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Humidity Monitoring System for Oyster Mushroom Cultivation Room by Web Based AVR ATmega328P-PU

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Abstract

Monitoring of humidity for Oyster Mushroom cultivation room in Bali especially in Oka Jamur Bali still monitor their Oyster Mushroom cultivation room using thermohygrometer which is placed in their cultivation room. It is not efficient because operator only can monitor the humidity of mushroom cultivation when they are stay at the cultivation room. Monitoring system for oyster mushroom cultivation room by web can be used to make farmer work more efficient because they can monitor the humidity of the cultivation room anywhere by accessing the website. The proposed system is able to monitoring humidity of oyster mushroom cultivation room and present the data of humidity on website for every 3 minutes in the form of tables and graphs. ATmega328P-PU as the main controller of the system is sending the data of humidity to database of server via SIM800L. Calibration of DHT11 done at BBMKG region III Denpasar resulting compatibility of instrument designed in system with reference instrument that obtained from calibration is equal to 99,81%. System tested in one of oyster mushroom cultivation space belong to Oka Jamur Bali, obtained that range of humidity of oyster mushroom space is equal to 83%-85%.

Keywords: DHT11, SIM800L, ATmega328P-PU, website

1. Introduction

Oyster mushroom can grow optimally if they are placed in a room with appropriate condition. There are several factors that affect the growth of oyster mushroom such as relative humidity (RH), pH of the substrate, water activity, luminosity and temperature [1]. Oyster mushroom requires high relative humidity for optimal growth in fruiting former (80%-90%) [6] with temperature range about 15^0C-30^0C [2]. Regular monitoring is required to keep the good condition for the oyster mushroom cultivation room for optimal growth. Oyster farmer in Bali has been using thermohygrometer to control the humidity and temperature of their mushroom cultivation room. However, they are able to monitor their cultivation room only at the area where they are take placed. Monitoring may not be done routinely because they have to stay at the room continuously. Monitoring that is not done regularly may cause the oyster mushroom growth disrupted. Impaired growth of mushroom can decrease the production of oyster mushroom. Humidity monitoring system for oyster mushroom cultivation space by web can be used to monitor the humidity of cultivation room everywhere. Microcontroller ATmega328P-PU as the main part of the system is processed the humidity data measured by sensor and send it to database of the server via SIM800L.

2. Material and Methods

Monitoring device for humidity of oyster mushroom cultivation room by web based AVR ATmega328P-PU displayed on a LCD 16x2 is designed using Proteus 8 Professional. Complete design of the device is shown in Figure 2.1.

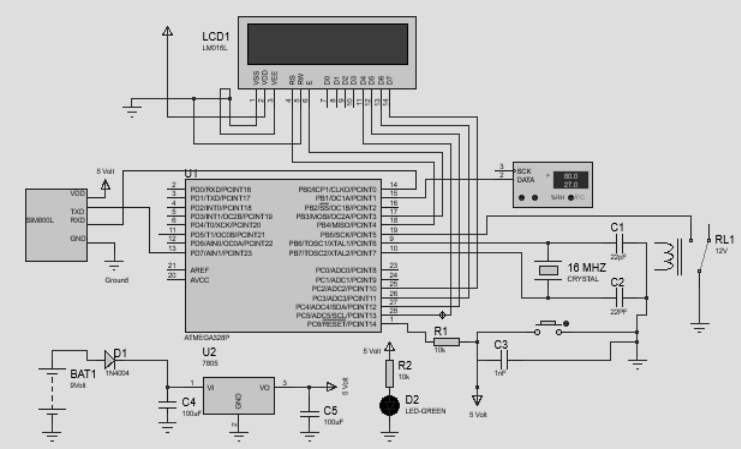

Figure 2.1 The complete design of humidity monitoring system for oyster mushroom cultivation room by web based AVR ATmega328P-PU

PortB.1 is used for input from sensor DHT11 and ATmega328P-PU. PortD0-PortD.7 is used for communication between LCD and ATmega328P-PU. PortB.1 is used for communication between DHT11 and ATmega328P-PU. PortB.5 is used for communication between relay and ATmega328P-PU. PortB.0 and PortD.7 is used for serial communication between module SIM800L and ATmega328P-PU. Sensor DHT11 requires voltage 5 Volts to make it work. It obtain input voltage from the ATmega328P-PU minimum system board. The output of the sensor is digital output, thus it does not need Analog Digital Converter (ADC). Data output from sensor DHT11 is humidity value of oyster mushroom cultivation room. Data of humidity of sensor output can be displayed on Liquid Crystal Display (LCD) in real time. ATmega328P-PU is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328P-PU achieves throughputs close to 1MIPS per MHz. This empowers system designer to optimize the device for power consumption versus processing speed [4].

