) Internet Technology of Things (IoT) makes it easier to control the full duplex method to provide information on the Waterwheel so it is more practical, effective and efficient.
2) The system regulates several variables consisting of: water pH, water temperature, disoolved oxygen and salinity form a probability distribution that determines water quality and the movement of waterwheels.
3) The system is equipped with the rule of the mill whether it is moving or not and the probability level calculation determines the possibility of a moving waterwheel to improve the intelligence of the system in making decisions.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9