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GO GREEN TECHNOLOGY FOR SMART CAMPUS WITHIOT (INTERNET OF THINGS) AND STUDENT MONITORING SYSTEM

Ari Purno Wahyu W[1], MohdHaizam Saudi[2]*

[1,2]Informatics Department, Faculty of Engineering, Widyatama University, Bandung, Indonesia

[1]ari.purno@widyatama.ac.id

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Keywords:Smart Campus, Go green, IOT, Energy management.

ABSTRACT

The Green Campus system is an implementation in the management of an energy resource and uses an energy system able to recycled and reused, a campus is a complex area where the use of energy sources and the implementation of technology are used to support the teaching process and according to implementation technology that supports IOT, one of the technologies used in computer vision technology that is used to record the number of incoming students using CCTV technology that is integrated with campus servers and campus security systems. The second technology is a security system that integrates with sensors installed in the building in the area around the campus. This system is connected to a web server that will provide information about the state of the room temperature electricity usage regulation. Based on the results of testing this IOT technology can be implemented and easy to use, a desktop application-based regulatory system has been proven to help manage and manage energy resources and can support learning systems.

Keywords: Smart Campus, Go green, IOT, Energy management.

INTRODUCTION

In the modern era of environmental awareness and the sustainability of resources, energy consumption will have a negative impact, namely and the waste we produce, we need to understand these terms and see their relation to a process of protecting the environment or a green campus. The Go green campus system will affect economic development and can have a good impact on the quality of life of the community, especially around the Widyatama University campus. In this activity, the Widyatama University (UTama) informatics study program was

involved in a community service activity with the theme "Campus Go Green" where this activity involved faculties, including students and lecturers, the activity began by providing counseling to the community around the UTama campus about the importance of maintaining environmental health in the midst of the Covid-19 pandemic, the process of activities began by spraying disinfectants starting from the streets, residential housing and places of worship.

The purpose of this activity is to involve lecturers and students in order to have a sensitive character towards campus development which is a support for the economy and teaching activity system to run smoothly and the students involved will set an example for future generations.

The implementation of smart campus technology serves to overcome excessive energy use and supports campus security systems, a data system that is integrated with a web server capable of displaying sensor usage data that can be seen in real time from the IOT device used, this system can be installed simultaneously with sensor devices installed in the campus area, the system able to control and turn off sensors directly and centrally through the server. this process will facilitate security control and use of other devices.

LITERATURE STUDY

The communication device module used for IOT connections is the nRF24L01 module, this device has a frequency of up to 2.4 GHz and this tool has been widely implemented in the fields of industrial automation, communication and health, this system is compatible with IoT devices and saves on battery current usage. In actual implementation, this module functions to send data from the sensor wirelessly, while the data source and electric current can use a battery that can be installed with sports equipment, games and other medical devices (A. Di Nisio, T. Di Noia, C. Guarnieri Calò Carducci, M. Spadavecchia, 2016)

An IOT device requires a special computer that is used as a server on the most widely used device is Arduino because the Arduino board has a small shape and has a large number of sensors, the weakness of this module is that it is not equipped with a power supply so it needs to use additional components, the power supply. The Arduino is divided into two parts, the USB power supply and the power supply using an adapter, while the small ATmega and Arduino nano types(Abdelrahman Abuarqoub;Hesham Abusaimeh;Mohammad Hammoudeh;Diaa Uliyan;Muhannad A. Abu-Hashem;Sharefa Murad;Mudhafar Al-Jarrah;Fayez Al-Fayez, 2017).

Control on campus smart systems is used to control devices or other household appliances, for example in a building an IOT device must have the ability to control AC electricity, control room lights, use of electrical resources, control center access to the room. control on electricity uses strong current control or (AC) so that the Arduino component requires additional safety devices or relays, the component consists of an electromagnetic coil that can change position if it gets current (Dr. Kamlesh sharma ;Dr. T. Suryakanthi, 2019).

Retaining the spring (spring) on the relay so that contact occurs where the initial closed condition (Normally Close / NC) will become open (Normally Open / NO). The difference with a switch is that the movement of the contractor on the switch for on or off conditions is done manually without the need for electric current, while the relay requires electric current. In this task, the author uses 8 channel relay modules.

