Server Room Temperature & Humidity Monitoring Based on Internet of Thing (IoT)

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Server Room Temperature & Humidity Monitoring Based on Internet of Thing (IoT)

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ABSTRACT. In Monitoring Temperature and humidity for Server Room is a system based an IoT, which provides information while regulating temperature and humidity inside the server room. There are various types of sensors in the prototype, using all parameters of temperature and humidity that can be measured. This system can be used to monitor the temperature or humidity of a particular room or place. The proposed system continuously sends data to the cloud to monitor data from anywhere. For direct monitoring and regulation, the system is equipped with features to provide notifications to users through the telegram application dynamically. The prototype brain is a Raspberry and Arduino module. Temperature and Humidity Sensor (DHT11) are connected to Raspberry. Every time these values exceed the threshold selected for each notification given to the user via the telegram application by utilizing the telegram API. Based on the notification, the user can remotely set the room temperature by giving an order via the telegram application. The Proposed System effectively monitors and dynamically controls commands via telegram applications or through web server applications.

1. Introduction

Technology and information are developing rapidly, particularly the information and many other fields related to technology [1]. One of the areas is the Internet of Things (IoT). IoT refers to the things around us that are connected by the internet and are able to communicate with each other. Most sensors are mounted on objects directly such as ovens, refrigerators, and others. IOT is the relationship between objects and other objects and with users [2]. IoT can be implemented in several domains such as smart city, industry, medical services, and others. With a very broad scope of space, the type of data generated by IoT is heterogeneous. The data generated by the IoT application is the Big Data which can be further analyzed to optimize the resources used [3].

One device that is often used in making Internet of Things (IOT) applications is Raspberry Pi and Arduino, this device is usually used as an access center or can also be a link between the internet and sensors so that data from these sensors can be accessed via the internet, or if connected with a microcontroller, it can be used to regulate the behavior of certain physical objects [3]. This study used Raspberry Pi and Arduino because both devices are open source, easy to use programming with C and Python languages, and there are many easy libraries.

The temperature and humidity of the air are important in increasing the effectiveness of work in the room [4]. Temperature or humidity of the server room which is not conducive is one of the causes of the server becoming hot[5]. Many factors cause the server air to be less conducive, such as the influence of temperature if the temperature is too high can cause damage to the hardware and too low temperature can take a lot of electrical power resulting in waste of electricity [6]. Another factor is the humidity of

the air in which too high humidity can damage the hardware on the server and too low humidity can trigger static electricity around the server room. Another factor is that many people often enter and leave the server room [6]. Another problem that accrued is that if there is an increase and decrease in the temperature that is drastic on server space that cannot be monitored when the network admin is not in the present. Therefore, this paper will try to retrieve, record, and process the temperature data of the acquired server room using a temperature and humidity sensor that is connected to Raspberry Pi devices that have been connected to the local network and the internet and actuators to control Air Conditioner using Arduino [7]. Temperature and humidity data that have been acquired will then be stored in the database and later it will be processed using the PHP programming language so that the temperature and humidity data in the database can be displayed on the web application. If abnormal conditions occur such as too high temperature and too low temperature, it will give notification to the network admin and give orders to the Air Conditioner to maintain the optimal temperature [8].

2. Methodology

2.1 System Design

The design of the system for monitoring the temperature and humidity of the air in the server room using raspberry PI and arduino is assisted with a DHT22 sensor. The architectural design of the system is illustrated in Figure 1.

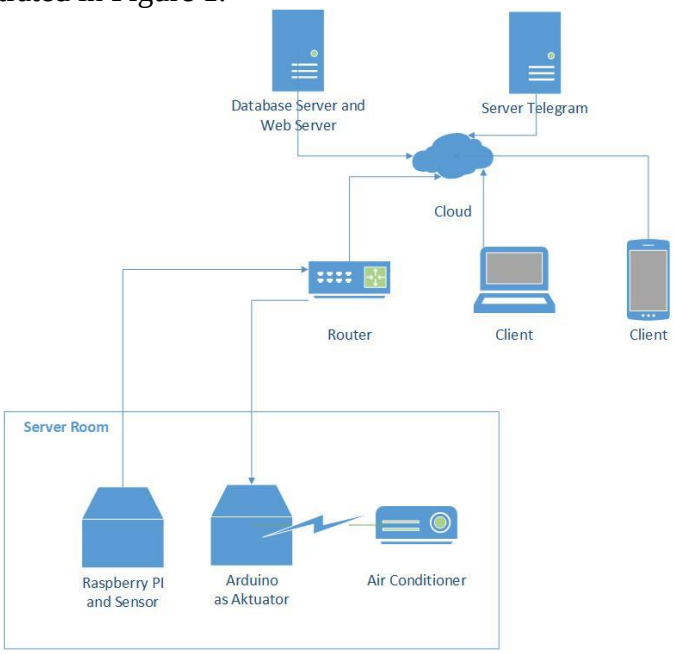

Figure 1 Architectural Design of Temperature and Humidity Monitoring System in the Server Room

Based on figure 1 it can be explained the flow of the system monitoring of temperature and air humidity in the server room as follows:

1. The temperature and humidity of the server room will be taken by sensors installed on RaspberryPI which will process the data first. The data sent by RaspberryPI as a sensor will be checked if the temperature is below 18 ℃ and above 27 ℃ then the paired Raspberry sensor will instruct Arduino as an actuator to reduce or raise the temperature of the Air Conditioner and provide notification to the Telegram. The sensor paired to Raspberry also gives notification to Telegram if the humidity is below 40% and above 55% [6] .

