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Intelligent Fishcarelab System (IFS) for Remote Monitoring of Koi Fish Farming System

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Abstract

Intelligent Fishcarelab System (IFS) is designed as online monitoring fish farming system. IFS hardware consists of mechanical and electronic systems. Mechanical system consists of water tanks and piping systems. While the electronic system comprises sensors temperature, pH and Dissolve Oxygen (DO). These sensors include signal conditioning circuit. Furthermore, by using Analog to Digital Converter (ADC) module the data can be read by the microcontroller circuit. Microcontroller circuit is assigned to conduct sensor readings and sends data to the server to inform water conditions. IFS in the operating system hardware requires microcontroller-based software and web-based software for monitoring water quality and feeding automatically and scheduled. Furthermore, this system apart can work directly in the area of fish farming can also be monitored remotely using an Internet connection.

Keywords: fishcarelab, IFSb, intelligent, internet, koi fish, monitoring

INTRODUCTION

Indonesia is the waters that have a wide range of diverse species of fish, some of which have fairly high selling value. One of them is the koi fish (*Cyprinus carpio*) is one potential ornamental fish are cultivated in Indonesia. Koi have an interesting characteristic colors and variation types are diverse. Broadly speaking koi fish are classified into 13 categories: Kohaku, Sanke, Showa, Bekko, Utsurimono, Asagi, Shusui, Tancho, Hikari, Koromo, Ogon, Kinginrin, and Kawarimono (Effendy, 1993; lasiola, 1995). Koi fish, including freshwater fish species with high economic value, both in the national and international market, so many fans of fish in Indonesia are keen to keep this fish.

Seeing the market prospects are quite high and promising the koi fish business seems to be getting a high enough profit. However, to produce a high enough profit is required fingerlings were superior. It is therefore necessary to have the knowledge, skills, soft skills and insights are high on maintenance and breeding koi.

Several studies of fish farming has also been carried out by researchers. The research primary results found the relationship between fish growth and water quality in which fishes are farmed (Xu & Chen, 2014; Diestre et al., 2014). Other research presented empirical modeling techniques based on collection of water quality monitoring data (Chang & Vannah, 2013b). Besides that, comparison of the utilization ratio of Genetic Programming (Genetic Programming) and Artificial Neural Network (ANN) was used to predict the long-distance water quality based on the image of water (Chang & Vannah, 2013a). Meanwhile, the results of other studies presented a good chance or a very promising prospect for supplier business of fish feed for the fishing industry (Junge, 2014).

There also research that produced aquaponics farming technique in confined space (indoor) automatically. Aquaponics is the integration of hydroponics (plant / vegetable production without soil) and aquaculture (fish farming) (Saaid et al., 2013). On the other hand fish farming itself as an attempt to get a higher income has also

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attracted people attention. Freshwater fisheries business has excellent prospects because until now fish supply, either fresh fish or processed one, is still lower than consumer demand (Shepherd & Jackson, 2013).

METHODS

The proposed monitoring system design as a remote Internet-based fish monitoring system is illustrated in Figure-1. Water from an underground reservoir will stop automatically if Elevation Level reaches a certain level. Water levels are known through the Level Sensor (Bhacelor) readings. Other sensors utilized to monitor the quality of water are a Temperature Sensor (Master degree), pH Sensor (doctoral) and Dissolve Oxygen (DO) Sensor (S4). Sensors readings are then amplified or conditioned using signal conditioning circuit module. Furthermore, by using the analog to digital converter circuit or Analog to Digital Converter (ADC) signal conditioning circuit module data readings can be read by the microcontroller circuit. Furthermore, the microcontroller circuit module is assigned to conduct the reading of the output signal conditioning circuit module and transmits the data to the server. Server works based on pond water quality monitoring program. The server is also responsible of feeding the fish according to the ideal fish growth standard.

Microcontroller is equipped with actuator module and Electric Valve (V1) to control the distribution of water into the pond. It is also equipped with Electric Valve (V3) to regulate the discharge of water for the replacement of pond water. Microcontroller is equipped with Regulator Module (P1, P2) for regulating water conditions (temperature and pH) as needed. Temperature, pH and Dissolve Oxygen (DO) settings are required so that Koi fish has ideal environment for its growth. The microcontroller also features an actuator module for regulating fish feeding as needed. Open and close the faucet of food reserves by turn on and off the Electric Valve (V2). Furthermore, using web-based program data readings can be displayed.