In a smart campus system, the use of sensors plays a very important role because this tool can record and read room temperature. The sensor used is the DHT11 type of sensor, this tool will record the room connected to an analog signal and this tool is responsive and very fast in reading room conditions and this tool has an accurate calibration feature.(Nyoman Putra Sastra, Dewa Made Wiharta, 2016)

In the calibration process this sensor can be stored in the program memory which is internally stored in the DHT system calibration system which will be stored in the VCC module, NC data, and GND. The results of sensor readings will be displayed in web-based form with digital mode in a responsive menu, the menu will display room data as well as the number of graphs of room and building temperature conditions, the web-based system used uses the laravel framework mode, this application is open source so that it is made and application development can be done easily. In addition, Laravel was built using the MVC (Model View Controller) concept, which is a software approach that separates logic applications from percentages or separates applications based on application components in the form of data manipulation, Controller and UI (User Interface) (IoT Solution for Data Sensing in a Smart Campus using Smartphone Sensors, 2018).

The installed sensor is connected to esp32 which is capable of sending log data so that data transmission able to wirelessly with a Wi-Fi frequency of up to 2.4 GHz. This tool is very suitable for use for IoT devices and mobile devices, process requests and can use a webserver which consists of data on sensors that will be stored in the database and the sensor data set will be displayed in graphical form the data can be manipulated and retrieved quickly so that the use of the database system with this server can make data can be integrated (Petr Foltynek, Marek Babiuch and Pavel S uranek, 2019).

ANALYSIS SYSTEM

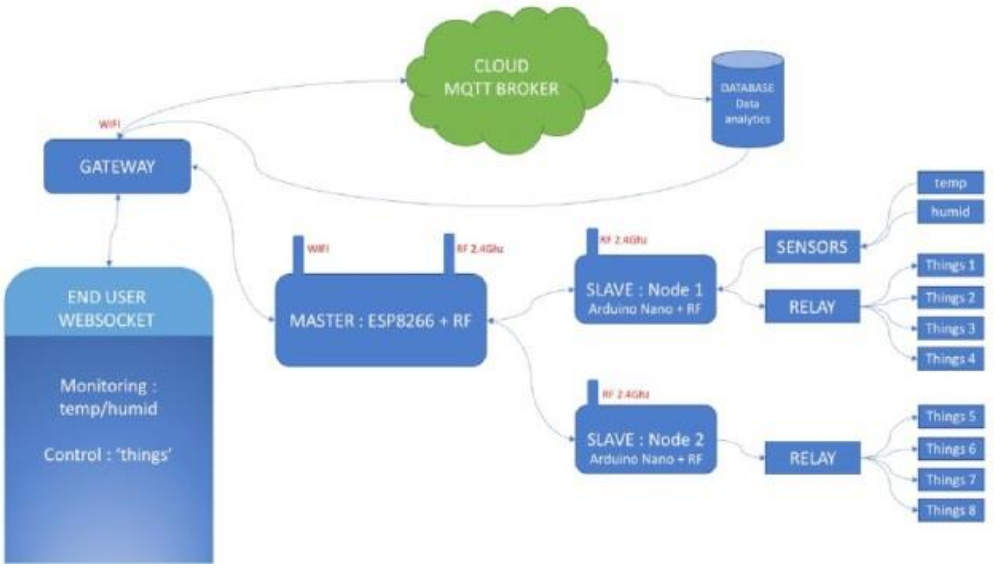

Figure 1.IoT-based smart campus control system

In the picture above is a cloud-based smart campus control system that is connected to the IOT supporting tools, including:

1. Gateway

The gateway system functions to regulate the connection between the IoT device and the connected sensor, each device will be given a unique IP address so that each data will provide information through the sensor in one direction.

2. websocket

Websocket functions to display and read sensor data taken from the main sensor data reading analog data so that the data displayed in graphical form makes it easier to read data in real time.

3. Clouds MQTT Broker

The sensor that is installed able to connected by cable or wirelessly, this is due to the large area where the sensor is installed, the data from the sensor is directly collected through cloud data to facilitate the process of reading data that will be created by the cloud broker which will later be displayed in the form of a website or graphic.

4. Analytic Data Database

Data from the clouds will be stored in a data base which will automatically read the analog signal readings.

5. Sensor

The sensor in this system is in the form of an analog signal reading sensor in the form of a temperature sensor and a humidity sensor as well as a sensor installed on the camera.

6. Slave Node

The slave node system in this system functions as a simple computer system by reading data from the installed sensor before the data is sent to the main computer

7. Relay

In this section, the relay functions as security because this system is connected to AC current, this can be used because the microcontroller sensor has DC power while the device settings in the campus area have a large electrical load, for example to control water machines, AC and garden lights so that this system using an intermediary relay as a safety medium.

