Automation Design of Kentongan Sound for The Feeding Process of Vaname Shrimp Farming in Pond

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Abstract. Feeding on vanamei shrimp culture in ponds is carried out on average 4 to 5 times a day. In aquaculture activities with a large number of ponds, the sound of kentongan becomes a time reference for the operator in providing feed. The purpose of this article was to describe the process required to turn the kentongan sound into a command input for an automatic feeder. The sound of kentongan will be used as input data (commands) for the microcontroller is translated as a command for the feeder to carry out its activities of feeding. The methodology used the following points: first, field observations of the use of kentongan sounds as a sign of the feeding process for feed operators; second, literature study covering sound frequency and sensor system; third, the creation of a chart in the form of step by step logic from input in the form of kentongan sounds to the process of feeding using an automatic feeding device; fourth, the design of the hardware that will be used and the creation of the software in the form of a command flow chart. The result was realized in the form of a chart from input in the form of kentongan sounds to the process of feeding using an automatic feeder. This includes hardware and software design. There were two important things in automation design. The identification process of kentongan sounds becomes a function of frequency against time, where this frequency had certain characteristics which were expressed by graphs that have certain equation values. This kentongan sound with a certain frequency will be the input for the microcontroller to carry out its task of giving orders to the feeding device to provide feed for vanamei shrimp in ponds.

1. Introduction

The sound of the kentongan will be used as a frequency versus time graph by MATLAB, through an artificial neural network (ANN) with the back propagation method. By using an artificial neural network, the sound of the kentongan will be recorded then this sound will be captured into a frequency signal against time, within a certain time span, it will fulfill a frequency function against time to form a graph, this function will be stored by MATLAB, so that when the kentongan sound is sounded and forming the same frequency function as the graph, it will be the output that will command the feeder to work. In this paper, the author will show how to catch the sound of the kentongan as a command to feed the automatic feeder.
MATLAB is an integrated tool for technical computing, computation and visualization, for example: mathematics and computation, algorithm development, data acquisition, modeling, simulation, and prototyping, data analysis, exploration, visualization, scientific and engineering graphics, application development, including the development of graphical user interfaces. MATLAB stands for MATrix LABoratory, this application is suitable for matrix manipulation and problem solving related to Linear Algebra.[1]

The voice capture system in this automation design begins with taking voice signals directly using a microphone to the Personal Computer and the file is saved in wav format.

![Figure 1. The process of transforming sound into a frequency graph against time, with the MATLAB program. [2]](image)

After that, the frequency form and so on can be seen from the visualization seen in the application system that has been designed. The process of transforming sound into a graph of frequency against time is carried out by Fast Fourier Transform through MATLAB using the artificial neural network (ANN) method. After taking the voice signal through the microphone, in the computer CPU the sound is converted into digital sound and processed by the MATLAB application system so that the frequency signal is displayed on the Graphical User Interface, as shown in Figure 1.

2. Materials and Methods

The methodology used includes the following points:

a) Field observations of the use of kentongan sounds as a sign of the feeding process for feed operators;

b) Literature study covers sound frequency and sensor system;

c) Creating a flow of commands in the form of a chart in the form of step-by-step logic from input in the form of kentongan sounds to the process of feeding using an automatic feeding device;

d) The design of the hardware to be used and the creation of the software in the form of a command flow chart.

2.1. Hardware Used In Creating Automated Drum Sounds

The sound of the kentongan which has been transformed into a function of frequency against time, this will later be used as input for the microcontroller as a command for the shrimp feeder to work on its duties. The hardware used in making the Automation of the sound of kentongan for the feeding process is a Microcontroller, Sound Sensor, Transmitter and Receiver, Relay, Liquid Crystal Display (LCD), Database, Transducer (feeding device).

