International Journal Of Health, Engineering And Technology (IJHET) *E-ISSN 2829 - 8683*
Volume 1, Number 3, September 2022, *Page. 383 - 392*
Email : editorijhess@gmail.com

Design and Build an Automated School Bell System Using Voice-Based IoT

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Abstract

A tool for Designing an Automated School Bell System Using Voice-Based IOT has been designed. The system of this tool uses a NodeMCU ESP8266 microcontroller where the NodeMCU ESP8266 functions as a data processor, and also a WI-FI network receiver emitted by a WI-FI network system. This tool system uses a control system using an android smartphone to turn on the school bell, namely the entrance bell, the recess bell, and the home bell, this tool uses a WI-FI network communication system so that the device system and android smartphone can be connected, the system of this tool uses the ISD1820 module as an output connected to the speaker and the speaker functions to emit the sound of the bell on the designed tool system. The smart phone application used in the design of this tool is the BLYNK application which can be downloaded on playstore or google.com It is hoped that this tool can help and make it easier for teachers who are on duty in turning on the school bell

Keywords: NodeMCU ESP8266, Smartphone Android, WI-FI, BLYNK

INTRODUCTION

The development of science and technology today is increasingly providing convenience in everyday life. Where all things are widely applied 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. So far, and in general, the school bell which indicates when it is time to start learning, break time and time to go home from school is rung manually, which is less effective and efficient for the picket teacher in charge of ringing the school bell. when learning starts, break time and time to go home from school.

In a previous study, a study was made with the title "Design of Automatic School Bell Based on the Avr Atmega8 Microcontroller" by I Gusti Agung Putu Raka Agung from the Department of Electrical Engineering, Faculty of Engineering, Udayana University Bukit Jimbaran Campus, Bali, where the working process of this tool is by setting the current time clock, then entering the bell list according to the existing schedule. After that the microcontroller will read today's stored bell list data repeatedly and compare it with the current time. If there is a match between the current hour and minute data with today's bell list, the microcontroller will

will send a command to the relay to connect the relay switch so that the round bell rings. This tool is equipped with a 4x4 keypad button that functions as an edit button and clock data input, besides that it is also equipped with a seven segment circuit that functions to display current hour data so that it helps users find out the current time. From the research results, the relay can be connected automatically with a round bell, where the full control is on the command of the AVR atmega8 microcontroller with a predetermined time placement from the RTC.

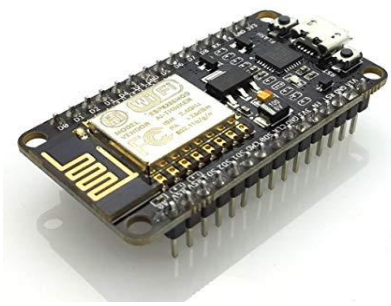
RESEARCH METHODS

This thesis contains previous research related to the Design of an Automatic School Bell System Using Voice-Based IoT based on the Research Journal of Handaya Tri Utomo from the Faculty of Computer Science, Narotama University Surabaya, with the title "Arduino Uno-Based Automatic School Bell Design" concluded that. The electric bell is one of the equipment that is widely used in schools. One example is used to find out when the lesson has ended, it's time to rest and it's time to go home from school by knowing the number of electric bells.
The school bell uses the Arduino Uno microcontroller as its processor and is added with several additional components such as a 16x2 LCD, keypad/push button, RTC DS1307 module and SD card shield. The way to input the automatic school bell schedule is to enter the school bell schedule program into the Arduino Uno microcontroller . In this automatic school bell schedule program, there are 2 modes, namely the main schedule mode and the exam schedule mode. Where each mode has a different school bell schedule (Handaya Tri Utomo. 2017).

In another study entitled 'Design of Automatic School Bell Based on Avr Atmega8 Microcontroller". School bell technology is no stranger to our world of education, especially in the school environment. The school bell is a means to notify students and teachers when lessons will start and end. Generally, school bells still use human power to ring them. It is still rare for schools to use the school bell automatically, which can work alone by ringing the bell according to the existing lesson schedule. The working process of this tool is to set the current time clock, then enter the bell list according to the existing schedule. After that the microcontroller will read today's stored bell list data repeatedly and compare it with the current time.

