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Design of School Bell Scheduling Application Based on Arduino Uno on MTs Babussalam Simandolak

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ABSTRACT

MTs Babussalam Simandolak which is located in Tebing Tinggi Simandolak Village, Benai District, Kuantan Singingi Regency. MTs Babusalam Simandolak has problems related to the scheduling of picket teachers and bell information which is still operated manually, where officers often have difficulty ringing the bell during changing hours because those who are often on duty are also teaching teachers, making the picket teachers have to go back and forth to set the bell and return to teaching. Then, the recapitulation data on teacher attendance in carrying out the picket schedule (picket implementation report) is still not well coordinated, there is often a buildup of data, data is suddenly lost, and sometimes people even forget where to put the picket book. Furthermore, the problem with bell information which is still manual causes inefficient time between study hours and students' break times. With this research, MTs Babussalam Simandolak can easily inform the change of each subject or other activity automatically without having to ring the bell and the scheduling process, Reporting already uses computerization. This school bell has used running text as a medium of information for teachers or employees at MTs Babussalam Simandolak.

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1. Introduction

The development of science and technology currently provides more and more convenience in everyday life. Where many things are applied in technological science with machines or electronics, so that human work can be done easily without having to waste energy and can shorten time [1]. In this country, Indonesia is a fast-growing country, so it requires information system technology that is able to provide convenience, for example in educational institutions. Indonesia prioritizes education for its vision and mission to educate the nation's young generation and for the progress of the country which can be seen from the implementation of an increasingly large APBN allocation for education [2]. Discussing Information Systems, Information systems are very important to use in agencies, organizations, companies and the world of education.

Educational institutions will serve all activities that are directly related to the institution[3][4]. These include services in the scheduling information system. This is where the role of the information system is really needed so that the information received can be used to make decisions. In this research, the information system will be displayed in running text, where running text is a system that can display information in text form as a scheduling information system. This research was conducted at an educational institution, namely a school. School is a place for learning and teaching, as well as a place for students to learn lessons [5] [6]. School is also the second place for students after home where students will spend more effective time getting education and socializing. Education is the basis for the progress of the nation in creating the character of every human being who has innovations and ideas to shape the development of a country. The school that will be used as the object of this research is MTs Babussalam Simandolak which is located in Tebing Tinggi Simandolak Village, Benai District, Kuantan Singingi Regency. MTs Babussalam Simandolak currently has 21 teachers, consisting of 2 civil servants, 1 kindergarten auxiliary teacher. I, 3 Non-Permanent Honorary Teachers, 3 honorary TU employees, and the remaining 12 people have Honorary Committee status. Of the 21 teachers, 18 of them have a bachelor's degree, and the remaining 6 have a high school education. The number of students is 144 people. [7][1][8]

However, problems arose when the author conducted direct observations/reviews and interviews with MTs Babusalam Simandolak, several problems were found related to the scheduling of picket teachers and bell information which was still operated manually [9]. Officers often have difficulty ringing the bell during changing hours because the teachers who are often on duty are also teachers, which means the picket teacher has to go back and forth to set the bell and return to teaching. Then, the recapitulation data on teacher attendance in carrying out the picket schedule (picket implementation report) is still not well coordinated, there is often a buildup of data, data is suddenly lost, and sometimes people even forget where to put the picket book [10]. Furthermore, the problem with the bell information being that it is still manual causes inefficient time between study hours and students' break times [11]. Teaching and learning activities are disrupted because the school bell is late or forgotten to be rung. Therefore, the author is interested in overcoming this problem so that it can be overcome by automatically controlling the school bell by using an automatic school bell activation system based on an Arduino microcontroller and making the picket teacher schedule automatic, making it easier for teachers to carry out the picket [12][13][14]. A computerized system that can assist in operating the school bell is very necessary in supporting, facilitating teaching and learning activities and disciplining teachers and students during teaching and learning time. This Arduino-based system is expected to be able to regulate where and when to schedule school activities which can work automatically [15]. By making the bell automatic, you can reduce the risk of being late or even forgetting to ring the bell. [16][17][18]

2. Research Method

Data collection techniques are used to collect data according to research procedures so that the required data is obtained. The data collection techniques in this research include:

1. Literature Study Method

   At this stage the author collects reference data in the form of literature from books, journals and information about design systems.

2. Observation Method

   At this stage the researcher made direct observations at MTs Babussalam Simandolak to find facts in the field related to the title of the research that the author will examine, such as school facilities and infrastructure, especially school bells.