Microcontroller

Microcontroller is a digital electronic device in the form of an integrated circuit that can receive input signals, process them and provide output signals that are controlled by programs that can be written and erased specifically. [3] A microcontroller is basically a computer on a single chip, which includes a microprocessor, memory, input/output (I/O) lines and other complementary devices. One type of AVR family microcontroller (Alf and Vegard's Risc Processor) produced by Atmel Corporation

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because this microcontroller has attractive features and complete facilities and is easy to obtain and relatively cheap in price. This microcontroller includes an 8-bit vCMOS series microcontroller made by Atmel which has low power in operation and is based on the Reduced Instruction Set Computer (RISC) architecture. [3] Nearly all instructions are executed in one clock cycle, and can reach 1 MIPS per MHz, so designers can optimize low power usage at high speeds. This microcontroller has 32 general purpose registers, flexible timer / counter with compare mode, internal and external interrupts, Universal Asynchronous Receiver-Transmitter (UART) serial, programmable Watchdog Timer, and power saving mode. It has an internal Analog To Digital Converter (ADC) and Pulse Width Modulation (PWM), and has an on-chip In-System Programmable Flash that allows program memory to be reprogrammed in the system using a Serial Peripheral Interface (SPI) connection. [3]

![Figure 2. Example of Microcontroller Atmega 8535.](image)

**Sound Sensor**
The sound sensor is a sensor module that senses the amount of sound to be converted into electrical quantities that will be processed by the microcontroller. This module works on the principle of the power of incoming sound waves. Where the sound waves hit the sensor membrane, which has an effect on the vibration of the sensor membrane. And on the membrane there is a small coil that can generate electricity. The speed at which the membrane moves will also determine the size of the electrical power that will be generated. The main component for this sensor is a condeser mic as a receiver for the size of the incoming sound. [4]

**Transmitters and Receivers**
Transmitter is the part that is connected to the input circuit or control circuit. In this section there is an infrared Light Emitting Diode (LED) (IR LED) which functions to transmit signals to the receiver. [5] When compared to using ordinary LEDs, infrared LEDs have resistance to visible signals.

The receiver is the part that is connected to the output circuit or load circuit, and contains a component that receives the light emitted by the transmitter. This light-receiving component can be a photodiode or phototransistor. [5]

**Relay**
Relay is an electrical equipment that functions as a switch, the relay works when the relay coil is given a voltage or current. When the coil is given a current, the coil core will become a magnet which then attracts the connecting contacts on the relay.

In the relay there are two different contacts, namely normally open (NO) and normally closed (NC) contacts. When the coil coil has not been given a current, the NO contact state will open and when the coil coil is given a NO contact current will be connected. For Normaly Close (NC) contacts when the coil coil has not been given a current, the NC contact has not been connected and when the coil is energized, the NC contact becomes connected.
Liquid Crystal Display (LCD)

LCD is a type of display that uses Liquid Crystal as a reflection medium. [3] LCD is also often used in the design of tools that use a microcontroller. LCD can function to display a sensor result value or display a menu on a microcontroller application that depends on the commands written on the microcontroller.

Databases

The development of automation technology is the main support for decision making in modern organizations. In this case, the application of computer technology has marked a civilizational revolution that allows jobs within organizations to be completed quickly, accurately and efficiently. The main issue concerning information for organizations is how to use the information in various forms for the benefit of the organization and the management of information that is beneficial to the organization. Information is data that has been processed with a certain model, useful and meaningful to the recipient. By looking at various phenomena regarding the effective and efficient use of information in organizations, it is necessary to understand data processing systems that are supported by computers and other automation devices.

![Database Management System](image)

**Figure 3.** Database Management System. [6]

A database system is a system consisting of a collection of interconnected files (tables) (in a database under a computer system) and a set of Database Management System (DBMS) programs that allow multiple users and/or other programs to access and manipulate files. [6] Database management system is shown in figure 3.

Transducer

A transducer is a device that can convert one form of energy into another form of energy. These forms of energy include electrical energy, mechanical energy, electromagnetic energy, light energy, chemical energy, acoustic energy (sound) and heat energy. In general, all devices that can convert or convert one energy into another can be referred to as a Transducer. [7][8]

2.2. Design of Automatic Feeding Equipment Using Sound of Kentongan

In designing the design of an automatic feeding device using a kentongan sound, the primary data that is owned is the sound of the kentongan. The steps for designing the design of an automatic feeder using a gong sound are as follows:

1. Using kentongan sound, the sound of the kentongan is recorded, then converted into a frequency with respect to time, producing a function of frequency against time (noise is removed) meaning that
by taking the characteristic sound of the kentongan one can recognize the sound of the kentongan, this phenomenon is presented through a graph in MATLAB, a graph of the frequency function against time which has a certain equation that is presented through MATLAB.