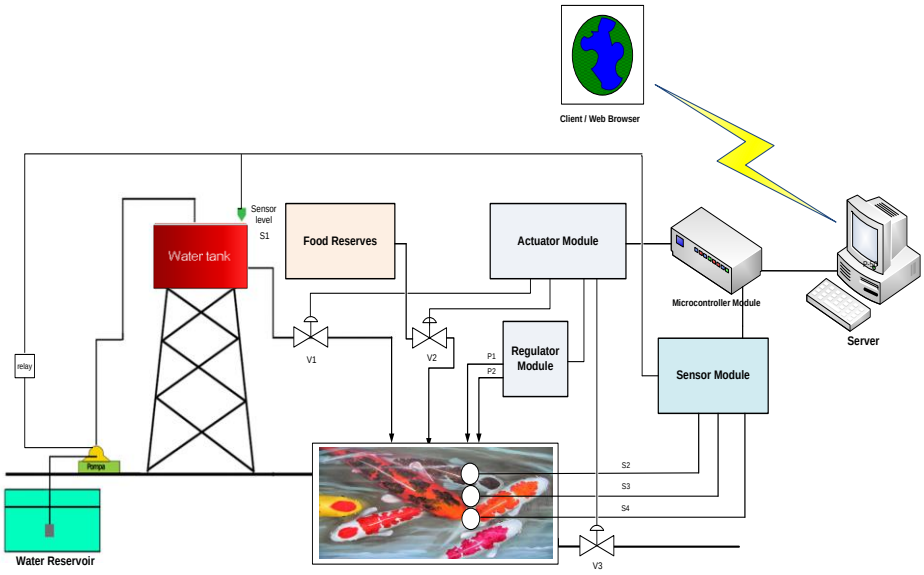

Figure 1. Intelligent Fishcarelab System (IFS) architecture

Overview pond which is designed as a space where the fish farming fish are monitored its growth, including water quality such as temperature, pH, and DO shown in Figure 2.

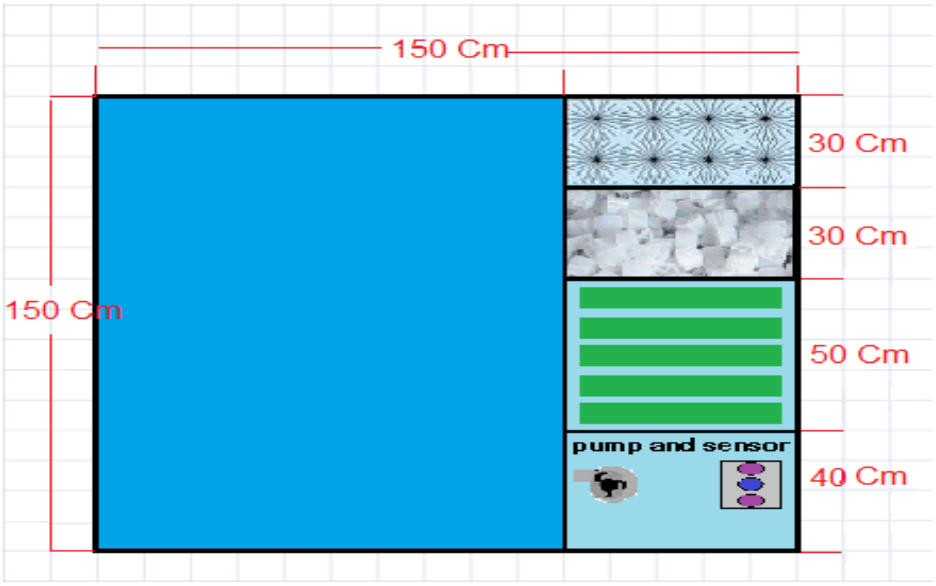

Figure 2. Intelligent fishcarelab system (IFS) pond design

Overview of a food reserves design which the feeding supply is regulated and scheduled automatically as required by the fish according to its age is shown in Figure 3.