3. Interview Method

   Interviews in research occur where the researcher is having a conversation with a source with the aim of gathering information through questions and using certain techniques.

4. Documentation Method

   Documentation is a method of reviewing and processing data from previously existing documents and supporting research data.

Research Flow Diagram

For more clarity, you can see the image below:

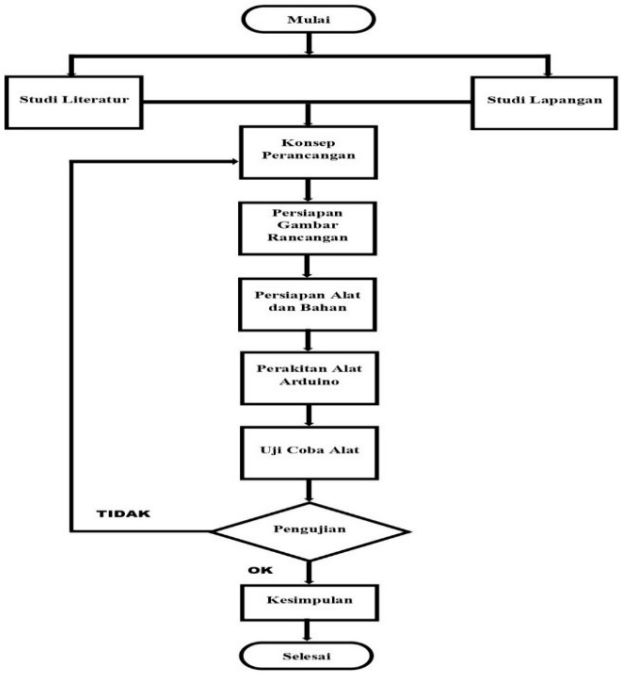

Figure 1. Research Flow Diagram

The advantage of using DFD in research is its ability to simplify complex systems so that they are easier for the research team to understand. DFD minimizes the possibility of errors in the data collection or analysis process because all flows and processes are clearly visualized. Apart from that, DFD also helps in communication between team members, because everyone can see the big picture and details of the process that occurs at each step. Thus, DFD is not only a technical tool, but also an important instrument in ensuring the quality and consistency of data collected and analyzed during research.

Data Flow Diagrams (DFD) are visual tools that are very useful in designing information system flows in research. In a research context, DFD helps researchers understand, design and analyze the data flow required in their research. DFD provides an overview of how data flows from one stage to another in a research process, including identification of data sources, final goals, and data transformations that occur throughout the process.

1.1 Implemention

Current System Analysis

After analyzing the current system processes, there were several deficiencies that had been previously identified regarding bell ringing which was still done manually and wanted to make the bell automatic.[19]

Analysis of the Proposed System

Based on the results of the current system analysis and the problems that often occur, an automatic system in the form of a database was created which can help manage the bell scheduling system so that the time used is more effective and efficient.[20]

System Design

In programming the design of the school bell system at the Arduino-based MTs Babussalam Simandolak, a series of systems is needed. The system design is carried out using flowcarts and UML (Unified Modeling Language), through stages that include general figures, data management schemes, and hardware design schemes.[21]

1. Hardware Design Scheme

Based on the results of the automatic school bell machine hardware design, all of the modules and components can be assembled and combined into a device which can be seen in the figure below:

