Jurnal Sainstech Nusantara	Vol.1 No.2 (2024) 29-36
https://nusantarajournal.id/sainstech	ISSN: 3063-0657

Web-Based Level Crossing Control System Monitoring Device (Software)

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Article Info

Article history:

Received 01 March, 2022
Revised 05 November, 2022
Accepted 25 December, 2022

Abstract

Failure function of level crossing control starts from not fulfillied the technical specifications in the level crossing operation. So it is necessary to have a monitoring system for the control of a level crossing door. This research was conducted at the level crossing of the Indonesian Railway Academy. The device circuit is arranged by attaching the sensor to the battery input, and inputing the flashing unit. Installation of sensors on the battery input is intended so that when the supply of voltage and current entering the battery does not meet specifications, it will be known that the charger battery is in trouble. Installation of sensors at the flashing input unit is intended so that when the supply of voltage and current entering the flashing unit is not according to specifications, it will be known that the supplier has a problem. The sensor will be connected to Arduino Mega which will then be sent to the database. From the data database the voltage and current will be processed in the web and displayed. If the voltage and current data from the database do not match specifications, a notification will appear on the web. Afterthat, it can be repaired by a technician.

Keywords: Monitoring, Level crossing, Arduino, Web maximum

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1. Introduction

Problems that occur at the level crossing can be a failure of the level crossing control system function. As happened in the 4.6 railway signalling resort area, rejuvenation of the battery voltage supplier is being carried out because the input voltage to the battery has decreased. So, the performance of the level crossing is not optimal. Operation of level crossing has technical specifications that must be fulfilled when the gate is operated. Failure of level crossing control function starts from not fulfilling the technical specifications in the level crossing operation. In overcoming the failure of the level crossing function, the technician receives a report from the relevant level crossing guard officer and then follows up. This study aims to determine the problem of failing the function of the control system on the level crossing using a monitoring device for the level crossing control system. With this device can overcome the problem of failing the function of the control system at the level crossing quickly.

DOI: https://doi.org/10.71225/jstn.v1i2.1

Based on the Attachment of the Minister of Transportation Regulation Number 10 2011 about Technical Requirements for Railway Signaling Equipment Number 5 concerning supporting equipment, the security equipment for level crossing serves to secure the train journey when passing a level crossing of highway users. The regulation also includes requirements that must be fulfilled by safeguards for level crossing to function optimally.

The research was conducted at the level crossing at the Indonesian Railway Academy by creating a web-based monitoring device for level crossing control systems. This research was conducted with several references other than Minister of Transportation Regulation Number 10. Another reference is the technical specifications of the Indonesian Railway Academy level crossing.

Table 1. Technical Specifications of Tested Level Crossing of Control Systems

Items	**Description**
Battery	Input voltage 7-18,8 VDC
	Current 10 A
Flashing Unit (Bell)	Input voltage 7,5-17,5 VDC
	Current 10 A

In making the monitoring device is divided into two parts, hardware which is discussed in other research and software discussed in this study. The used hardware is the Arduino Mega, Ethernet shield, current sensor, and voltage sensor. The software making done in this research uses xampp as a link between data from hardware and database, databases stored in phpmyadmin, and web browsers that are used to display monitoring data.

Software is a special term for data that is formatted, and digitally stored, including computer programs, documentation, and various information that can be read, written by a computer. The software can also read connected hardware that will be converted digitally into a program.

Web is a collection of pages that are used to display text information, images or motion, animation, sound, and / or a combination of all that is both static and dynamic which form a series of interrelated buildings where each is connected to the network (hyperlink). The web elements are domain name, web hosting, program scripts, web design, website maintenance.

HTML (Hyper Text Markup Language) is a mark language used to create a website page. In the world of web-based programming, html is the basic foundation on web pages. HTML file is saved with the extension .html (dot html) and can be executed or accessed using a web browser (Google Chrome, Mozilla Firefox, Opera, Safari and others). As explained in HTML is the basis of a website. to make a website is not enough to only use HTML, we need the help of CSS, JavaScript and PHP to create a dynamic website, if the website page is created using only HTML, the website page is called a static page because it does not have actions or functions that can manage the website. Of course the developer will be very busy with having to change the HTML file again every time you want to update the article.