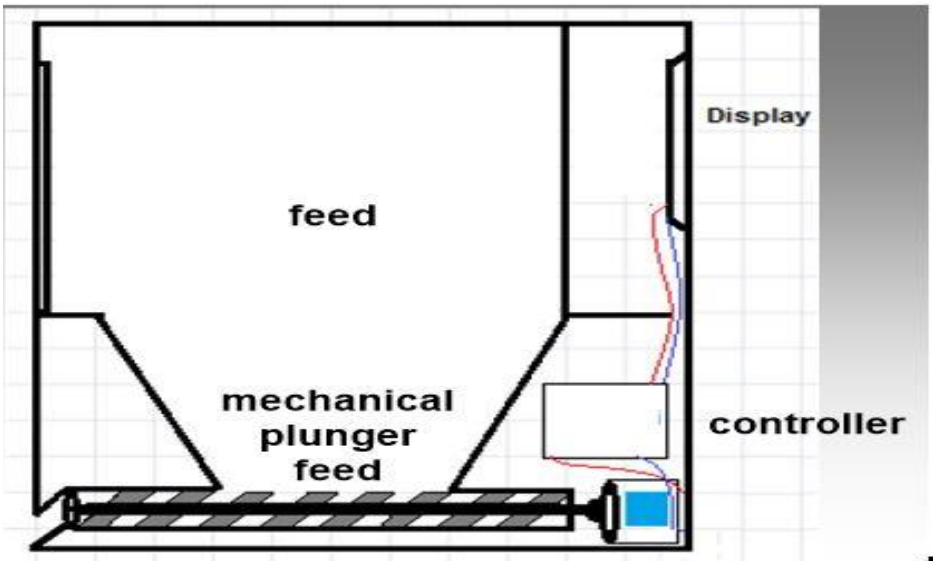

Figure 3. AutoFeeder design

The Supporting Electronic Module (Relay) as a module supporting the system, among others, as shown in Figure 4.

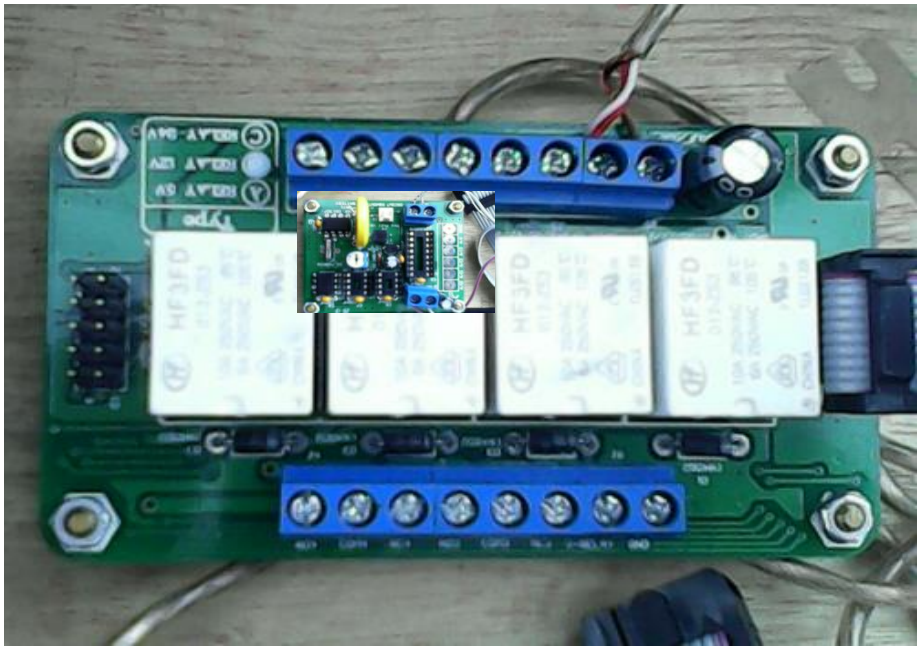

Figure 4. Electronic support module (relay)

The Power Supply Module as the supporting electronic modules of the system is shown in Figure 5.

