

Dashboard Monitoring of Atmospheric Corrosion Sensor in Materials Metal Using Laravel Framework

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Abstract

Corrosion is a chemical reaction that occurs in materials made of iron such as steel. Steel that is experiencing corrosion will appear dark brown spots, the longer it is getting more and more and can cover the entire surface. Corroded steel will result in a major deterioration and structural failure because the thickness of the steel will decrease over a period of time, so the safety of the building is clearly not guaranteed. Research on the tools used to detect the corrosion value of steel has been carried out. However, not using the internet of things technology. Therefore, a web-based corrosion monitoring or monitoring system was designed. The web will display data on voltage and temperature values in the form of numbers and charts. In addition, the website can also send SMS and Whatsapp message notifications if the value obtained exceeds the threshold. In developing this website using the prototype method, Laravel Framework, PHP and Java programming languages, MySQL database, Guzzle, and Whatspie as automatic message sending bots. The System can provide information of monitoring regarding dummy, active, and delta voltage along with their time and temperature.

Keywords: Laravel Framework, Prototype Method, Whatspie, MySQL.

I. INTRODUCTION

Corrosion is a chemical reaction that occurs in materials made of iron such as steel. Steel that is experiencing corrosion will appear dark brown spots, the longer it is getting more and more and can cover the entire surface. Corroded steel will result in a major deterioration and structural failure because the thickness of the steel will decrease over a period of time, so the safety of the building is clearly not guaranteed [1].

Research on the tools used to detect the corrosion value of steel has been carried out [2][3]. However, not using the internet of things technology. Therefore, a web-based corrosion monitoring or monitoring system was designed. The web will display the voltage value data, namely dummy voltage, active voltage, and delta voltage as well as temperature and time. Corrosion value is related to the voltage [4], the higher the voltage value is, the greater the corrosion will be, the data are displayed in the form of numbers and charts.

If the voltage value exceeds the specified limit, which is 10 Volts, the website will send an SMS [5] and Whatsapp message to the number that has been managed on the website. Metal is one of the strongest building materials. One type of metal that is usually used as a building material is steel. Steel is a strong, flexible, and durable building material. However, steel is very susceptible to corrosion or rust [6].

In developing this website using the prototype method, laravel framework, MySQL database, Guzzle[7], postman[8], VSCode [9] and Whatspie [10] as automatic message sending bots. In accordance with the website test results, the website can provide information of monitoring regarding dummy voltages, active voltages, and delta voltages along with their time and temperature. Delay for sending message notifications is according to the numbers that have stored in the database.

II. LITERATURE REVIEW

A. Website

Websites contain data that is generally found on a page in the form of text data, images, files, videos, and so on. With the website, many benefits are generated as is done by most humans today, such as searching, finding, and managing various information from various sources available on the internet [11].

B. Laravel Framework

Laravel is a framework or framework of the *PHP* programming language that has MVC or Model View Controller as its base. MVC itself has three parts, namely, the Model functions as the part that connects the application with the database. View functions as part of designing the view, the *view* here is managed by the Controller. Then, the controller functions as a controller or controller of the model and view before further determining what the application will process [12].

C. MVC (Model-View-Controller)

Model-View-Controller or MVC is a method for creating an application by separating data (Model) from the view or appearance and processing it in the Controller. MVC separates application development based on main components such as manipulation of data, user interface, and parts that become controls in a web application. MVC section:

1. Model, Model represents data structure. Usually, a model that serves to assist management databases such as entering data in the database as well renewal.
2. Viewers, Viewers is a place to set page views. You could say it as a web page.
3. Controller, Controller is the part that connects the model and view. The controller will process the data and will be sent to a web page [13].

D. MySQL

MySQL is a database management system software or commonly called a Database Management System (DBMS). SQL (Structured Query Language) is a concept of database operation, especially for selecting or selecting and entering data, which allows data operations to be done easily automatically [14].

E. Guzzle

Guzzle is a package composer that contains all the functions to make fire requests. Guzzle provides the HTTP client functionality better than PHP's default HTTP client. This package can be used anywhere in PHP native and framework. But, it would be more advisable to use this package in a framework like Laravel [7].

F. Whatspie

Whatspie Service is a tool to send commands or simple automated messages to broadcast bot information to be transmitted through Whatsapp messages. Whatspie provides a free service that is given a limit of up to 2000 messages for a trial [10].