IMPLEMENTATION AND TESTING THE SYSTEM

In testing the system will be divided into two parts, namely a smart home system in the form of sensor control which is displayed in web-based form and a computer vision system that can record students in the campus area.

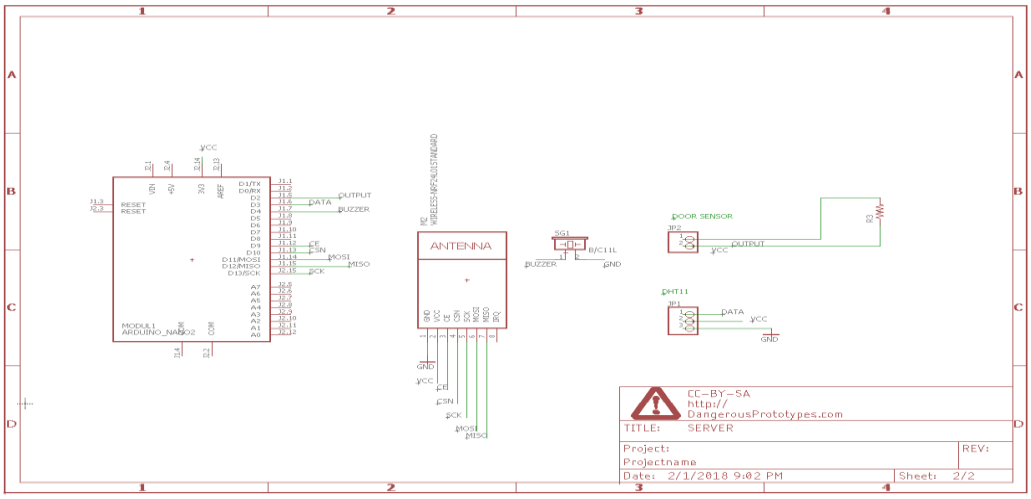

Figure 2.Sketch of the design results using a microcontroller

In the picture above is a sketch of the design of a smart campus system using the ESP control module, which is connected to several sensors, such as a humidity sensor, temperature sensor, and camera system. The work system will be programmed using language C, which is connected to the analog sensor mode ESP8266 divided into two parts, namely slave mode and slave mode 1 and slave node 2, these nodes directly control the relay device, each of which consists of 4 channels, each channel will be connected to a relay.

```
#include <DHT.h>
#include <SPI.h>
#include <nRF24L01.h>
#include <RF24.h>


#define DHTPIN 3
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);

RF24 radio(9, 10); CE, CSN
const byte pipes[2] = { 0xF0F0F0F0E1LL, 0xF0F0F0F0E2LL };
#define DoorSensorPin 2
int state;
int buzzer = 4;

struct data {
  byte humid ;
  byte temp ;
  byte door;
};
```

```
#include <Wire.h>
#include <i2c_relay.h>
#include <nRF24L01.h>
#include <RF24.h>
#include <SPI.h>
#include <PubSubClient.h>
#include <ESP8266WiFi.h>
#if defined(ESP8266)
#include <pgmspace.h>
#else
#include <avr/pgmspace.h>
#endif
```

Figure 3. The use of libraries in sensor control

In Figure 3 is a configuration process between the software and the sensor used, the sensor is connected to a pin on the microcontroller on each pin, then data and identified according to sensor needs, the program language used is C language, the programming language this was chosen because it is easy to implement and good for IOT programming, in the picture above the system records and adds the library used in this case the sensor library used is the DHT sensor which is used to measure humidity, then the SPI.h library which is used for serial cable connections. between the server and the sensor, and the last one used is the Radio Frequency module or Nrf24l01 and RF24.H the two sensors are installed into two parts, namely the master and slave mode each of which serves as a transmitter and receiver.

