

Internet of Things (IoT) Based Trash Can Monitoring System Using Web Services with the CodeIgniter Framework in the Surabaya Aviation Polytechnic Environment

Ade Irfansyah^{1,*}, Yudhis Thiro Kabul Yuniar², Bambang Bagus Harianto³

¹ Politeknik Penerbangan Surabaya

*Yudhis Thiro Kabul Yuniar. Email: yudhis.kabul@poltekbangsby.ac.id

ABSTRACT

The use of plastic bottles tends to increase every year. Plastic bottles have now become a daily necessity and more and more plastic bottle products are being used. This has an impact on the accumulation of plastic bottle waste in rubbish dumps in the Surabaya Aviation Polytechnic environment. Plastic bottle waste is one of the problems that must be resolved because it is difficult for the soil to decompose and can cause environmental pollution in the Surabaya Aviation Polytechnic Environment.

Based on the background of these problems, Innovation and Research in Management of plastic waste processing is needed at the Surabaya Aviation Polytechnic campus by developing new technology and strategies to recycle or manage plastic waste more efficiently and environmentally friendly. In this research we propose the title Based Waste Bin Monitoring System Internet of Things (IoT) Using Web Services with the CodeIgniter Framework in the Surabaya Aviation Polytechnic Environment. The flow of this research is to build an Internet of Things platform for monitoring plastic bottle waste using web services with the CodeIgniter framework method so that it can be integrated into the data management system. The results of this waste monitoring will later be integrated into an Android-based cellphone application so that it can be monitored in real time. The results from plastic bottle waste will later be passed on for recycling.

Keywords: *Internet of Things (IoT), Web Services, Rest API, Plastic Bottle Waste*

1. INTRODUCTION

The use of plastic bottles tends to increase every year. Plastic bottles have now become a daily necessity and more and more plastic bottle products are being used. This has an impact on the accumulation of plastic bottle waste in rubbish dumps in the Surabaya Aviation Polytechnic environment. Plastic bottle waste is one of the problems that must be resolved because it is difficult for the soil to decompose and can cause environmental pollution in the Surabaya Aviation Polytechnic Environment.

Based on the background of these problems, Innovation and Research in Management of plastic waste processing is needed at the Surabaya Aviation Polytechnic campus by developing new technology and strategies to recycle or manage plastic waste more efficiently and environmentally friendly. In this research we propose the title Based Waste Bin Monitoring System Internet of Things (IoT) Using Web Services with the CodeIgniter Framework in the CodeIgniter

Framework in the Surabaya Aviation Polytechnic Environment.

Web Service using the CodeIgniter framework based on Representational State Transfer (REST) Application Programming Interface (API) is a technology that makes it possible to integrate different systems. The REST API communication system allows various applications and devices to communicate with each other using the HTTP protocol. The use of the REST API in the CodeIgniter framework in the IoT monitoring system makes it possible to increase efficiency and flexibility in integrating various devices.

The development of a website service using a framework for an IoT monitoring platform with REST API integration is expected to facilitate device integration with IoT monitoring technology. The development of the CodeIgniter framework website will enable users to monitor and analyze plastic waste data in trash bins more effectively and with great flexibility in real-time more easily and efficiently. Overall, developing a website service using the CodeIgniter

framework on a REST API-based IoT monitoring system can help speed up and simplify the development process. This will allow users to optimize the use of IoT devices and improve monitoring system performance so that developing a website framework for an IoT monitoring platform with REST API integration is important to apply to waste control in the Surabaya Aviation Polytechnic environment.

2. METHOD

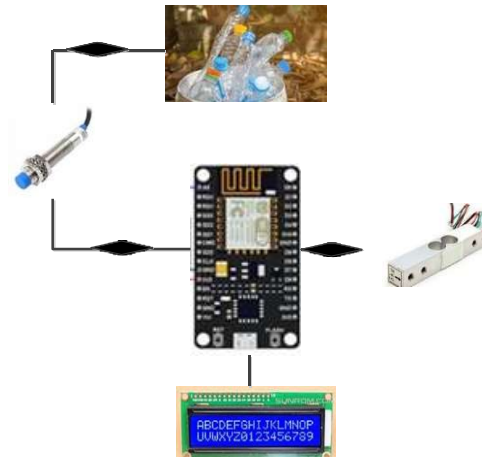
In the development of the Internet of Things (IoT) Based Plastic Bottle Trash Can Monitoring System Using a Web Service Based on the CodeIgniter Framework, there are concepts and methods used by the author, namely using a literature study method, next is carrying out a needs analysis process with the aim of collecting data and information, book references, journals, papers required for this research. The development of this system uses embedded system devices, namely proximity sensors, load cell sensors and microcontrollers as plastic bottle detectors. In preparation for developing web services software, a design plan is needed to obtain an overview of the software system that will be built. This process aims to make it easier for researchers to build and develop the system, which is then continued with the trial process to find out the results of the system development so that it can be evaluated if there are obstacles.

3. RESULT AND DISCUSSION

The result of this research is a monitoring system for the detection and capacity of plastic bottle waste in rubbish bins. The monitoring system is in the form of web services using codeigniter and the results of sensor data sent using the REST API.

A. Design of a plastic bottle detection system

In developing an embedded system for detecting plastic bottles using proximity sensors and load cells. In developing a data transfer system using NodeMcu, which is a series of embedded system modules based on the AT Mega microcontroller which is integrated with the ESP 8266 wifi module. In the development system for this research, the Arduino IDE is used as a text editor to input the proximity sensor reading program code. The following is the programming code algorithm used for building a plastic bottle monitoring system.