III. RESEARCH METHODOLOGY

In developing monitoring websites using the prototype method, which is the development of a prototype suitable for systems or software customized or software created based on requests and needs according to certain situations and conditions [15]. The Method of the prototype starts by collecting the needs of user for the system to be made. Then, a program is made 'prototype' so that users can imagine what they want. Then, the program of the prototype is evaluated by the user until the specifications are found as desired.

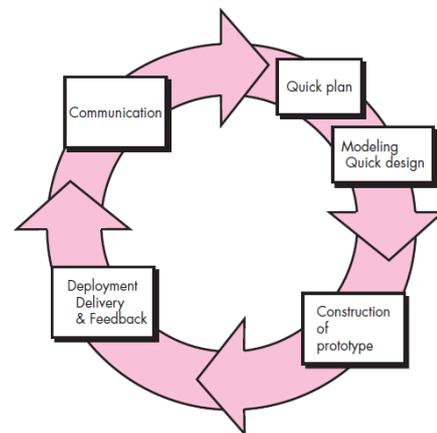


Figure 1 The Prototype Method

The following are the stages of system development in the prototype method:

A. Communication

At this stage, the identification of the entire software is carried out by collecting data such as functional and non-functional requirements, system design limitations, and user characteristics. Then, the functional requirements can be discussed again with the user which is the stage of evaluating the needs with the user.

B. Quick Plan and Modeling Design

After communicating and evaluating to users regarding system requirements specifications, the next stage is software design. In software design, there are 4 discussions, namely regarding user characteristics, system requirements specifications, User Interface mockups, and database design.

C. Construction of Prototype

This stage is a coding process (programming) after obtaining the system specifications and the designs obtained from the results of the previous stages.

D. Deployment Delivery and Feedback

Prototypes will be given to customers and then evaluated by the customers themselves. Feedback is obtained from complaints or suggestions given by customers after evaluating the prototypes that have been tried. The feedback itself is needed for the development of the following prototype until the prototype matches the customer's wishes [16].

IV. RESULT AND DISCUSSIONS

In developing the monitoring website through each stage in the *prototype* method. Each stage gets results that have been evaluated to fit the user's needs. The results of each stage of the prototype method in developing the monitoring website are as follows:

A. Communication

Based on the results of communication with users, functional requirements are obtained, namely:

- a) The system can display the login page.
- b) The system displays a page that displays the highest and lowest data daily and monthly.
- c) The system can display a data chart of the value of active voltage (ϵ_A), dummy voltage (ϵ_D), delta voltage ($\Delta\epsilon$), and temperature (T) in real-time every one hour.
- d) The system can display a chart history of the data values ϵ_A , ϵ_D , $\Delta\epsilon$, and temperature (T).
- e) The system displays the number of occurrences of voltage values that exceed normal thresholds.
- f) Processing contacts who will receive notification messages.
- g) Creating a system that can provide notification of the height of the voltage value that exceeds the threshold.
- h. The system can process the data received into excel.

B. Quick Plan and Modeling Design

After communicating and evaluating to users regarding the specifications of the system requirements to be built, the next stage is software design.

In Figure 2, the Use Case Diagram describes the interaction between actors and the monitoring system. In this monitoring system, there is 1 actor, namely the user.