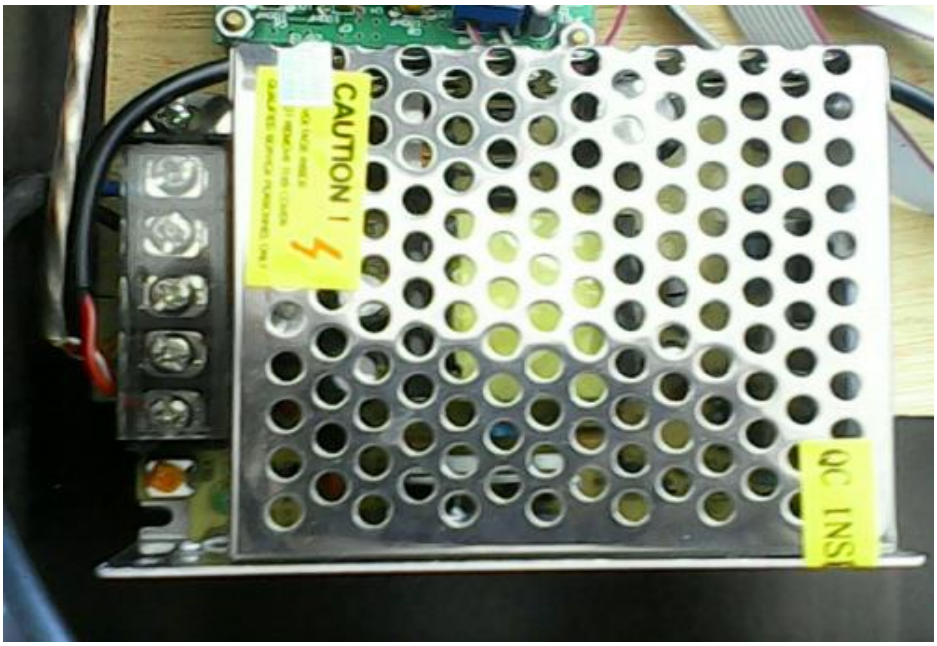

Figure 5. Electronic support module (power supply)

Real Time Clock (RTC module) as Microcontroller support system shown in Figure 6

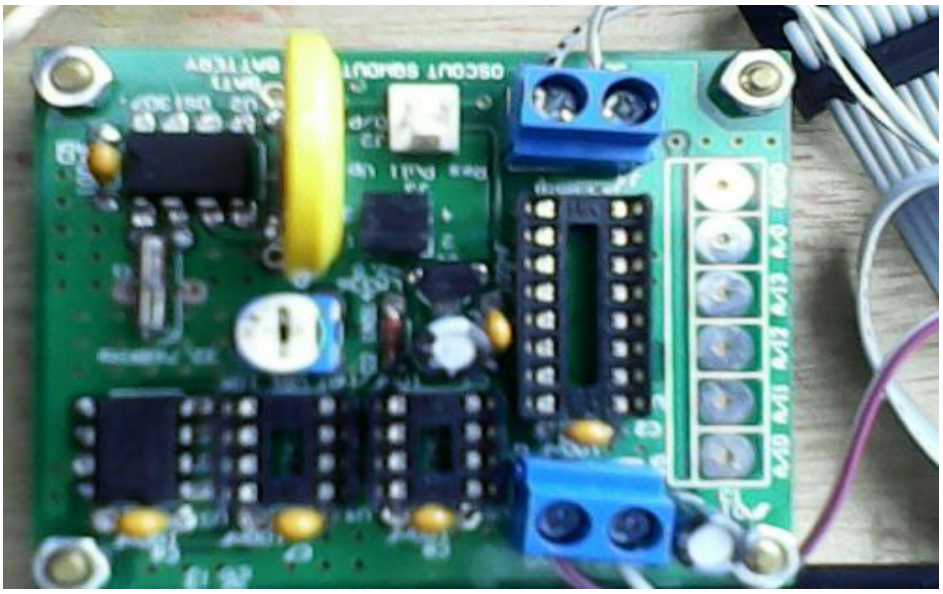

Figure 6. RTC module (microcontroller support)

The microcontroller module as the main controlling brain of the system is shown in Figure 7.