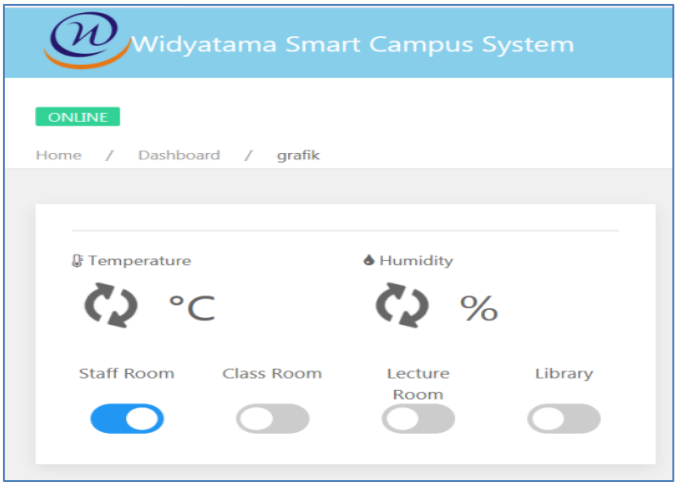

Figure 4.Campus Room Monitoring System Server

In Figure 4 is a monitoring system for the use of electricity resources on campus, this image is a menu display in the admin section, automatically and structurally the admin can monitor the state of the room temperature and the use of tools both in the classroom or in the lecturer's room so that the process of using this system can be directly set and connected to the campus CCTV camera which will be integrated with campus security.

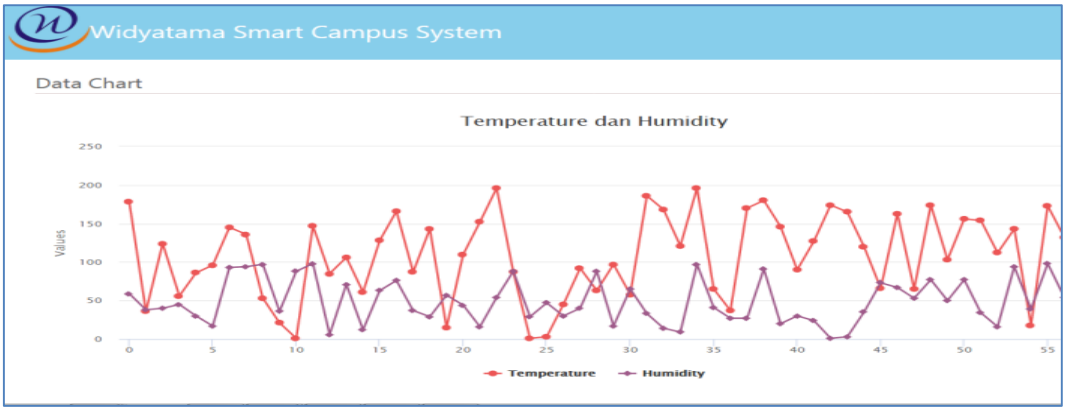

Figure 5. Use of Electric Current

In the picture above is a graph of smart campus usage in each building in the campus area, this graphic data is taken on each sensor installed in the room, where the analog signal readings will go to the server and from the server it is displayed in graphic form for easy reading.

Figure 5. Monitoring students in class

In the picture are the results of the student's monitoring system in the classroom, this monitoring system utilizes a camera connection installed in each room, the camera will automatically read student data which is useful as a student attendance system and replace it with a manual system.

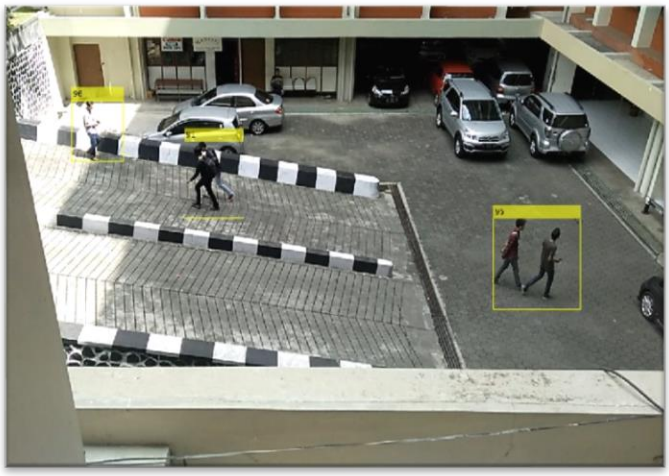
Figure 6 Monitoring Students Outside the Classroom

In Figure 6 is a student monitoring system outside the campus, this system can automatically be used to count the number of students entering the campus area, digitally this system will record student activities outside the campus and store it in a database.

CONCLUSION

From the results of the experiment it can be concluded that the campus monitoring system using IOT technology can be easily implemented and used, in general this system is able to record and check the use of electric current resources, as a whole the sensors installed are very helpful and read the surroundings in this case. the state of temperature and room temperature as well as the use of classrooms which will later be effective in using the room and the state of the campus electrical system in each room. while other technologies that can be integrated are the use of an attendance system that is already based on computer vision where this technology is integrated with CCTV cameras in the campus area and can be used to calculate the number of students and attendance, for further research the number of sensors used can be added and using a server with a larger data storage capacity so that the IOT system and the computer vision system can be integrated with each other.

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