

# REAL TIME FISHPOND MONITORING TO OPTIMIZE A NURSERY FRESHWATER WITH DISTRIBUTION DATABASE

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## ABSTRACT

*The aim of my research is to optimize a nursery freshwater by fishpond monitoring that can be displayed on desktop base so the behavior of fish with fishpond condition can be observed how suitable fish against fishpond where a nursery is affected by the place, the media and the condition. The data were drawn on monitoring is temperature and humidity by more than one sensor taken using one microprocessor. Using temperature sensor to get data condition in fishpond, data from fishpond is processed by microcontroller as an input and sent to desktop to display then distributed on database for data record in real time asynchronous serial communication between PC and microcontroller. Getting ideal condition is the goal of this device, because real time data communication if something wrong or not suitable on media, the fishpond condition can be handled directly by fitting the volume of fish or the condition of water. 28-30°C is ideal temperature condition for seedling that influence the appetite of the fish. By using realtime database distribution methodology, The influence of fish quantity and nursery media can be observed and fish behavioral can be recorded every season.*

**Keywords:** fishpond monitoring, distributed database, serial communication, freshwater fish

## 1. INTRODUCTION

Fishpond monitoring using sensor as indicators biological requires an understanding of the state of pollution of waters, choice of bio-indicators, physiological and behavioral endpoints of fish and principles of the methodology and their potential applications. Here, we discuss monitoring, vision-based monitoring on micro and desktop information application. Water quality monitoring is also essential to meet international regulations that want to assure fish quality and farming conditions. Fish farms facilities can demonstrate that companies have implemented new systems that will put them in much better commercial positions than others that are still working in a traditional way.

Many type of freshwater fish that have a typical behavior in the growth of their life. For example catfish having various types and having different way in their growth. But generally freshwater fish have an ideal condition in growing like a temperature of the water, a density of fish, water contain. With this system, the farmers will know directly the Changes that occurred during the process of enlargement and data monitored can be stored on database so behavioral record each season can be known.

Realtime monitoring can help farmer determining the provision of the amount of fish in the media or fishpond, configuring water temperature by adding sodium ion (Na), magnesium (Mg) and calcium (Ca) to protect from high temperature. The desktop information had a notification on the display monitor that build by Delphi software and distributed access databases through serial interface between micro and computer.

## 2. LITERATURE REVIEW

Growing fish influenced by internal and external factor. Internal factor like the condition of temperature that affected by sun intensity, climate, disease, plankton density and the external condition can be caused by flood, rainfall, pollution. Freshwater fish cultivation, harvest generally occurs three times a year. Various research done by monitoring system on farm To see the behavior of animals on enlargement system. With knowing the characteristic each of fish so the farmer will know when the right time to plant, choose what the right type of freshwater fish, amount of fish that be planted. Monitoring system is design a system that can give feedback when the program was do their function [1].

Good or bad condition of growing fish is affected by temperature where the increasing the temperature will cause the solubility of oxygen in declining of water [2]. The changes of temperature affect at fish respiration and the respiration of the fish contacting directly with the response of feeding.

Table 1 The influence of temperature to fish appetite

Temperature (Celcius)	Response on feed
Nearing point of frozen	Critical condition, minimum response
8-10	low response
15	Response reduced
22	50 % Optimal
28-30	Optimum response
33	50 % Optimal
35	Response reduced
36-38	low response
38-42	Critical condition, minimum response

Have two condition in table 1, the first condition when the temperature under 28<sup>0</sup>C and the second condition when the temperature above 30<sup>0</sup>C. Both of condition had difference influence at fish. Under 28<sup>0</sup>C the water more cold that can cause fish less aggressive on movement and a fungus disease can appear, fishpond bacteria easily growth rapidly because encouragement of residual feed. at 30<sup>0</sup>C above, plankton more easily growth so less oxygen be get by the fish and the fish have low response on feeding because smell sensory in pressure condition.

Quickly addition long larvae in the early phases of is up to speed absorption egg yolks .This water temperature that is too low can resulted in the process of metabolism to be slow this can be impact on growth rate fish larvae will be growing slow[3]. The rate of absorption egg yolks increase in line with the improvement temperature .Temperature affect survival rate of the larvae significantly [4].

Automation control system research had done on the cultivation of Patin fish with using automation temperature condition [5], PH and clarity water environment by monitoring system with parameter reference. The result have error average 1,477% PH, 0,688% Temperature and 5,62% water clarity. No distribution database in this system but have reference control.

Real time monitoring research base on web done in cloud with real time getting data and then stored the data via cloud computing [6]. But the application not low cost system because there need IP public server, internet network communication, farmer that known internet technology, dedicated network and village area in developing countries difficult to do. It like in the system that was proposed, the different in offline distribution data record.