Module SIM800L is used to send the humidity data to database of the server using GPRS technology. SIM800 is a quad-band GSM/GPRS module that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz. SIM800 features GPRS multi-slot class 12 or class 10 and supports the GPRS coding [5]. In this system, module SIM800L is connected to Atmega328P-PU through pin TX and RX using communication method named USART with baud-rate 9600 bps [3]. Writing codes for the device is using Arduino IDE 1.8.3, that has been set to use baud-rate 9600 bps for its serial communication protocol with 8-bit data, 1 stop bit and without bit parity [3]. The output data from sensor will be processed by ATmega328P-PU and will be sent and stored in database of the server. When user access the website, all of humidity data measured by sensor will be displayed on website in the form of table and graph.

3. Results and Discussion

Based on calibration humidity data of room on attachment 1 and the relation between standard humidity measuring device and humidity measuring device that has been designed is shown on Figure 3.1.

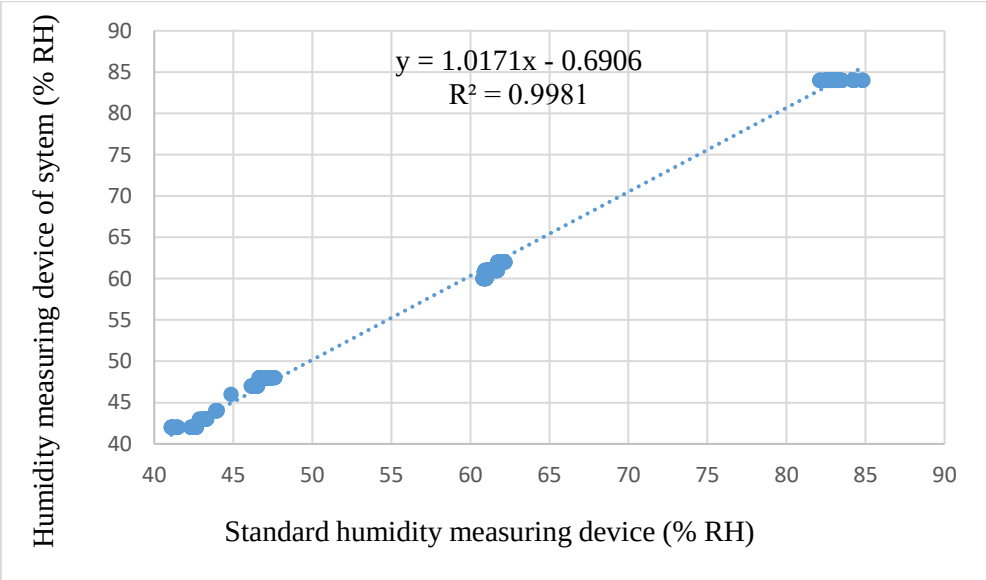

Figure 3.1 Relation between standard humidity measuring device and humidity measuring device that has been designed

Calibration between standard humidity measuring device and humidity measuring device that has been design obtained that compatibility of instrument designed in system with reference instrument is equal to 99,81%.

Testing the system in Oka Jamur Bali

Data testing of the system in Oka Jamur Bali located at Badung Bali. Table 3.1 shows that humidity of oyster mushroom cultivation room is in range of 80%-90%. The humidity data measured by sensor automatically send and stored in database of the server. In the form of table and graph.

Table 3.1 Humidity data of oyster mushroom cultivation room in morning on the 1st January 2017

No	Month/Date/Year	Clock (Bali Time)	Relative Humiditys (% RH)
1	12/1/2017	5:11	89.71
2	12/1/2017	5:14	89.50
3	12/1/2017	5:17	89.50
4	12/1/2017	5:20	89.50
5	12/1/2017	5:23	89.30
6	12/1/2017	5:29	89.30
7	12/1/2017	5:32	89.30
8	12/1/2017	5:38	89.30
9	12/1/2017	5:44	89.40
10	12/1/2017	5:47	89.50
11	12/1/2017	5:50	89.40

4. Conclusion

The calibration between standard humidity measuring device and humidity measuring device that has been design obtained that compatibility of instrument designed in system with reference instrument is equal to 99,81%. System has been tested in one of oyster mushroom cultivation room belong to Oka Jamur Bali, obtained that humidity measured in range of 80%-90%.

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