



Electronic Alarm Uses Arduino with Ultrasonic Sensor and MP3 Module as the School Bell Time at Kemala Bhayangkari Delog Vocational School

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ABSTRACT

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School bell is a device that is needed at school as a supporting medium to convey information or as notification of changing of hours to students and teachers. But the problem that often arises is that the sound of the bell produced is generally only limited to the sound of the buzzer that has no specific information and is difficult to understand, besides the bell is activated manually through the picket staff whose job is to convey information and ring the school bell at certain hours or times. The ARDUINO-based automatic school bell application is equipped with a mini DFPlayer module that is able to play the .MP3 sound file format, so information conveyed through the bell can be in English and Indonesian[10]. With the ability to play sound files in .MP3 formats, the information conveyed through the bell can be easily understood by all stakeholders in the school.

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1. Introduction

The development of science and technology is now increasingly providing convenience in everyday life. Where all the things that are widely applied by science and technology with machines or electronics, so that human work can be done easily without having to waste energy and can shorten time. Various household appliances to office work tools use electronic devices so that human work is much lighter and easier.

Speaking of education is inseparable from the role of schools as a means of implementing the education process of children. As a means of the educational process, the school not only presents the best curriculum. Discipline of teaching time for teachers and students is an important component that must be considered.

As an example of the use of Arduino Uno microcontroller which is used as an automatic school bell controller. With this system it can be easier in terms of ringing the school bell when learning time starts, time off and time to go home from school. Meanwhile, teachers who are on duty to ring the school bell will find it inconvenient to always ring the school bell that is felt to be inefficient in time and energy. These problems can be overcome with automatic school bell controllers using the school bell activation system automatically using the Arduino Uno microcontroller. Subianto, M. (2015) [5].

One of the conveniences possessed by this automatic school bell is the control system of the school bell activation schedule, by inputting the school bell schedule to the Arduino Uno microcontroller, the school bell will automatically activate automatically according to the school bell schedule that has been programmed, so that the teacher in charge picket to ring the school bell no longer need to always ring the school bell manually. Muhammad, Syahwil. 2014 [3].

The discipline of teaching time is always identified with the regularity of study time change. And notice of the change of study time is always identified with the school bell. School bell is an effective tool in providing information to teachers and students to get ready to continue teaching further subjects or information on school breaks. School bell equipment is always identified with school bells. School bells are the initial technology in the application of learning time change information. Serambi Engineering (2017) [11].

2. Research methods

2.1 Research Stages



For the achievement of an objective of a research a research phase is needed so that the course of research becomes systematic. The stages of the research can be seen in Figure 1.



Fig 1. Flowchart Research Stages

- a. Identification of problems changing class hours on school bell problems used at the Kemala Bhayangkari Delog Vocational School which still uses the bell manually, so that students are not disciplined in coming on time. It also alternately presses the bell inefficiently, and requires people to press the bell alternately, and cannot monitor student attendance time.
- b. Literature study is needed to gain a deeper understanding of components such as microcontrollers by studying various references from previous research journals related to research needs. In addition, to determine the tools such as hardware and software as in the following table.

Table 1
Hardware

No	Hardware
1	Arduino / Mega
2	RTC DS3231
3	Resistor
4	Breadboard Board
5	Jumper Cable
6	USB cable
7	LCD
8	Speaker
9	The laptop

Table 1 mentioned the tools used in the study to smooth the process of designing the employee attendance system.

Table 2
Software

No	Software
1	Arduino IDE 1.8.10

Table 2 has mentioned the software specifications used to design this tool. Arduino IDE application as a text editor to write arduino program code that is made,

- c. Next is to design a system, where this stage will explain all the process flow that is in the system, the following is a picture of the system block diagram, school bell system diagram:



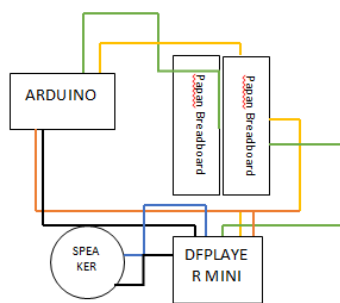


Fig 2. System Block Diagram

A design of an automatic school bell system and a combined circuit in the form of PLN electricity. In Figure 2. the system design has shortcomings, namely when the program is running and suddenly the electricity sourced from PLN goes out, then all the processes will stop and will function again if the electricity is on. Results and Discussion Tools testing is carried out to determine whether the planned tool is working properly or not. System testing conducted by the author is the Arduino uno microcontroller module, 16x2 lcd, RTC DS3231 and DFPlayer mini Mp3 audio module. For arduino uno communication modules can be done with one computer or laptop unit. For testing RTC DS3231 can be done by making a digital clock.