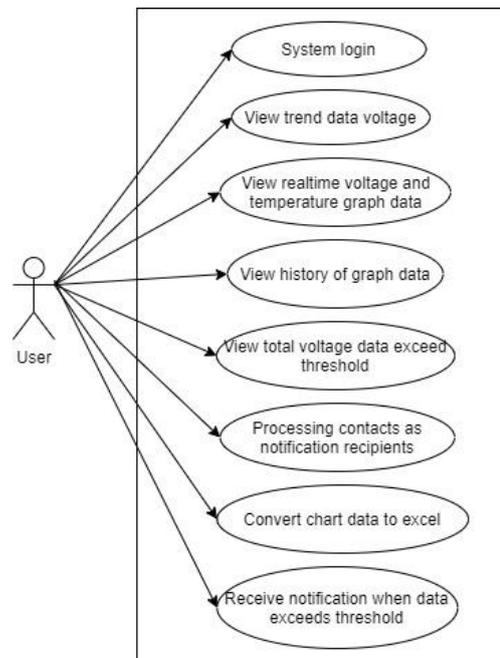


Figure 2 Use Case Diagram

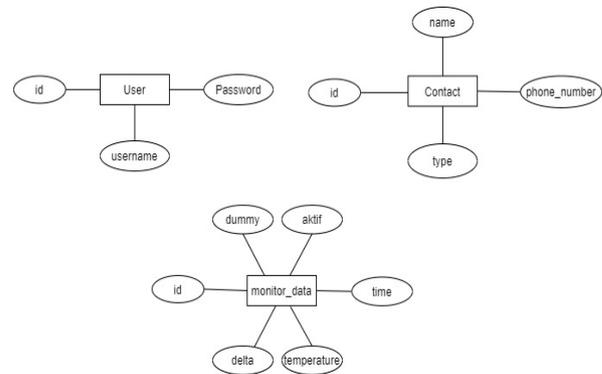


Figure 3 Entity Relationship Diagram

In database design, there are entities and attributes. Entities are the data that will be stored and table in the database. Attributes are columns of data that need to be stored in an entity. In this study, there are 3 entities used, namely users, contacts, and monitor of data.

C. Construction of Prototype

At this stage, the program code for the monitoring system is written in accordance with the requirements discussed in the previous stage. This web-based monitoring system uses the Laravel framework and its database implementation uses MySQL.

1. Implementation

a) Login Page

Users must enter the username and correct password to enter the monitoring system page. After the username and password are entered, then press the login button to go directly to the dashboard page.

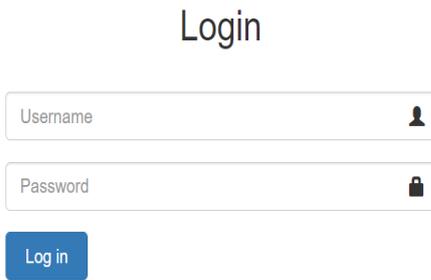


Figure 4 Login Page

b) Dashboard Page

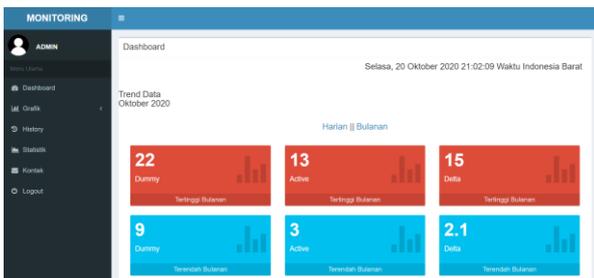


Figure 5 Dashboard Page

A dashboard page display containing trends of data by displaying the highest and lowest voltage values (dummy, active, delta) based on the daily or monthly time menu selection.

c) Real-time Chart Page

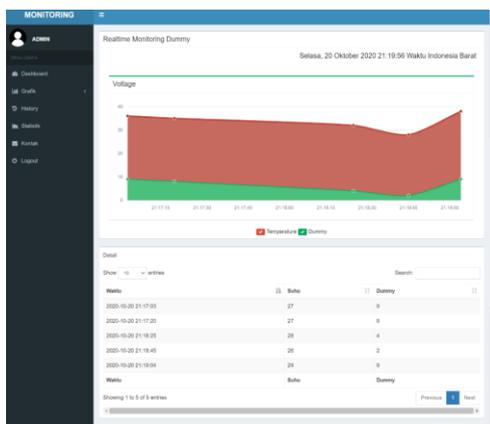


Figure 6 A Real-time Chart Page

A real-time chart page of dummy monitoring displays time information, dummy voltage, and temperature values in the form of a chart with a red area to indicate that the value is for temperature and the area is green indicating that the value is for the dummy voltage. For active voltage, the chart is light blue and delta voltage is dark blue.

d) Statistics Page

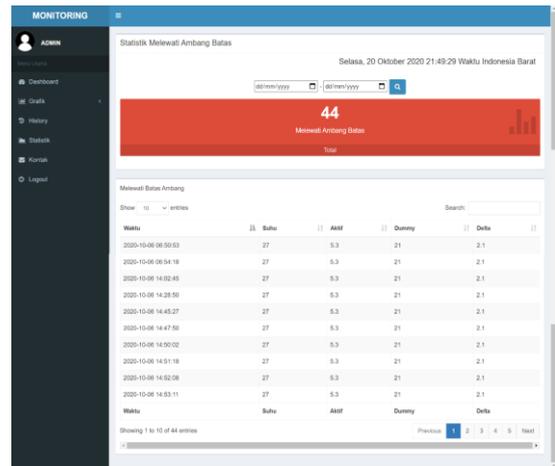


Figure 7 Statistics Page

The statistics page shows the total voltage data whose value exceeds 10 or the threshold. To be able to see the total of data, the user uses a date filter by entering the start date and end date that will be searched for and the web will display it.