If there is a match between the current hour and minute data with today's bell list, the microcontroller will send a command to the relay to connect the relay switch so that the round bell rings. This tool is equipped with a 4x4 keypad button that functions as an edit button and clock data input, besides that it is also equipped with a seven segment circuit that functions to display current hour data so that it helps users find out the current time. From the research results, the relay can be connected automatically with a round bell, where the full control is on the command of the AVR atmega8 microcontroller with a predetermined time placement from the RTC. (I Gusti Agung Putu Raka Agung. 2015).

The IDE uses a suitable firmware, namely the firmware output from Ai-Thinker which supports AT Command. For the use of the Firmware loader tool, the NodeMCU firmware is seen in Fig



NodeMCU measures 4.83cm long, 2.54cm wide, and weighs 7 grams. This board is equipped with WiFi and Firmware features that are open source. There is a builtin mic and a record button to directly record sound into the IC ISD1820 and you can directly play the sound by pressing the play button and listening to it with speakers connected to the duino board. Great for adding sound

indicators in your project, the ability to record sound up to 20 seconds (depending on the sampling rate you set, the default is 10 seconds)
Specification:
Chip: ISD1820
Size: 37mm x 41mm
Visit Tokoduino dot com
The working voltage: DC 3V to 5V
Loudspeaker: 8Ohm, 0.5W

In this study, the researcher will explain the flowchart so that the researcher can represent the steps that must be taken in the design.
Algorithms and Programming using the C++ Builder Language" is a graphical representation and the steps that must be followed in solving a problem consisting of a set of symbols where each symbol represents a particular activity.
Flowchart is started by receiving input and ending with output display. Flowchart is a picture that explains the sequence of data readers, data processing, the appearance of decisions on the data and the presentation of the results of data processing.
Purpose of Creating a flowchat:
1. Describe a stage of problem solving.
2. In a simple, unraveled, neat and clear.
3. Use standard symbols.

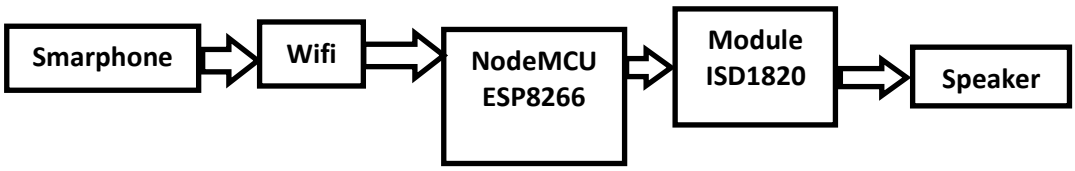
Types of flowcharts:
1. System Flowchart (System Flowchart)
2. Schematic Flowchart
3. Program Flowchart
4. Process Flowchart

RESULTS AND DISCUSSION

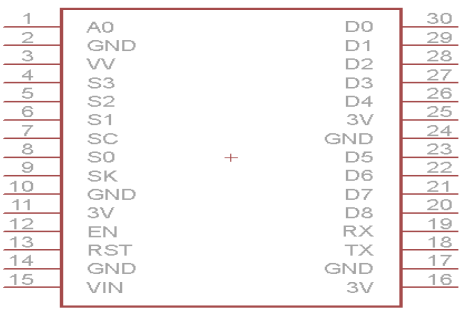
Research plan or design in a narrow sense is defined as a process of collecting and analyzing research data. In a broad sense as a research design includes the process of planning and implementing research. The preparation steps in the Design of an Automatic School Bell System Using IoT-Based Voice are as follows:
1. Literature Study
   The author examines the references obtained from several scientific works such as:
   thesis journals and from books.
2. Literature Study
   The library method, namely collecting data and information by reading

references, e-books, websites, documents which include research that has been appointed, books, articles and journals related to object of research.