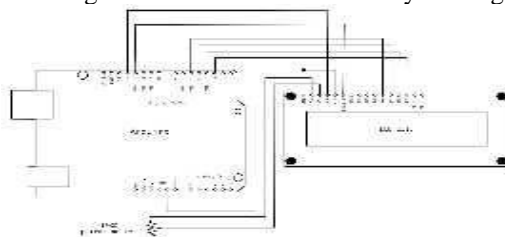


Fig 3. 16x2 LCD circuit

An overview of the 16x2 LCD circuit with Arduino Uno. And wherein that 16x2 lcd will be used as a digital clock viewer or interface of an automatic school bell.

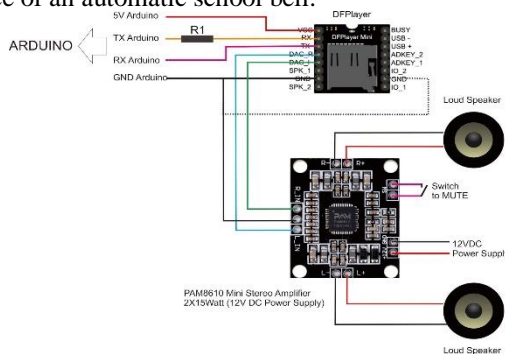


Fig 4. DFPlayer mini series and Mp3 Module

An overview of the DFPlayer mini and Mp3 Module and Arduino Uno series. And where the audio module that will be used as a file player that is in micro SD memory and will be the output of the automatic school bell in the form of audio or school bell sound.

Is an automatic school bell tool that has been designed. In this automatic school bell there are 2 school bell modes, the main schedule mode and the exam schedule mode. And it functions to set the value of the digital clock on the automatic school bell.

Table 3
School Bell Schedule

Hour	Main Mode Schedule
6:30	The bell
8:00	Substitution of 2nd lesson
9:30	Break
10:00	Rest Done
10:30	Substitution of the 3rd lesson

Hour	Main Mode Schedule
12.00	Substitution of 4th lesson
1:00	Return
p.m.	

In table 3. is the schedule for the main mode school bell entered into Arduino Uno, to be run as an automatic school bell.

Table 4
Exam Schedule

Hour	Exam Mode Schedule
6:30	The bell
9:30	Break
10:00	Rest Done
11:00	Return

In table 4. is the exam school bell schedule which is entered into Arduino Uno, to be run as an automatic school bell.

3. RESULTS AND DISCUSSION

3.1 Implementation of System Design

Making this presence tool system using 2 implementations, namely the implementation of hardware and software.

3.1.1 Connects DS3231 RTC and DFPlayer mini Mp3 to Arduino

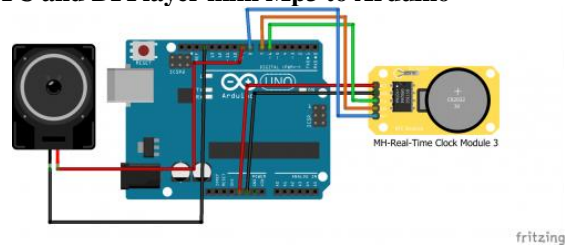


Fig 5. DS3231 RTC and DFPlayer mini installed in Arduino

RTC and Mp3 are already connected as directed in Figure 5. RTC has 4 pins and 4 that are connected directly to Arduino. Pin configurations for RTC and Arduino connections are shown in Table 3. In total there are 4 RTC pins connected to Arduino.

Table 3
RTC pin connection to Arduino

RTC DS3231	Arduino
SCL	A5
SDA	A4
5V	5V
GND	GND

DFPlayer mini has 3 pins and is connected directly to the Arduino microcontroller. Pin configuration to connect DFPlayer mini with Arduino can be seen in Table 4.

Table 4
DFPlayer mini pin connection to Arduino

DFPlayer mini	Arduino
TX	RX0
RX	TX1
VCC	5V

3.1.2 Preparing RTC DS3231 As Main Time

The first step is to connect RTC DS3231 to Laprop then install the existing RTC set in the Arduino IDE software which will be used as a text editor for the program commands to be input. After that, upload the



prepared program and wait for it to finish. If the upload process is complete, the DS3231 RTC can be used as the main time in the school bell tool system.