e) Contact Page

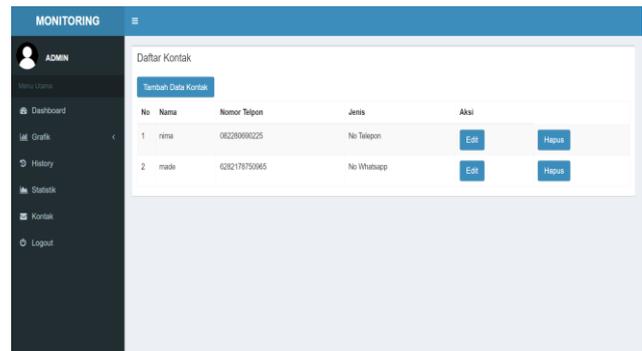


Figure 8 Contact Page

The contact page is displayed a list of contacts or numbers that receive notification messages if a value exceeds the threshold. The contact list table contains the column number, name, phone number, type and action. For these types, there are two, namely telephone numbers and Whatsapp numbers.

f) Implementation of Message Notifications

Figures 9 and 10 are the implementation of message notifications via SMS and Whatsapp when the incoming voltage data exceeds the value of 10. SMS notifications are sent via the SMS server of Siakad Unila. The notifications of Whatsapp using Whatspie as a tool to carry out the command to send a message by calling the fire of Whatspie accounts that have been created. Whatsapp messages will be received by

contacts in the database. The information obtained in the message notification is in the form of data that exceeds the threshold, the date, and time in hours, minutes, and seconds.

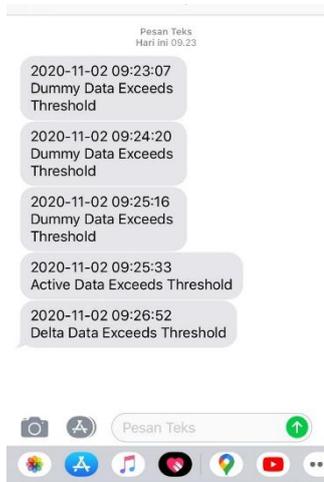


Figure 9 SMS Message Notifications

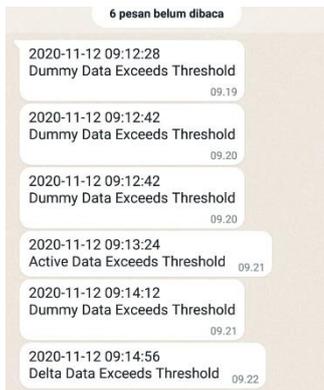


Figure 10 SMS Message Notifications

D. Deployment Delivery and Feedback.

At this stage, the finished application is tested using the Black Box method and will be given to the user to be evaluated. Feedback is obtained from the results of system testing in the form of complaints or suggestions given by the user after evaluating the prototype that has been tried. There is an analysis for the length of time or delay in sending the message notification.

1. Analysis of the Length of Time for Notification Message Delivery

In table 1, there are 4 phone numbers registered in the delivery contact of SMS notification on the database. It can be seen that the delay for each received SMS is very different, the delay is calculated from the data entered into the database until the SMS is received by the registered contact number. Based on the results of these experiments, the sequence of contact numbers in the database affects the delay in sending SMS

notifications. The first serial number will receive messages faster than the order below it, the more telephone numbers are entered, the second delay on sending the last number will be greater.

Table 1 A delivery time of SMS when the numbers in a database are more than one

A sequence of numbers in the database	Phone Number	Time Data Sent	Time SMS Received	Delay (second)
1	082280xxxxxx	16:12:42	16:12:47	5
2	081279xxxxxx	16:12:42	16:13:01	19
3	082178xxxxxx	16:12:42	16:13:05	23
4	085156xxxxxx	16:12:42	16:13:08	26

V. CONCLUSION

Based on the results and discussion obtained in this study, there are several conclusions including: In accordance with the results of system testing, the system can provide the information of monitoring regarding dummy voltage, active voltage, and delta voltage along with time and temperature. In accordance with the system test results, the user can receive a message notification if the voltage exceeds the 10 Volts value. In the message notification delivery trial, if there are more phone numbers in the database, the delivery delay on the last sequence number will be even greater.

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