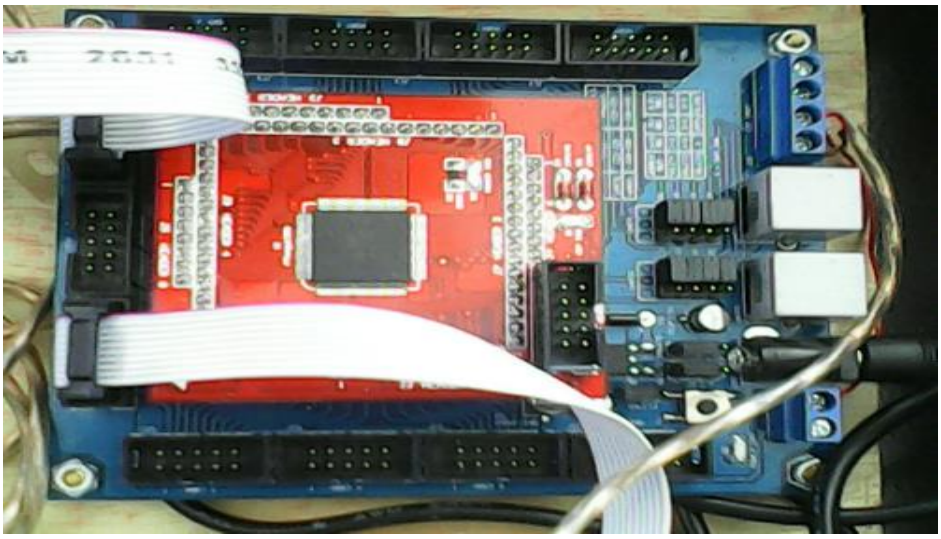

Figure 7. Microcontroller module

RESULT AND DISCUSSION

The results of this research are shown in the following figures. Realization of the pond which is designed as space where the fish farming are monitored its growth, including water quality such as temperature, pH and DO, shown in Figure 8.

Figure 8. IFS koi fish pond

Realization of Auto Feeder Module as the food reserves which the feeding supply is regulated and scheduled automatically as required by the fish according to its age is shown in Figure 9.

Figure 9. Auto feeder module settings

IFS as online koi fish growth monitoring system has been tested for koi fish cultivation shown in Figure 10. Looked two koi fish swimming occupy its new home.

Figure 10. Trial of koi fish cultivation

From the monitoring testing results of the temperature, pH and DO water quality of pond koi fish cultivation obtained from sensor readings is shown in Table 1.

Table 1. Water quality monitoring results

Temperature (^{o}C)	pH	DO (mg O_2/L)
27.87	8.2	2.35
27.87	8.2	2.35
27.87	8.17	2.35
27.81	8.17	2.35
27.81	8.16	2.35
27.81	8.16	2.35
27.75	8.16	2.35
27.75	6.98	2.35
27.69	6.98	2.35
27.69	6.98	2.35

CONCLUSION

Intelligent Fishcarelab System (IFS) is designed as online monitoring fish farming system. IFS hardware consists of mechanical and electronic systems. IFS software consists of microcontroller-based and web-based programming. From the monitoring testing result, it can display temperature, pH and DO water. It can be concluded that IFS can be used as an alternative for koi fish pond water quality monitoring system.

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REFERENCES

Lasiola, G, C. (1995). Koi: everything about selection, care, nutrition, diseases, breeding, pond design and maintenance, and popular aquatic plants. book, Barron's Educational Series.

Chang, N. B. & Vannah, B. (2013a). Comparative data fusion between genetic programing and neural network models for remote sensing images of water quality monitoring. *2013 IEEE International Conference on systems, man, and cybernetics (*SMC*),* 1046–1051.

Chang, N. B & Vannah, B. (2013b). Intercomparisons between empirical models with data fusion techniques for monitoring water quality in a large lake. *2013 10th IEEE International Conference on Networking, Sensing and Control (ICNSC)*, 258–263.

Diestre, R. E. I., Izcara, Z. J., Sanz, P. F., Rojas, C. J. A., Vazquez, C. M. A., Nunez, N. J. (2014). Soil ecotoxicity of natural ester transformer liquids. *2014 IEEE 18th International Conference on Dielectric Liquids (ICDL),* 1-4.

Effendy, H. (1993). *Mengenal Beberapa Jenis Koi*. book, Kanisius.

Junge, G. H. (2014). Creating value through supplier development: The case of a fish feed supplier to the aquaculture industry. 2014 *International Conference on Collaboration Technologies and Systems (CTS)*, 244–251.

Saaid, M. F., Fadhil, N. S. M., Ali M, S. A. M., Noor M, Z. H. (2013) Automated indoor Aquaponic cultivation technique. *2013 IEEE 3rd International Conference on System Engineering and Technology (ICSET),* 285-289.

Shepherd, C. J. & Jackson, A. J. (2013). Global fishmeal and fish-oil supply: inputs, outputs and marketsa. *Journal of Fish Biology*, *83 (4),* 1046-1066.

Xu, T. & Chen, F. (2014). An embedded fuzzy decision system for aquaculture. *2014 IEEE Workshop on Electronics, Computer and Applications,* 351–353.