PHP (Hypertext Prepocessor) is programming language designed specifically for web development. PHP has Server-Side properties because PHP is run or executed from the server side. the intention to run from the server side is that PHP is run on the server computer and not on the client computer. PHP is run through a web browser application just like HTML.

If compared to a building foundation for an overview of the functions or uses of PHP, we can refer to HTML as foundation poles, roofs, floors and walls. That's why we use CSS to make the shape and appearance of the house attractive and comfortable in view. In the case example of this house building, PHP is used to make anyone who can enter the house, who can see the house, and who can store the items in the house. so basically PHP is useful for making actions on a home or website if in actual examples.

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Codeigniter Framework is one of the most widely used PHP frameworks by web developers to build a website-based application. Framework is a collection of instructions that are collected in class and functions with each function to make it easier for developers to call without having to write the same program syntax repeatedly. this has the use to save time and prevent syntax research repeatedly to create a clean and structured source code. Codeigniter is a php framework that is open source and uses the MVC method (Model, View, Controller). Codeigniter is free or unpaid if you use it. the codeigniter framework is made with the same purpose as other frameworks that is to facilitate developers or programmers in building a web-based application without having to make it from scratch. The advantage of using codeigniter is structured syntax, ease of use, helper and library facilities available, guaranteed security (Hadi, 2016).

The first thing that must be prepared in installing codeigniter is to prepare a web server. One of the famous and free web servers is Apache, a web server that is used on some servers on the internet. Websites that involve databases as a place to store their data need not be confused because codeigniter also supports various types of database servers, namely MySQL, MySQLi, MS SQL, PostgreeSQL, Oracle, and SQLite. Codeigniter can also be run on all operating systems that can run applications above, such as Windows, Linux, BSD, and others. (Daqiqi, 2011)

2. Research Method

Researchers made observations at Signalling Resort 4.6 when doing a gradual rejuvenation of the charger battery by replacing the old circuit with a new one. This replacement is must be done because the performance of the charger battery which was previously not optimal. As a result the supply of voltage to the battery is below the standard which will also affect the work of the level crossing motor. The motor that lacks voltage supply causes the door bar to be operated in accordance with its function.

Researchers conducted a survey in several level crossing guards in the Operation Area VII Madiun region. The survey aims to obtain data perturbations that often occur at the level crossing . The disturbance data is as follows.

Table 2. Level Crossing Failur Data in the Operation Area DAOP VII

Post Number	Guards Name	Problem	Action	Time
114	Darmawan	the door is up late	refill of battery water	15 min
111	Wanto	the door is up late	Battery replacement	15 min
106	Sukarno	The door can't go up	refill of battery water	30 min
105	Endrik	the door is up late	refill of battery water	10 min
118	Sujarman	The door doesn't work	Repair the motor	30 min

The researcher made a survey of five level crossing guards by giving questions about the disturbances that had occurred at the level crossing. Four of the five level crossing that experience interference have the same repair components, namely batteries. Batteries that do not work according to standards are affected by the battery charger supply or the life time of the battery itself. This affects the performance of the motor that moves the level crossing. The handling time of the above disturbances is influenced by the distance of the level crossing with Signalling Resort and the type of disturbance. Signalling technician receive news from guard after the door has been interrupted.

