Wireless Sensor Network Data Communication and Information system to Regulate Water Volume and Turbine Rotation

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Abstract. The increasing need for electrical energy makes innovation in creating alternative energy is needed to help meet the needs of electrical energy that is more efficient and environmentally friendly. Therefore, the selection of water turbines as alternative energy because the cost of building hydropower is relatively low and environmentally friendly, making it a competitive source for renewable energy. Wireless Sensor Network (WSN) is a wireless network consisting of several sensor nodes that are individual that are used to monitor the condition of a place and can interact with its environment by means of sensing, controlling and communication to its physical parameters. The application of WSN to water turbines as a power plant is used to control and remotely monitor water turbines. So that it allows users to get maximum information and is real time without having to be in the sensor area. The programming used for this tool is the Basic Compiler AVR and Virtual Basic to display data in the form of graphs. Then the programming will be analyzed which has been entered at ATmega128 and ATmega8, which is programming to measure the height of the water tank and control the output of the tool.

Keywords: Artificial Intelligent, Basic Compiler, Electronic Device, Microcontroller, Embedded System, Visual Basic, Wireless Sensor Network

1. Introduction
Alternative energy resources have recently developed quite rapidly. This is because the need for energy use is now increasing. Innovation in creating alternative energy is needed to help meet the needs of electrical energy that is more efficient and environmentally friendly. Utilization of water turbines or hydropower is now very developed. The selection of water turbines is an alternative energy because the generator does not consume resources, unlike coal or gas plants.
Visual Basic is a programming language that offers an integrated Integrated Development Environment (IDE) to create software programs/applications based on Microsoft Windows operating systems based on GUI (Graphical User Interface). Application of Wireless Sensor Network in water turbine simulation is used to control and remote monitoring of water turbine simulations with Basic Compiler-AVR programming to run WSN functions and Microsoft Visual Basic[1], applications as interface media. So it is easier to monitor and control on the device in real time, and then it will then use communication between the transmitter and receiver antenna movements[2]. Therefore the author is interested in designing, making, and taking the title of this paper is "Wireless Sensor Network Data Communication and Information System to Regulate Water Volume and Turbine Rotation". Where in this paper will be discussed about how the communication process tools in the Client section according to how it works using Wireless service network.

2. Method

This paper to assist and drive water turbines with WSN technology, which will be determined by the sensor settings. So the system applied here is detecting, controlling/controlling remotely with WSN and the use of accelerometer sensors, so that the water turbine movement selection system can be selected well, then calculations will also be used using binary logic 0 and 1. Design and match the theories obtained in lectures, the internet and sharing with a number of sources trusted by the research team. This paper is method also uses empirical methods and security[3,4,5]. On one hand, WSNs enable new applications and thus new possible markets; on the other hand, the design is affected by several constraints that call for new paradigms [6], where this method will be used to calculate the data packet delivery from WSN, which is applied to the programming language, in the application of technology design of Wireless Communication is the efficiency to finish the task as follows[7] and Information Systems as Water Turbine Control, so that WSN will be controlled by the IoT command, and then to move the antenna, human robots will be used[8], for antenna design researchers will refer to previous studies as follows[9], printed yagi is used as an antenna element of the proposed MIMO antenna. In order to achieve low spatial correlation, cross-polarization arrangement between adjacent elements in proposed MIMO antenna is investigated to minimize coupling level. Numerical investigation has been conducted. The results show that the proposed antenna has cover large bandwidth around 5 GHz, from 4.54 GHz to 5.51 GHz with low return loss at 5 GHz.

This paper are interested in how to regulate the movement of water turbines with digital commands, so that the accelerometer sensor can quickly receive stimuli that can move the water turbine, otherwise it will be in line with the application of using IoT that supports industrial era 4.0. The technology applied is accelerometer sensor control technology on embedded systems, this control uses the algorithm of the program select and do (if .. then) with a condition, and the are method used by finding and collecting data about objects that will be made from scientific books, magazines, reports or other sources.

In wireless sensor network data communication[10] and information system to regulate water volume and turbine rotation, will be used to a block diagram of Water Turbine Simulation Interface and WSN Transceiver Diagram Blocks Simulation of Water Turbines, for more details can be shown in figure 1.
3. Current Result
The program that has been compiled is immediately downloaded to ATMega8 and the circuit will work according to program instructions. First the circuit will be activated through the Visual Basic application with the Command Interface on the Play button. When pump 1 is turned on, the appliance will work immediately, the water sensor will automatically move to detect parts of the water tank and the wireless HC-12 will send information on the server by marking the LCD display on the transmitter circuit, for more clearly, it can be seen in the results of scenario 1 and scenario 2, as below.

Figure 1. Block Diagram of Water Turbine Interface and WSN Transceiver Diagram Blocks Simulation of Water Turbines.
Scenario 1

This scenario is the judging from the results displayed by the visual basic application on the graph data shows a flat line when the pump is turned off, there are 3 colors of the graph in the dark green graph showing the height of the water sensor 1, the red color indicates the height of the water 2, when the pump is activated the graph will increase moving. This is because when the pump is turned on all sensors work according to the instructions in the program, for more details can be shown in the figure 2.

![Figure 2. Visual Basic application screen when the pump is off, the sample time is 50 ms](image)

Scenario 2

In test 1 test displays ADC graph 1. ADC 1 as water sensor in tank 1. When the water sensor detects the volume in the low, the graph is displayed as Figure 3, when the tank 1 contains water, the water will automatically flow down to drive the turbine. And the LED indicator on the circuit will turn on when the turbine output fills the battery, and visual basic application display computer screen when the pump has been activated.
Figure 3. Visual Basic 6.0 Application Display Computer Screen When the pump has been activated

4. Conclusion
The results for the sending and receiving information section using the HC-12 Wireless module with a frequency range of 432 MHz in the transmitter circuit and interface circuit. HC12 Wireless Transceiver that can receive information on the Master Controller device and can send requests to the microcontroller on the server device. In this subsystem there is an IC MAX232 as a converter that converts the RS232 level signal from the TTL level signal on the Wireless HC12 module to become data communication that can be displayed on the computer. So that the interface from the device to the laptop uses the Visual Basic programming language that has been translated by IC MAX232. The application will be run the control tool where if we activate the interface this will mark the application running, then if if pressing the ON button on pump 1 then the pump will immediately charge from drum 1 to drum 2 the water sensor will work immediately and the value for the part setting the volume of water will immediately appear in the log section in the visual basic application.

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