The Planning Of Temperature Monitoring System , and Humidity On Supply Chain potatoes industry based on Web

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Abstract. The advancement of technology, facilitate businessmen in applying technological advances in overcoming problems. One of the them is the existance of a price war due to the abundance of crops’ harvest such as potatoes, chili, onion, and fruits, in particular area. Thus, causing prices to fall dramatically. Even, the farmer cannot sell their harvest product. The aim of this study was to create Planning Temperature Monitoring System and Humidity in the supply chain potatoes industry through online system based on web(website). Supervision of this will result in the value of temperature and humidity on each individual warehouse cold storage that will be sent through the web. Therefore, a plan for monitoring temperature and humidity in the warehouse potatoes industry, designing performance of the system, analyzing their application on the web was made. The analog data is received by the receiver and read by Visual Basic 6.0 software to be translated into temperature values and humidity, then it is informed in real time. The result of this study is providing planning monitoring system where the harvest can be stored. As a result, when prices rise, the stored products in cold storage warehouses can be sold.

1. Introduction
Large natural resources and good climate, Indonesia has great potential to utilize the international fruit market for the prosperity of its people by exporting as many fruits and vegetables. In transportation of fruits and vegetables, transportation is used as a storage to maintain quality by maintaining the temperature and humidity of the product itself. Potatoes are one of the agricultural products that are seasonal and are easily damaged, so the product is sold in fresh form at a very low price to avoid the costs arising from damage to products in large quantities at the peak of the harvest season. [1].

Building a wireless sensor network system requires development and integration of many hardware and software components.[2]. The current center around formative and research issues of Wireless Sensor Network (WSN) based Smart Home. WSN based shrewd home detection system gives a safe and safe living condition. A Wireless Sensor System (WSN) is a system which is building by utilizing little independent hubs (sensors). Its motivation is to screen certain ecological parameters, for example, temperature, dampness, brilliance, weight, sound, movement, and so forth.[3] The wireless communication and mesh networking capability of the sensor node is implemented using the Digi XBee module.[4] The Sensirion (SHT) is a single chip relative humidity and temperature multi-sensor module that delivers a calibrated digital output. The device includes a capaci- tive polymer sensing element for
relative humidity (RH) and a band gap temperature sensor. Both are seamlessly coupled to a 14 bit analog to digital converter and a serial interface circuit on the same chip. Each SHT is individually calibrated in a precision humidity chamber.[5] In this research, we have combined the gateway node of wireless sensor network, database server, and web server in one single-board computer (SBC) hardware platform, which helps to reduce the cost and complexity of deployment. A web application is developed to provide users a convenient web interface to the system. Users can interact with the web application within the local area network or from any terminal on the Internet to access the sensor data or perform remote configuration and management of deployed sensor nodes. [2].

2. Methodology

2.1 Plan and Implementation
Manufacture of tools for monitoring temperature and humidity, using sensors that are connected to the transmitter. With the transmitter on the transmitter captured by the receiver (Base Station Control) namely PC (Personal Computer) to receive analog data in real-time, then analog data is processed using Visual Basic 6.0 software to display temperature data in real time. So the computer can identify the temperature and humidity graphs of these fruits. By connecting to the FBB will be received by the owner to know the temperature conditions in real time.

![Figure 1 Plan & Implementation](image)

2.2 Integration of System
Integration of system testing to find out problems that might arise include testing:
- The success of sensor nodes in monitoring temperature and humidity in cold storage to get results in real time.
- Successful sending of analog data via WSN to BSC.
- The success of software programs in receiving analog data in real time.
- The success of temperature and humidity data through the FBB is received by the owner.
2.3 The using flowchart

Figure 2 The using flowchart
4. Testing and Analysis

4.1 Sensor Node Assembly

The series of Sensor Nodes shown in Figure 9 is composed of several components including: SHT 11 sensor module, LCD module, XBee PRO Module, ATmega 32 Module, and Power Supply Module.

![Figure 3. Sensor Node Assembly](image)

4.2 Receiver Assembly

The series of receivers in Figure 10 consists of several components including: XBee, USB converter module, and USB cable. Assembly by connecting the XBee pins namely pin 1 (Vcc), pin 2 (Data), pin 3 (Clock) and Ground into a USB module that has been assembled with XBee.

![Figure 4. Receiver Assembly](image)

4.3 Sensor SHT 11 Test

In testing the sensor node is placed in an ice cupboard for 5 x 5. In the data record obtained, it can be compared between temperature and humidity in the sensor node with digital medical thermohigro validation tools. Then the values in table 1 and table 2 are obtained, with acceptable validation.