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### 3. METHODOLOGY

Methodology that been chosen to develop this system is Waterfall

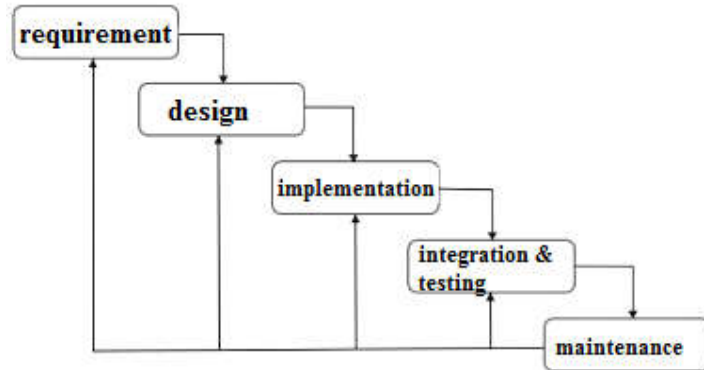


Figure 1. waterfall method [7]

This method was used in software side. Requirement is the part to prepare what software that been need to integrate the hardware so the plant can work as designated. Using basic compiler that can be integrated on AVR and implementing on the function of processing ADC, serial communication sending data to computer, displaying data on LCD module, determine parameter on wanted condition. Design is what structure program used in determine the function of plant like looping at one sensor that attached at the edge of fishpond or determine of conditional structure program. Implementation is the state where after the program compiling, the hex format embed on microcontroller by Proteus software simulator if running on the right task, the software were ready to be implemented on the hardware. Integration and testing is the state to integrate software with hardware minimum system by software downloader and running the function with giving the power to test the response function of the system. Maintenance is the state that how the software handled the error or bug on feedback parameter that determined or using system reset by software or hardware.

#### Blok diagram system

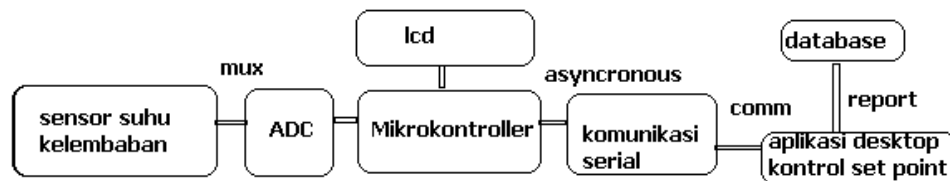


Figure 2. blok diagram system monitoring fishpond optimization

The part of the system has a functional task that will be an embedded system monitoring. Temperature and humidity sensor there are 2 kind of sensor. LM35 is a temperature sensor that used to get temperature data. It analogous so needed ADC component to conversion the signal. Pin Vout is Analogue signal has produced from LM35 and must be connected to ADC as an input pin ADC. LM35 has operating temperature range on -40 to 110°C, 10mV/°C. using DHT 11 to get humidity and temperature parameter, This DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity sensor complex. Its technology ensures the high reliability and excellent long-term stability. A high-performance 8-bit microcontroller is connected. This sensor includes a resistive element and a sense of wet NTC temperature measuring devices.



The design of equation and implementation on ADC process were places on microcontroller facilities that the output Vin connected to ADC0 pin on the ATmega8535 pin chip. The code that show the getting temperature sensor is

```
Data_adc = Getadc(0)
    Suhu = Data_adc * 5
    Suhu = Suhu / 10
```

Data\_adc from pin ADC0 then suhu or Vin was taken from multiplying between data\_adc and Vref.

The result of testing temperature sensor with 5 Vdc supply and Vref, using avometer to get the output value of the sensor and adc. The range temperature measured at 27-31°C where the range of this is the ideal temperature for the growth of fish.

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Tabel 2 the result of temperature sensor and ADC process

Suhu (°C)	Vout Sensor Suhu (mV)	Output Biner ADC (Vref = 252 mV)
27	266	1110 0001
28	276	0011 0001
29	285	1000 1001
30	295	0110 1001
31	305	1101 1001

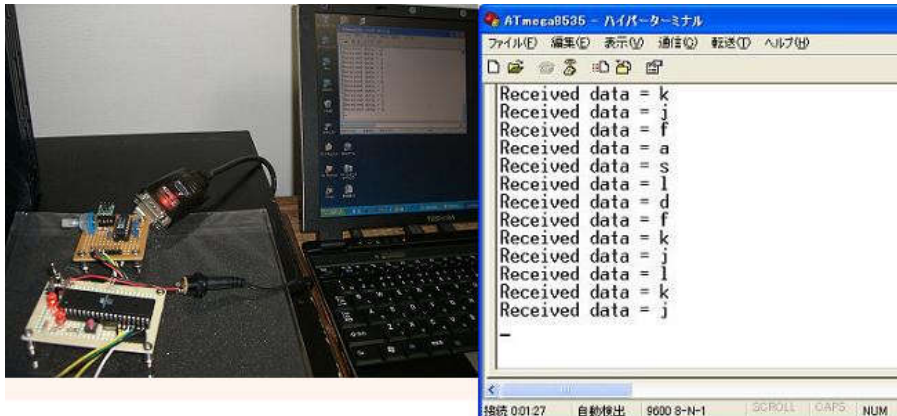
Tabel 3 error percentage of temperature sensor at ADC