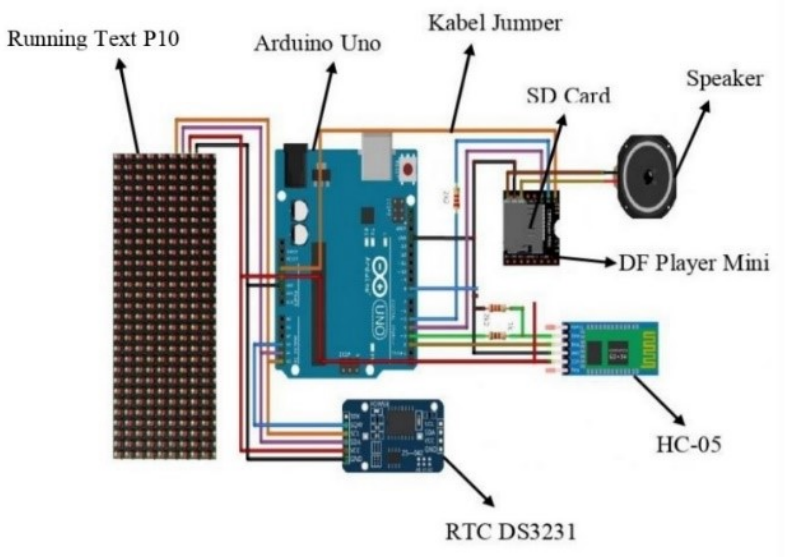

Figure 2. Hardware Design Scheme

Use case diagram using the Arduino bell support application

The use case diagram in the development of this information system is intended to display the relationship between admin and the main function of a system, namely between admin and the bell schedule setting system. By designing this system, the admin can access it using the website system and Android system.[22]

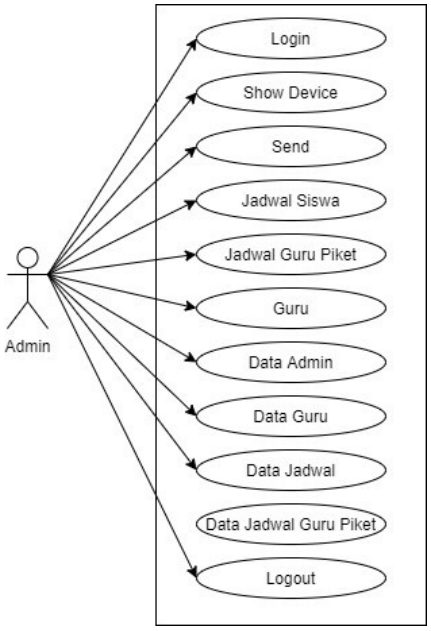

Figure 3. Use Case

Activity Diagrams

This diagram is very similar to a flow chart created to describe the workflow of a system, while an activity diagram is created to describe actor activities.[23]

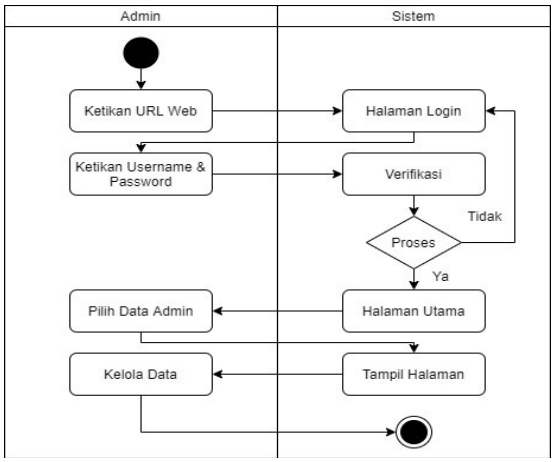

Figure 4. Admin Activity Diagram

Sequence Diagrams

Sequence diagrams display interactions between objects in two dimensions. The vertical dimension is the axis of time, where time flows downwards. Meanwhile, horizontal dimes represent individual objects.[24]

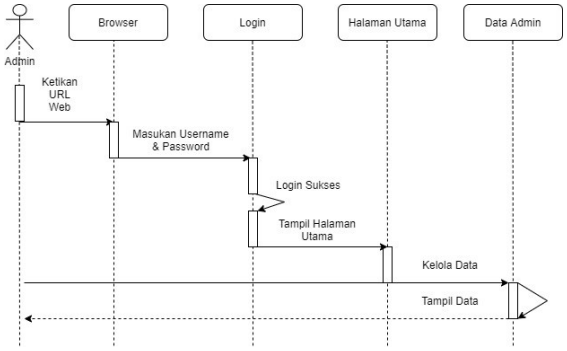

Figure 5. Sequence Diagram Admin

Class Diagrams

A class diagram is a class that illustrates the structure and explanation of objects, classes, packages, and their relationships with each other.

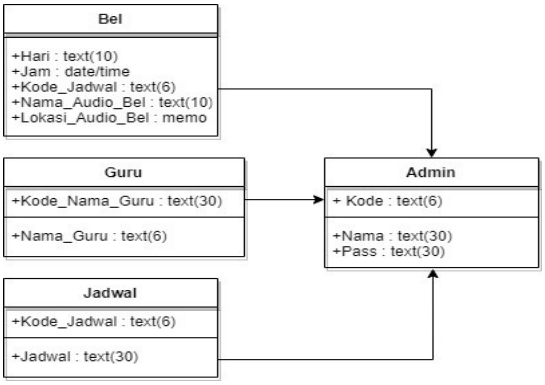

Figure 6. Class Diagrams

System Implementation

System implementation is a procedure for using the program. Apart from that, hardware and software are needed to use the Arduino Uno-based school bell at MTs Babussalam Simandolak.