3. Consultation
   Done in consultation with the supervising lecturer for solve problems encountered during device manufacture software and hardware manufacturing.
4. Testing Tool
   It is carried out by conducting experiments, testing modules and integrate the module with the program to control the system in order to become a unified whole and obtain maximum results possible.



This ESP8266 NodeMCU serves as the control center of the entire existing system. So you can see the circuit in Figure:



NodeMCU is basically an extension of the ESP 8266 with e-Lua based firmware. The NodeMcu is equipped with a micro usb port that functions for programming and power supply. In addition, the NodeMCU is equipped with a push button, namely the reset and flash buttons. NodeMCU uses the Lua programming language which is a package of esp8266.
The Lua language has the same logic and programming structure as C, only the syntax is different. If you use Lua then you can use.

Lua loader and Lua uploader tools. In addition to the Lua language, NodeMCU also supports Arduino IDE software by making a few changes to the Arduino IDE board manager. Before using this board, it must be flashed first so that it supports the tools that will be used. If using the Arduino IDE, use a suitable firmware, namely the firmware output from AiThinker which supports AT Command. For the use of the Firmware loader tool, the NodeMCU firmware is used.

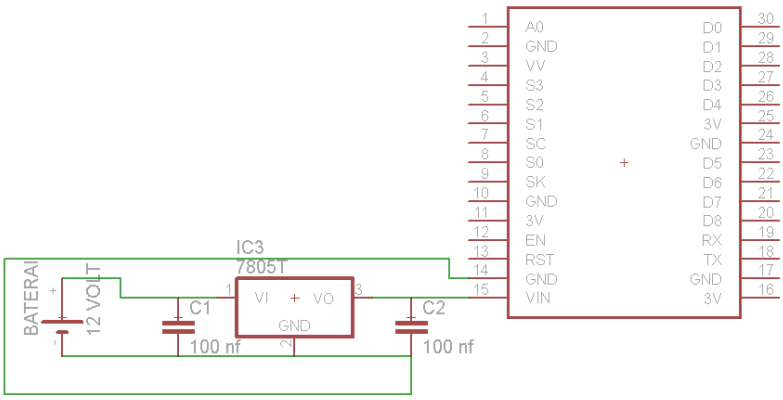
A. NodeMCU Circuit Programming ESP8266

The programming of the ESP8266 NodeMCU circuit is carried out using the Arduino programming language, this programming is carried out to determine the ESP8266 NodeMCU circuit is functioning properly, the programming code is as follows.

```
void setup() {
// initialize serial communication at 9600 bits per second:
Serial.begin(9600);
}
// the loop routine runs over and over again forever:
void loop() {
// read the input on analog pin 0:
int sensorValue = analogRead(Vin);
// print out the value you read:
Serial.println(sensorValue);
delay(1);        // delay in between reads for stability
```

B. Voltage Stabilizer Circuit (Regulator)

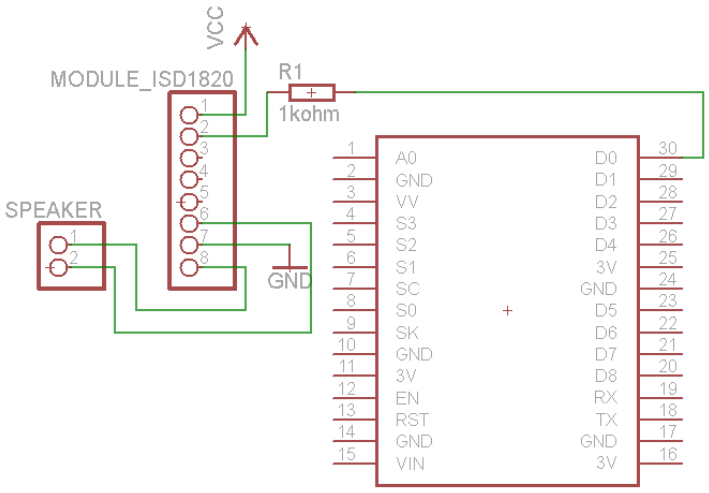
This circuit serves to provide voltage supply from the battery throughout the existing circuit. The output of this regulator circuit is 5 volts



In the above circuit a 12 volt battery is connected to a 100 nf capacitor, then connected to the input voltage regulator ic 7805 to get a 5 volt dc output, this 5 volt dc output will serve to supply the NodeMCU ESP8266 system.