Suhu (°C)	Vout Sensor Suhu (mV)	% error
27	266	1.5
28	276	1.4
29	285	1.7
30	295	1.7
31	305	1.7

The analyze are:

- According to datasheet, temperature sensor have  $V_{out} \pm 10 \text{ mV}/^\circ\text{C}$ . If temperature maximum set  $51 \text{ }^\circ\text{C}$  so analog input maximum is  $\pm 510 \text{ mV}$  and  $V_{ref} = \pm 255 \text{ mV}$ . While the results of testing above shows vref set 252 mv to get results conversion approaching same to a thermometer. This value relatively in accordance with tolerance of censorship temperatures give range  $V_{out} \pm 10 \text{ mV}/^\circ\text{C}$
- The results of testing shows changes in output sensors temperatures near linear every  $^\circ\text{C} (\pm 10 \text{ mV}/^\circ\text{C})$ .
- Any position digits on output binary adc with  $V_{ref} = \pm 255 \text{ mv}$  have binary weight as follows  $\frac{2^1}{5}, \frac{2^2}{5}, \frac{2^3}{5}, \frac{2^4}{5}, \frac{2^5}{5}, \frac{2^6}{5}, \frac{2^7}{5}$  <sub>msb</sub>
- So the binary weight of ADC output are <sub>lsb</sub> 0,2; 0,4; 0,8; 1,6; 3,2; 6,4; 12,8; 25,6 <sub>msb</sub>  
 So the result of ADC conversion changes every  $\pm 0,2 \text{ }^\circ\text{C}$ .
- With the average error 1,6 and the datasheet have accuracy  $0.5^\circ\text{C}$ , Vref 252 is the ideal value.

The output on microcontroller sent to pc through serial communication by Tx pin atmega8535 with baudrate 9600 that connected to Rx pin PC



Picture 5 serial test communication with hyperterminal

On Delphi GUI used as receiver from micro get signal from micro by serial communication with activate pin receiver (Rx), the procedure used comport library is *procedure TForm1.ComPort1RxChar(Sender: TObject; Count: Integer);*

```
var  
Str: String;  
cek:string;  
P1,P2,P3:integer;  
T,H,i:integer;  
begin  
ComPort1.ReadStr(Str,Count);  
in_daq:=in_daq+str;  
cek:=rightstr(in_daq,1);
```

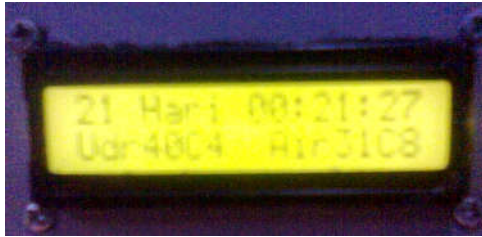
comport read string , get the value of the sensor with realtime receiving data. Serial communication or using USART serial communication, UBBR contents of the UBRRH and UBRL. If baudrate get 9600 and Xtal used 11059200, the value of UBBR is:

$$UBRR = ((11.59200)/(16*9600)) - 1 = 71.$$

This value ubrr is 71 or 0047h . ( in the form of 16 bit hex ) . Writing value ubrr in a program ( to in register ubrrh and ubrl ) becomes:

```
UBRRH=0x00;  
UBRRL=0x47;
```

Chosen of XTal. Value ubrr is an integer, so select xtal frequency that produce calculation integer. If Xtal 1159200 replace with 8 mhz baudrate 9600. This value ubrr is 51,0833 the value on ubrr is 51 . This value will generating possible communication error of 0.2 % . While if using xtal 11.059200 erornya 0 % .At LCD LM016 panel information is a module that can display directly from the result of microcontroller system. The information that showed on LCD panel are the temperature, the time and the day counter. Using 4bit data connected to portC ATmega as an output device with 2 line information character 16\*2.



*Picture 6 LCD LM16 display monitoring*

## **CONCLUSION**

The system can get the value of ideal condition at fishpond, with affected by the amount of fish and the variety of fish, the condition of fishpond changes every time. Like 500 seeds Dumbo catfish cannot grow normally on pond that having volume 3m<sup>3</sup> in contrast to Sangkuriang Catfish that still grow normally until 2 month long. At a Dumbo Catfish after 3 weeks the pond temperature will reduce significantly, response to feed reduce, aggressivity reduce and illness. At this condition after the farmer getting the information from this monitoring device they must be stabilize the condition of pond. Similarly at the other kinds of fish. Using multi sensor every pond, it use enough ADC internal atmega8535 that have 7ADC at port A. all the sensor placed at pond to monitor the condition every time, the plant can adding buzzer to notify if the ideal condition of pond out of range.

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