With the back propagation method, with the input of the kentongan sound then stored as data, this output can instruct the microcontroller to work, in short when the sensor from the microcontroller catches the sound of the kentongan which has the same equation as the one that has been recorded into a data base, the microcontroller will instruct the feeder to work. or do their job. Defining problems related to the points to be automated:

- Automation of input kentongan sound captured by the sensor which is the result that has been defined into a command, which has been processed by MATLAB.
- Automation of the command output from MATLAB becomes a command for the microcontroller to run the feeder to do its job.

Designing automation systems:

- Automation of input kentongan sound captured by the sensor which is the result that has been defined into a command, which has been processed by MATLAB.
- Automation of the command output from MATLAB becomes a command for the microcontroller to run the feeder to do its job.

3. Results and Discussion

3.1. Sound of Kentongan as Input Data

At this stage is the initial stage before entering the automation design process, one important point is to make input in the form of a kentongan sound which is transformed into a frequency function against time which is expressed in graphic form, each sound has certain characteristics, in this case it is expressed in the form of a function graph as shown in Figure 4.

![Figure 4](Source: Personal Documentation).

3.2. The process of automating the sound of kentongan becomes a command for the microcontroller to move the shrimp feeder

At this stage, what is automated is the sound of the kentongan with a frequency function against time as input and then captured by the sound sensor and then transmitted to the microcontroller, in the microcontroller the voice input is processed whether it matches the frequency in the database or not,
Figure 5. Work System Design of the automation of kentongan sounds in the process of feeding vanamei shrimp in ponds (Source: Personal Documentation).

If appropriate, it will be forwarded as a command to run the feeder through the receiver to receive instructions from the microcontroller and will turn on the transducer with the relay. This illustration is depicted in figure 5 above.

3.3. Hardware design for automation of the sound of kentongan

3.3.1. Input circuits
The input circuit is a series of sound sensors that will receive input in the form of sound from outside. This input sound will be transmitted to the microcontroller which will then be processed. (Figure 6).

Figure 6. Input circuit design on the Microcontroller (Source: Personal Documentation).

3.3.2. Controller circuit
This controller circuit uses the Atmega 8535 microcontroller which has a feature of reading the input value sent by the input circuit shown in Figure 7. The pin used on this Atmega 8535 as input is pin A, which is the pin for the ADC, and the output pin is pin B for the driver, on the transducer. While Pin D is used for the LCD to display the status of the feeder working or not.
3.3.3. LCD Circuit
LCD is used to display the data contained in the microcontroller (Figure 8). The LCD will display the status of the shrimp feeder in working condition or not.

3.3.4. Transducer Circuit
The transducer is used to forward the output from the microcontroller in the form of a command to run the feeder to do its job, namely to carry out activities to provide feed to the vanamei shrimp pond. In this circuit, the output of the microcontroller is received by the receiver then the relay will turn on the transducer and then the feeder will actively work (Figure 9).

3.4 Programming
The software used to program the microcontroller uses the C programming language on the Code Vision AVR software. The steps in making the program can be seen in Figure 10.
4. Conclusion
The kentongan sound can be used as a command input for the microcontroller to drive an automatic feeding device. This includes hardware and software design. There were two things that are important in the design of the automation of kentongan sounds in the feeding process for vanamei shrimp in ponds: first, the process of identifying the sound of kentongan becomes a function of frequency against time, where this frequency had certain characteristics which was expressed by graphs that have certain equation values; second, this kentongan sound with a certain frequency will be the input for the microcontroller to carry out its task of giving orders to the transducer (feeding device) to do its job of providing feed for vanamei shrimp in ponds.

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