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3. Results And Discussion

Researchers work on making web that can be monitored by technicians from the office. The first stage is data retrieval from the batabase. The second stage is data processing by comparing data from databases and specification data. The next stage is the appearance on the web. Before the data is taken from the database, the web will be connected to the database with connection.php as in the following picture:

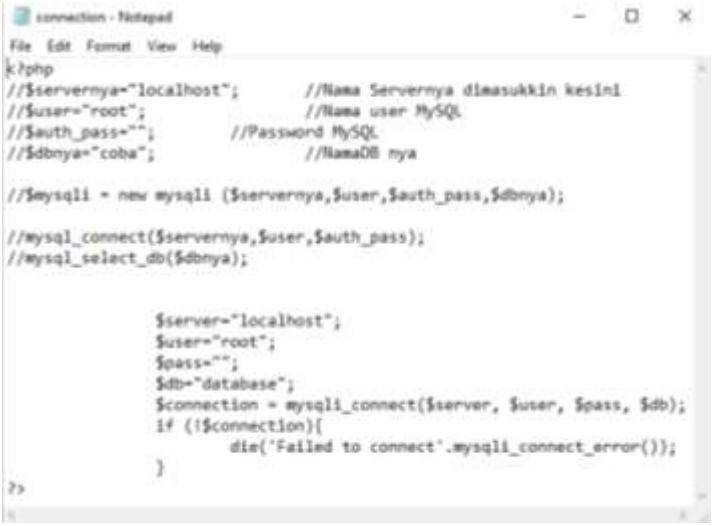

Figure 1. The Code in Connection.php

After the database is connected, then the data from the database is invoked according to each code through the following add.php.

Figure 2. The Code in Add.php

Data that is called from the database is then displayed in the form of three kinds of displays or menus, consisting of: single numbers with the index.php code, tables with the Tables.php code, and statistics with the Stats.php code. Home Views on the web come from index.php. The web displays measurements from the latest sensor with a large number size so that it is clearly visible when the measurement results

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rise and fall. In index.php also included the technical specifications of the control system and notifications if the measurement results are not in accordance with the technical specifications.

Figure 3. The Code in Index.php

Display with stats.php code below displays in the form of line diagrams or graphs. The rise and fall of the measurement results will be known by the rise and fall of the graph.

Figure 4. The Code in Stats.php

Display with tables.php code below displays in table form. All measurement results from the beginning to the latest measurements will be displayed in this table.

Figure 5. The Code in Tables.php

DOI: https://doi.org/10.71225/jstn.v1i2.1

3.1. Testing the Device

The device is tested by researchers by connecting directly to the level crossing at the Indonesian Railway Academy. The following are the results of testing tools conducted by researchers.

Table 3. Trial Result

Experiment Number	Battery		Buzzer
	Current (Ampere)	Voltage (Volt)	Voltage (Volt)
1	3,95	13,45	13,37
2	3,92	13,45	13,42
3	3,96	13,45	13,35
4	3,91	13,45	13,23
5	3,92	13,40	13,30
6	3,93	13,45	13,13
7	3,90	13,40	13,40
8	3,93	13,40	13,35
9	3,90	13,42	13,35
10	3,92	13,45	13,33
11	3,95	13,45	13,89
12	3,94	13,42	13,33
13	3,95	13,45	13,06
14	3,90	13,45	13,30
15	3,97	13,42	13,33
16	3,91	13,42	13,33
17	3,95	13,42	13,35
18	3,95	13,42	13,28
19	3,95	13,45	13,30
20	3,96	13,45	13,20

The table above is the result of testing the device with twenty measurement experiments. The test results show that the condition of the level crossing control system at the Indonesian Railway Academy is still in the range of specifications. In addition, the hardware used can be concluded to work well because the measurement results show stability.

4. Conclusion

The cause of the problem of failure of the control system function on the level crossing can be known through the monitoring tool of the level crossing control system. The way to reduce the problem of failure of the control system function on the level crossing is to find out the cause of the problem of failure of the control system function on the level crossing door and prevent damage that can be caused. Control system monitoring device on this level crossing measures the standby of the voltage and current. For

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further research can be developed for measuring voltage and current during operation. Control system monitoring device at the level crossing are useful for the maintenance of train operation facilities. In the future this tool can also be applied to other operating facility equipment.

Acknowledgments

First and foremost, we express our sincere thanks to Arun Kumar for his technical expertise and unwavering dedication to the project. His innovative ideas and meticulous attention to detail were crucial in the software development process.

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