C. ISD1820 Module Circuit and Speaker

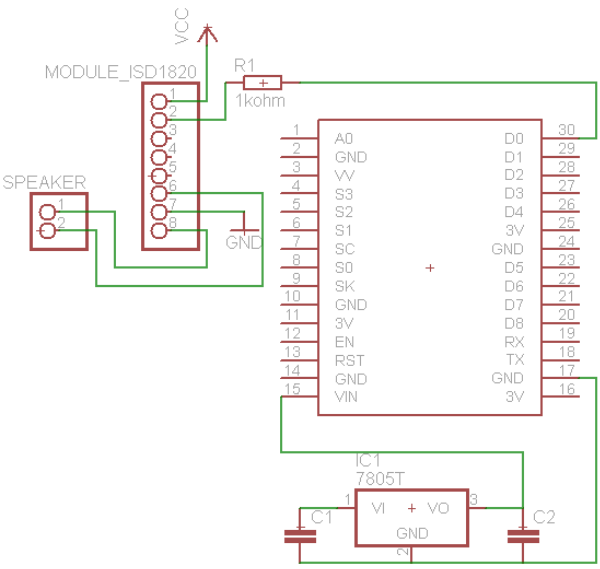
This circuit functions as a sound output on the designed tool system.



The 1st pin of the ISD1820 Module is Vcc: the 1st pin of the ISD1820 Module is connected to the Vcc NodeMCU ESP8266.
Pin 2 of the ISD1820 Module is Input: pin 2 of the ISD1820 Module is connected to the D0 NodeMCU ESP8266.
Pin 7 of the ISD1820 Module is Gnd: pin 1 of the ISD1820 Module is connected to Gnd NodeMCU ESP8266.

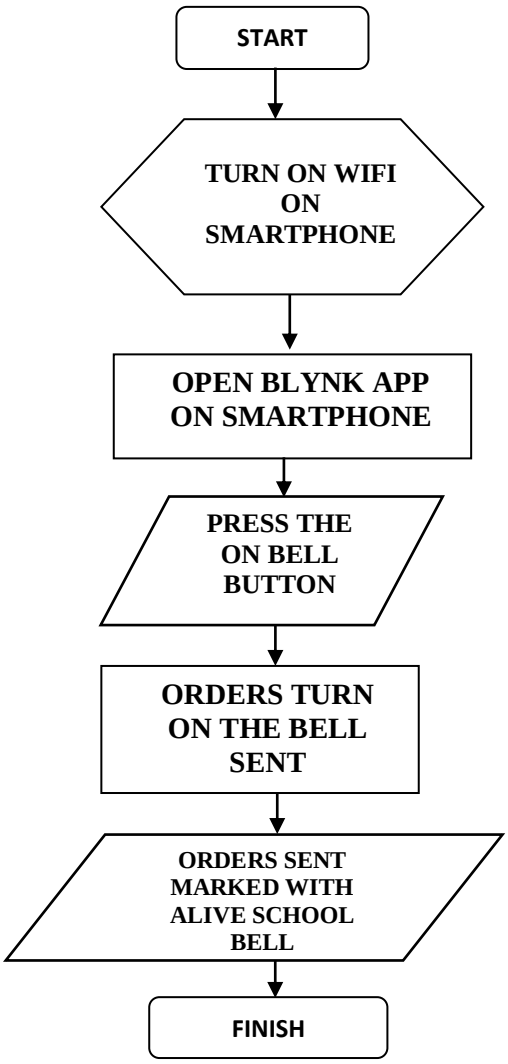
D. System Entire Circuit

This circuit is composed of the components needed to design the tool so that the data tool works as desired. In this circuit the 7805 regulator circuit serves to provide voltage supply from the battery throughout the existing circuit. The output of this regulator circuit is 5 volts. NodeMCU 8266 functions as a processor, data receiver, and WI-FI signal transmitter on the device system, and then the smartphone functions to give a command signal to turn on and turn off the school bell, which is where the school bell sound is generated by the ISD1820 module and speaker, and this tool also has a hybrid function that can be automatic and can be manual, and can send notifications to school leaders.