![Table 1. SHT11 Temperature Test Results with Digital thermohigro.](image)

| Time  | SHT 11 | Thermohigro Digital | Error % |
|-------|--------|---------------------|---------|
| 13.00 | 20.50  | 20.30               | 0.98    |
| 13.05 | 20.20  | 20.30               | 0.48    |
| 13.10 | 20.10  | 20.30               | 0.98    |
| 13.15 | 20.10  | 20.30               | 0.98    |
| 13.20 | 20.10  | 20.30               | 0.98    |

The SHT11 sensor temperature has been validated

Accepted
The test results that have been obtained in table 1 and figure 5 have obtained an error difference with digital thermohigro of 0.98%, so the SHT 11 function in this test is in good condition and validated.

**Table 2.** SHT11 humidity test results with Digital thermohigro.

| Time  | SHT 11 | Thermohigro | Digital | Error % |
|-------|--------|-------------|---------|---------|
| 13.00 | 62.6   | 63.2        | 0.95    |
| 13.05 | 61.4   | 63.2        | 2.85    |
| 13.10 | 61.0   | 63.4        | 3.79    |
| 13.15 | 60.9   | 63.4        | 3.94    |
| 13.20 | 60.9   | 63.4        | 3.94    |

The SHT11 sensor humidity has been validatedAccepted

**Figure 5.** Test Result Graph for SHT11 Temperature and Digital Thermohigro

**Figure 6.** Test Result Graph for SHT11 humidity and Digital Thermohigro

The test results that have been obtained in table 1 and figure 5 have obtained an error difference with digital thermohigro of 0.98%, so the SHT 11 function in this test is in good condition and validated.
The humidity test results that have been obtained in table 2 and figure 6 have obtained an error difference with a digital thermohigro of 3.94% which is still in accordance with the SOP, so the SHT11 function in this test is in good condition and validated.

4.4 Node Sensor Testing with BSC.

Displaying Temperature and humidity in Visual Basic 6.0 software in real time. With a graphical display that can be set with a specified time range.

![Visual Basic result](image)

**Figure 7.** Visual Basic result

**Table 3.** SHT11 humidity test results with Digital thermohigro

| Distance (m) | Sensor Node | Base Station Controller | Data |
|-------------|-------------|-------------------------|------|
|             | Temperature | Humidity                |      |
| 10          | 26.3        | 63.0                    |      |
| 20          | 26.1        | 63.5                    | Send |
| 30          | 26.1        | 63.5                    | Send |
| 40          | 26.1        | 63.5                    | Send |
| 50          | 26.1        | 63.5                    | Send |
| 60          | 26.1        | 63.5                    | Send |
| 70          | 26.1        | 63.5                    | Send |
| 80          | 26.1        | 63.5                    | Send |
| 90          | 26.1        | 63.5                    | Send |
| 100         | 26.1        | 63.5                    | Send |
| 110         | 26.6        | 64.9                    | Not send |

The SHT11 sensor humidity has been validated

| Data浪   |      |      |      |      |
|----------|------|------|------|------|
|          |      |      |      |      |

5. Conclusion

By using a wireless sensor network system, it provides convenience in monitoring temperature and humidity at various points of the specified box fruits. So that real time information data can be retrieved by the Base Station Controller / operator using Visual Basic 6.0 software. With the use of the FBB /
Inmarsat tool, it can be directly / online connected with satellite as an intermediary for communication between the ship and the owner.

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References
[1] A. Hidayati and H. Irianto, “DI KABUPATEN MAGETAN Development Strategy of Sustainable Potato Supply Chain in Magetan Regency,” vol. 36, no. 2, pp. 1–20, 2018.
[2] S. Ferdoush and X. Li, “Wireless Sensor Network System Design using Raspberry Pi and Arduino for Environmental Monitoring Applications,” Procedia - Procedia Comput. Sci., vol. 34, pp. 103–110, 2014.
[3] A. D. Salman, O. I. Khalaf, and G. M. Abdulsheeb, “An adaptive intelligent alarm system for wireless sensor network,” vol. 15, no. 1, pp. 142–147, 2019.
[4] S. Abraham and X. Li, “A Cost-Eff ective Wireless Sensor Network System for Indoor Air Quality Monitoring Applications,” Procedia - Procedia Comput. Sci., vol. 34, pp. 165–171, 2014.
[5] E. Correa-Hernando et al., “Development of model based sensors for the supervision of a solar dryer,” Comput. Electron. Agric., vol. 78, no. 2, pp. 167–175, 2011.