Pic1. Image of Embedded System Sensor Design

```
//Mengakses module sensor dengan indikator LED pada Arduino
const int pin_2 = 2;
const int led = 13;

void setup () {
  pinMode (pin_2, INPUT);
  pinMode (led, OUTPUT);
  Serial.begin(9600);
}

void loop() {
  int kondisiSensor = digitalRead(PIN_2);
  Serial.print(kondisiSensor);
  if (kondisiSensor == HIGH)
    digitalWrite(led, HIGH);
  else digitalWrite(led, LOW);
  delay (1200);
}
```

Source Code Proximity Sensor

```
HX711 scale;

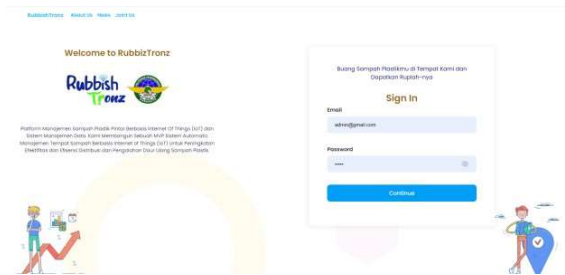
void setup() {
  Serial.begin(57600);
  scale.begin(LOADCELL_DOUT_PIN, LOADCELL_SCK_PIN);
}

void loop() {

  if (scale.is_ready()) {
    scale.set_scale();
    Serial.println("Tare... remove any weights from the scale.");
    delay(5000);
    scale.tare();
    Serial.println("Tare done...");
    Serial.print("Place a known weight on the scale...");
    delay(5000);
    long reading = scale.get_units(10);
    Serial.print("Result: ");
    Serial.println(reading);
  }
  else {
    Serial.println("HX711 not found.");
  }
  delay(1000);
}
```

Source Code Load Cell Sensor

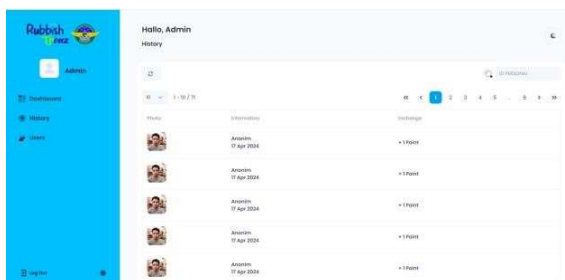
B. Web Services Software Design



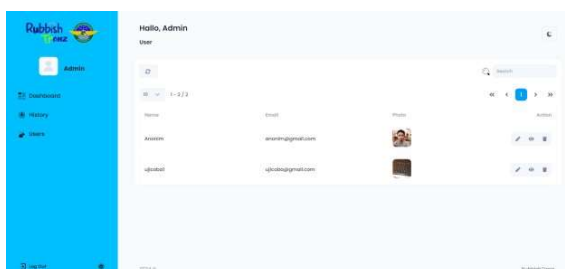
Pic2. Dashboard LogIn Web Service Soil Moisture Sensor Monitoring System



Pic3. Dashboard Display for Monitoring Plastic Bottle Trash Capacity on Web Services



Pic4 Dashboard Display Monitoring Updates on Plastic Bottle Disposal on Web Services

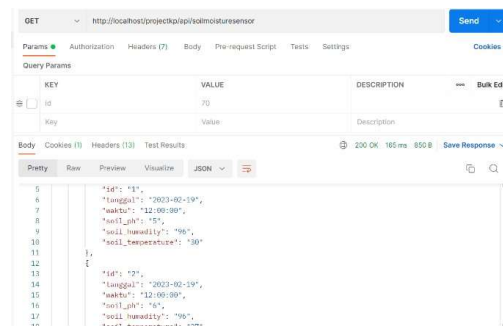


Pic5 User Data Display Dashboard on Web Services

In developing website service software, we use the CodeIgniter framework with a REST API using the GET method to retrieve data from the embedded system of proximity sensors and load cells. Open Rest API is a service that provides real-time proximity and load cell sensor data. The REST API can retrieve proximity sensor and load cell data to display trash bin capacity data information on the website page. To create a REST API for proximity and load cell sensors, you can use the

API endpoint to obtain data via GET requests. Sensor retrieval data in the web services system uses JSON or XML format.

C. REST API Design



Pic 6 Image of Testing RESTful API GET Method with Postman

In designing website services using the CodeIgniter framework with the RESTful API method (GET, POST, PUT, DELETE). In the CodeIgniter framework, RESTful APIs can be implemented using certain libraries such as Rest Server, which helps integrate RESTful API functionality into web applications. Implementation of a RESTful API on the CodeIgniter website, allowing clients to access data easily and flexibly. In addition, the use of RESTful APIs also makes integration with other applications easier and enables efficient centralized application development.

CONCLUSION

1. Developing a framework-based website service for the Internet of Things (IoT) monitoring platform with Representational State Transfer (REST) API integration is the right step in improving the performance and effectiveness of monitoring on IoT devices.
2. REST API integration on the website framework allows more efficient use of HTTP requests and responses in accessing data on IoT devices.
3. The results of the tests carried out show that the developed CodeIgniter framework-based website service has succeeded in monitoring and displaying data from IoT devices accurately and in real-time.
4. Using the CodeIgniter Framework can increase the effectiveness and efficiency of monitoring the capacity of plastic bottle bins.

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