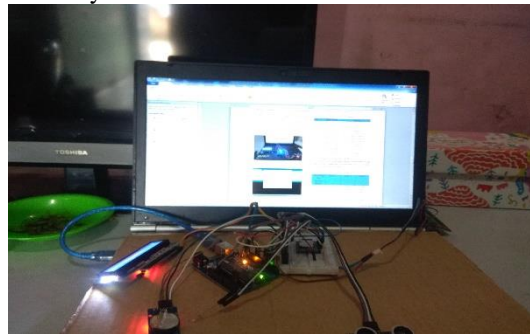


Fig 6. Connecting RTC DS3231 with Laptop

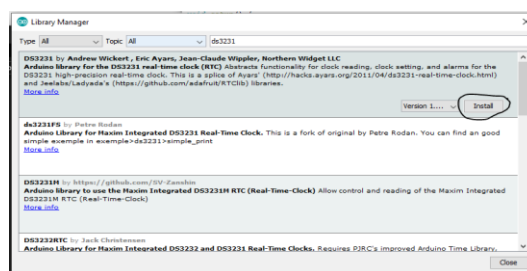


Fig 7. Installing the DS3231 RTC library

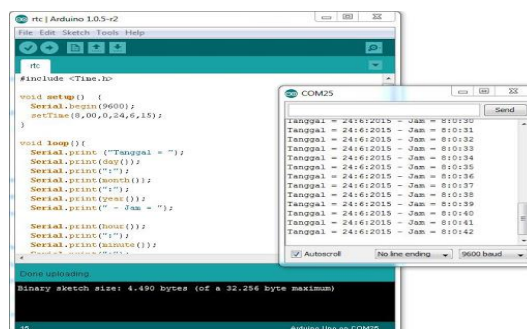


Fig 8. Upload DS3231 RTC Command Code

3.1.3. Preparing an Ultrasonic Sensor

The HC-SR04 module is an ultrasonic sensor module which has the main function as a distance meter. This module consists of a pair of transducers with four pins, namely the voltage supply pin (Vcc), trigger pin, echo pin, and ground pin. The transmitter will send an ultrasonic wave that will be received again by the receiver when the wave hits the object and bounces.

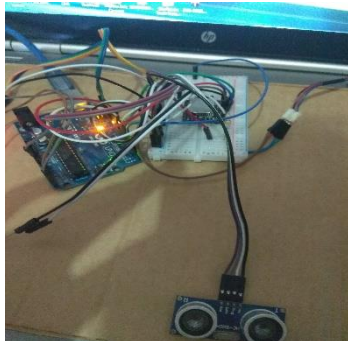


Fig 9. Connecting the Sensor with Arduino

3.2 Test result

The results of testing of the bell system tool system for schools using RTC DS3231 are:

3.2.1 RTC DS3231 Testing

This test is carried out to find out what time can be read by the RTC DS3231 module.

Table 5
RTC DS3231 Test Results

Time	Set Time Beeping	Loudspeaker	Sound
6:30	6:30	Turn on	Turn on
8:00	8:00	Turn on	Turn on
9:30	9:30	Turn on	Turn on
10:00	10:00	Turn on	Turn on
10:30	10:30	Turn on	Turn on

3.2.2 Ultrasonic Sensor Testing Tool

From several attempts the tool can communicate with sensors. From this test can be seen in table 6.

Table 6.
Test Results of Tools With Sensors

Ultrasonic Distance Sensor	TAG 1	TAG 2	TAG 3
5cm	Legible	Can't read	Can't read
4cm	Legible	Legible	Legible
3cm	Legible	Legible	Legible
2cm	Legible	Legible	Legible
1cm	Legible	Legible	Legible

From the test in the above table it can be concluded that the Ultrasonic Sensor will only be read accurately at a distance of 2-3cm, because the Sensor is passive which does not have a battery power supply so that the reading period is short, different from the active sensor that is able to read up to a distance of 30m due to having battery power supply.

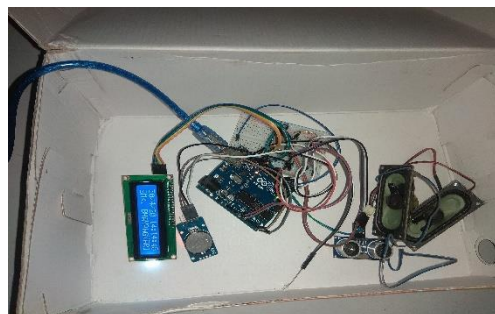


Fig 11. Display of School Bell Tools



Fig 12. LCD Display Main Time

4. Conclusion

Based on the results of tests that have been carried out, with the existence of this automatic school bell tool, the teacher in charge of ringing / activating the school bell, no longer rings the school bell manually. So that it can lighten the task of the teacher in charge of buying / activating the school bell ... With this automatic school bell tool made it makes it easier to send back to school delog in the automatic school bell.

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