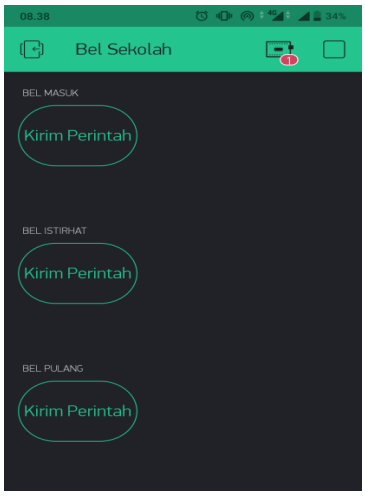


The configuration of the entire system circuit is as follows:
The Vo IC7805 pin is connected to the Vin NodeMCU ESP8266 pin.
The IC7805 Gnd pin is connected to the ESP8266 NodeMCU Gnd pin.
The 1st pin of the ISD1820 Module is Vcc: the 1st pin of the ISD1820 Module is connected to the Vcc NodeMCU ESP8266.
Pin 2 of the ISD1820 Module is Input: pin 2 of the ISD1820 Module is connected to the D0 NodeMCU ESP8266.
Pin 7 of the ISD1820 Module is Gnd: pin 1 of the ISD1820 Module is connected to Gnd NodeMCU ESP8266.