1. School Bell Series with Running Text

In this figure there is information and the bell sounds automatically according to the settings determined by the admin. The information displayed will be displayed in the form of Running Text which will later be placed in the teacher and staff room at MTs Babussalam Simandolak[25]. This automatic bell circuit will produce a sound that will be sent using the speakers provided, for more details, see the figure below:

Figure 7. Bell circuit with running text

Arduino Uno circuit

The following is an Arduino Uno circuit where this circuit functions to create programs to control various electronic components. And the Arduino Uno function was created to make it easier for users to carry out prototyping, program microcontrollers, make sophisticated microcontroller-based tools.

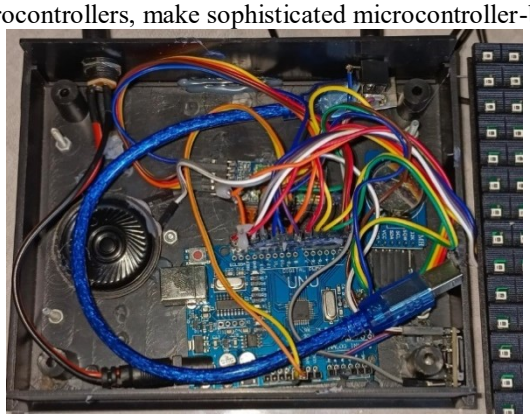

Figure 8. Arduino Uno circuit

Test Results

The test results will be used as a basis for determining conclusions and points of deficiencies that must be immediately corrected so that the performance of the entire system can be in accordance with the planning and design that has been made. Tool testing is useful for obtaining specification data from the tool that has been made so that it is easy to analyze errors and damage that will occur when the tool is working. To find out if this tool works, it is tested before implementing it for users [26].

Table 1. Automated Doorbell Application Testing

No	Analysis	Explanation
1	Running Text can display information	Works fine
2	The bell sound works	Works fine
3	Teacher data report	Works fine

4	Aplikasi android	Works fine

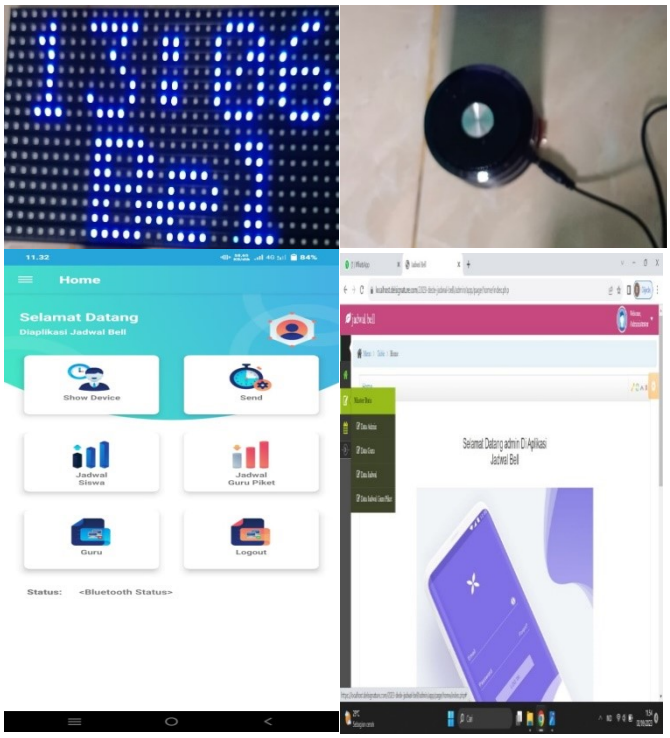

Figure 9. Bell Tool and Application Test Results

Conclusions

Based on the problem formulation as well as the description of the discussion and analysis of the results, the author can describe it as follows:

1. The Arduino Uno-based school bell at MTs Babussalam Simandolak can make it easier to inform each subject or other activity automatically without having to ring the bell.
2. The scheduling and reporting process uses computerization and uses a database as a data storage medium.
3. This school bell uses running text as a medium of information for teachers or employees at MTs Babussalam Simandolak

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