2. Notifications provided by the server for telegram are sent over the internet network received by the Telegram application installed on Android.
3. The order given by the server is received by Arduino as the actuator, then Arduino will reduce or increase the temperature of the Air Conditioner in the server room.
4. The Telegram application on Android receives notifications related to temperature and humidity. The Telegram application can also give commands to see the temperature and humidity conditions in the server room.
5. After checking the temperature and humidity, sensor paired to Raspberry will send temperature and humidity data to the server and is stored in MongoDB.
6. The client on the laptop can access the website monitoring the temperature and humidity on the server.

2.2 Design of Raspberry PI circuit as a sensor

In the sensor circuit, the system monitors the temperature and air humidity in the server room by using Raspberry Pi 3 b + with DHT22 sensor assisted. Raspberry PI is chosen because it is open source, easy to use programming with Python Languages, and many libraries that are easy to use. For images Raspberry PI is illustrated in Figure 2.

Figure 2 Raspberry PI

The sensor uses DHT22 because the accuracy is adequate for temperatures between -40 ℃ to 80 ℃ with an accuracy of approximately 2 ℃. For air humidity range that can be measured is ranged from 0% to 100% with an accuracy of 4% [9]. DHT 22 has better accuracy than DHT 11 with a relative temperature measurement of 4% and air humidity of 18% [10]. The DHT22 sensor image is depicted in Figure 3.

Figure 3 Sensor DHT22

The DHT22 Raspberry and Semsor circuit that will be installed in the monitoring system for air temperature and humidity is illustrated in Figure 4.

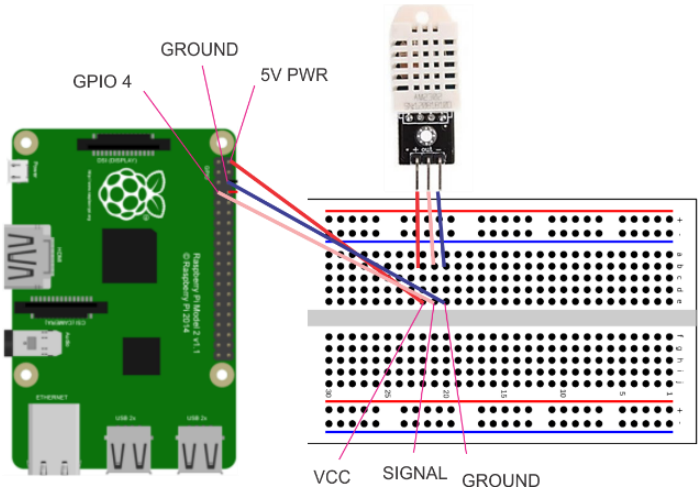

Figure 4 Raspberry Series with DHT22 Temperature and Air Humidity Sensor

In Figure 4 it is shown that the DHT22 sensor has 3 pins, the signal pin is mounted on the GPIO 4 pin on the Raspberry PI, the pin ground (-) is installed on the ground pin on the Raspberry PI, and the Vcc (+) pin is attached to the power source pin with 5 volts on Raspberries.

2.3 Arduino as Actuator

The Arduino circuit as an actuator uses Arduino Mega with the help of Ethernet shield module, an infrared receiver and an infrared transmitter. Arduino is a microcontroller board based on Atmega328 [11]. Arduino is chosen because it has many libraries that support infrared receivers and transmitters. The programming language used by Arduino is the C Programming Language [12]. The Arduino circuit is an actuator with an infrared transmitter and receiver to register signals from the remote air conditioner and send a signal to the air conditioner described in Figure 5.

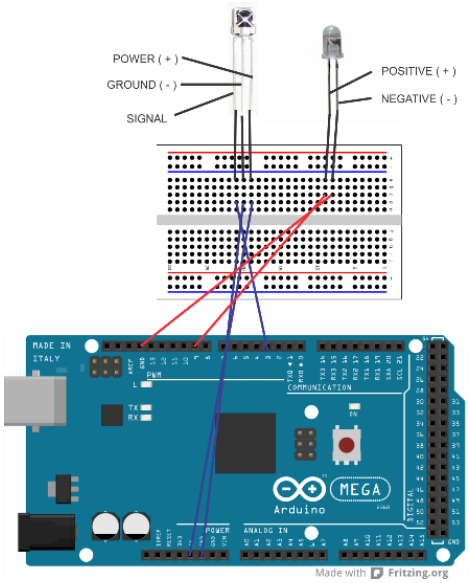

Figure 5 Arduino circuit with Infrared Receiver and Infrared Transmitter

In Figure 5, it is explained that the infrared receiver is installed on the breadboard for the ground pin mounted on the ground pin on Arduino, for the power pin is installed on the 5 volt power pin on the Arduino, and the signal pin is installed on the Digital Pin 3 on Arduino. The circuit in Figure 6 aims to get the signal code for each temperature setting from remote Air Conditioner. The obtained signal code will be entered on the Arduino paired with the Infrared Transmitter.