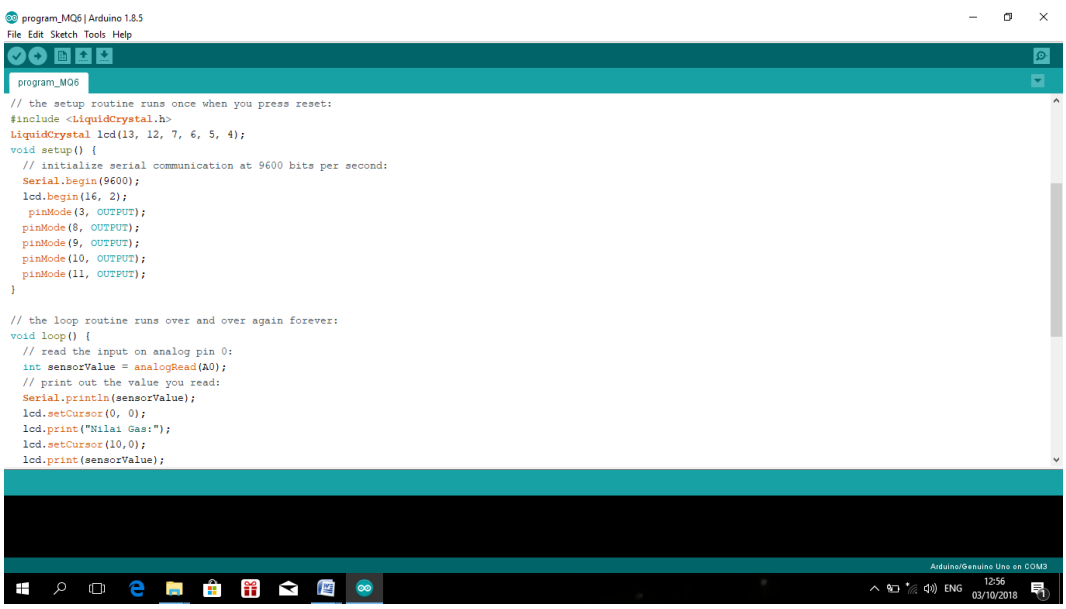
E. Program Flowchart on Smartphone



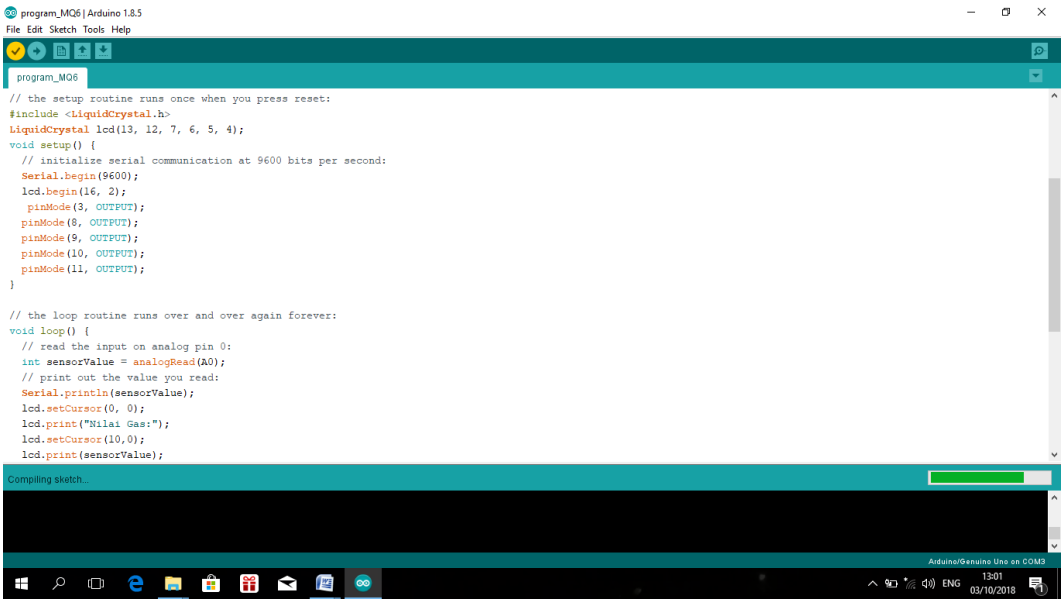
F. BLYNK Application Display On Smartphone



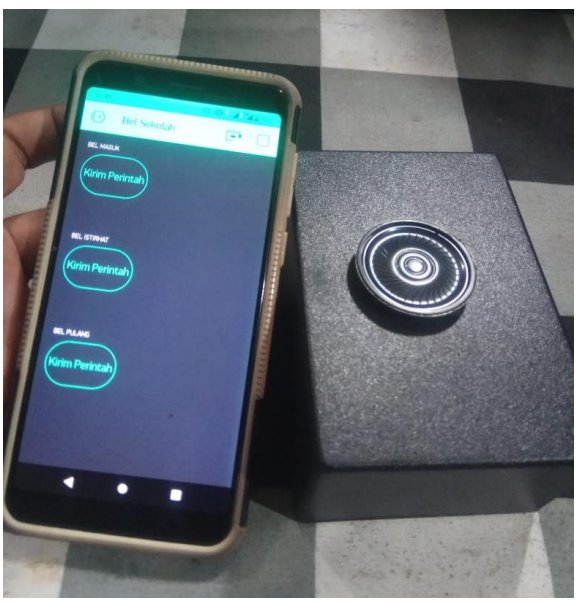
To find out whether the Arduino Nano Microcontroller circuit has worked well on the device, then a test is carried out by giving a command program to the Microcontroller by inputting data from the computer into the Microcontroller.
In performing the installation, first connect the computer to the downloader via a USB cable to the circuit



To continue the microcontroller installation stage, the program must first be checked by clicking the "Compile" button or this process icon serves to set the program into the Microcontroller Chip. It can be seen whether the program made has errors or not, if successful it will be written "No errors". Compile process can be seen in the picture



After the hardware device is programmed to the microcontroller and has been executed using the downloader, the program will automatically enter the microcontroller.



CONCLUSION

After carrying out the design and manufacturing stages of the system, which is then continued with the testing and analysis stage, the following conclusions can be drawn:

1. NodeMCU ESP8266 functions as a controller, data receiver, and data processor as well as a WI-FI signal receiver that can be connected to Android.
2. The android smartphone functions as an input signaling command to turn on the school bell using the WI-FI communication system.
   The ISD1820 module functions as a sound output that is connected to the speaker in the control system on the device.

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