In Figure 5, it is explained that the infrared transmitter is mounted on a breadboard. Positive pins (+) is installed on digital pin 9 on Arduino and negative pins (-) on Arduino ground pin. The circuit in Figure 7 aims to set Air Conditioner by sending the infrared signal code from Arduino to Air Conditioner.

3. Results and Discusion

3.1 System Flowchart

The system flowchart describes the workflow of devices and systems. The system flow chart of system for monitoritng temperature and humidity is illustrated in Figure 6.

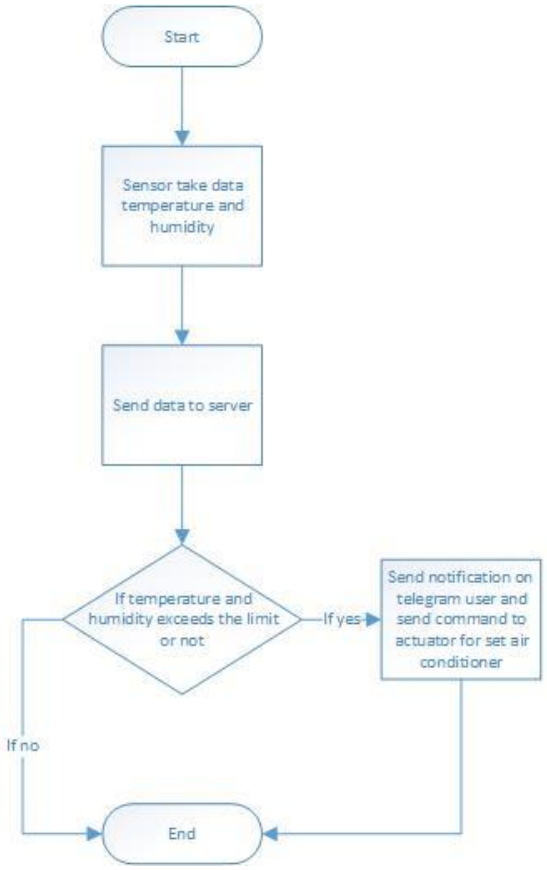

Figure 6 System Flowchart for Temperature and Humidity Monitoring Systems

In Figure 6, a system flowchart is explained, from the first sensor on raspberry to take temperature and humidity data on the server room for every minute. Temperature and humidity data taken are stored in the database server. Air temperature and humidity data are checked whether they exceed the temperature limit in which a minimum temperature is 18 ℃ and a maximum temperature is 27 ℃ or exceed the humidity limit, i.e. air humidity of at least 40% and maximum humidity of 55%, the sensor will send a notification to the telegram installed on the smartphone used and give orders to air conditioners to raise or lower the room temperature by using a web service. The form of notification on the telegram is illustrated in Figure 7.

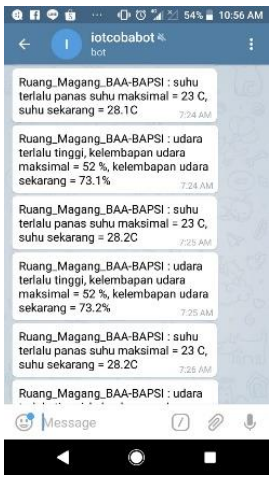

Figure 7 Notifications to Telegrams

Temperature and humidity data stored in the database can be displayed on the website so that the user can read the temperature and humidity in the server room. For graphs the temperature and humidity of the air are depicted in Figure 8 for the temperature graph and figure 9 for the air humidity graph.

Figure 8 Temperature Charts of Time at Specific Time

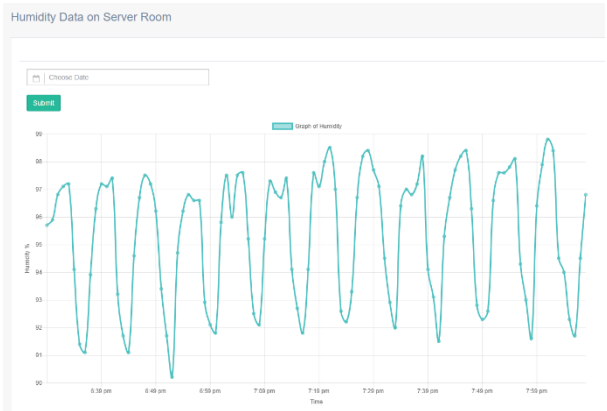

Figure 9 Graph of Air Humidity of Time at Specific Time

4. Conclusions

The conclusion of this paper is that the system created can retrieve temperature and humidity data on the server room and the temperature and humidity data that has been taken can be displayed on the website in graphical form. The system can send notifications on the telegram and setting temperature on air conditioner if temperature and humudity in server room exeeds the limit. The suggestion of this paper is that this system can also regulate the humidity in the server room and use one of the tools as sensors and actuators.

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