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Automatic Microcontroller Based Smart College Electric Bell System with Time Display

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ABSTRACT:

The primary goal of our project is to implement a "Automatic college bell ringing system" using IOT. In our project, we employ four essential components: an IC RTC, an Arduino Uno Board, and a 16 x 2 LCD. As an alarm, an electric bell is employed, which will ring when the alarm is activated, and the date and time are displayed on the LCD module. We wrote the code in such a way that the bell rings every hour, according to the college schedule. We configured the bell to continue ringing for 10 seconds in each block of our campus at the same time by sending the information IOT. The primary benefit of this is that it provides

Keywords- Real Timer Clock(RTC); STM32;bell;timer.

1. INTRODUCTION

All of our springtime have been significantly impacted by academy bells. But indeed though a lot of effects have gone digital since the preface of technology, academy bells are still manual.Let's contemporize the academy bell by creating a digital interpretation that can do further than just ring. The council bell we produce is a digital bell that does the following tasks storing a timing schedule for the entire day buzzer sounding at the end of each period Capability to reprogram the board at any time The system uses an STM32 regulator, a Bluetooth module, a buzzer for the council bell, a 16x2 LED display with buttons, introductory electronic corridor, and a PCB board to make it. The STM32 regulator communicates with the stoner through the display.Both handling and settings modes are available.The system allows druggies to connect an Android handset while in setting mode. We use an app to program the schedule into the system once we're connected. The Android app enables druggies to enter the timings for moment's schedule into the system. The STM regulator keeps track of time and displays the current and forthcoming ages using an internal RTC.

2. BLOCK DIGRAM

Fig 1 depicts the block diagram of the automated bell system. The STM32 microcontroller, which we used as the master device, is the brains of the circuits. The main device is the RTC IC DS1307, which, once turned on, counts automatically every second. The microcontroller has already been loaded with the intervals of time after which the bell should ring. The bell sounds when the fixed time and the time on the RTC clock are in sync. The bell tolls constantly for a predetermined amount of time—10 seconds in our implementation—that is also specified at programming time.A 16x2 LED display with an STM32 controller a Bluetooth module, a buzzer for the college bell, and It is made with RAM buttons, common electronic components, and a PCB board.

The STM32 microcontroller implements the circuit. The RTC IC DS1037 is interfaced with this.The STM32 microcontroller reads the precise times through this serial port, where they are then compared to the set of times in the code. When the bell should ring, logic HIGH is sent to the microcontroller's output port.This tiny voltage serves as the relay circuit's enable, turning on the 230V to the bell and causing the bell to ring.

The system also includes a time display. Through its port pins, the microcontroller's RTC also outputs the time value that was read into it.

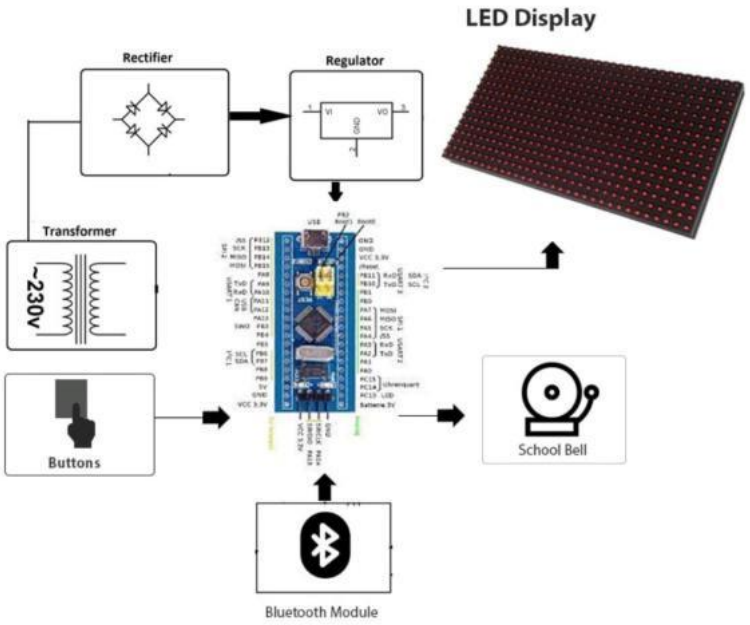
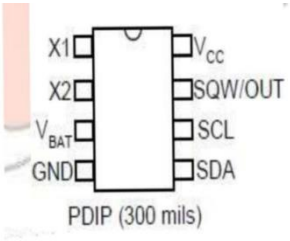


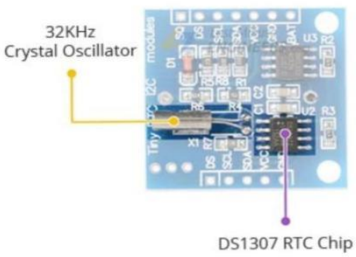
FIGURE 1.BLOCK DIAGRAM

3. REAL TIME CLOCK:

RTC (Real Time timepiece) measures factual time, including seconds, twinkles, hours, date, day, week, and time. It has 56- bytes of non-volatile RAM for data storehouse. Circuitry detects and switches when power fails automatically.In battery backup mode, with the oscillator handling, it consumes lower than 500 nA. voluntary artificial temperature ranges of-40 c to 85c are available. OPERATION tackle overview This module is grounded on the extremely competent DS1037 RTC chip and the AT24C32 EEPRAM, both of which have a long history and solid library support. DS1307 RTC CHIP It's in charge of all timekeeping functions and connects with the microcontroller through 12c. It has an AM/ PM index and may work in either a 12- hour or 24- hour arrangement. It automatically updates the date at the end of the month for months with smaller than 31 days, including vault time corrections. The SQW leg on the DS1037 is also interesting since it can be set to affair one of four square- surge frequents 1Hz, 4KHz, 8KHz, or 32KHz. The DS1307 IC includes a battery input enabling precise chronometer indeed when the device's main power is turned off. A 32- byte AT24C32 EEPROM is also included with the DS1307 RTCmodule. This chip has nothing to do with the RTC, but it can be handy for data logging or storing any other data that needs to tenon-volatile.



Pin diagram of RTCDS1307



The RTC serves as a slave device. To gain access to the machine, a launch condition is established. Registers can be penetrated successively when a STOP condition is handed. When main power goes below VBAT, the device ends the access and the device address counter is reset. As a result, when the main power is out, the device switches to battery power mode. During this time, inputs are limited to help data crimes. When the power is turned on, the device is connected to main power via battery power, and when input power exceeds VBAT, it recognizes inputs. The RTCDS1307 is used to track over the real time and day with the help of its internal registers. The battery backup handed for tracking the time when power is turned off.

4. STM32MICROCONTROLER

The microcontroller is configured as the master device in the operation of the automatic bell that we utilized.The microcontroller connects serially with the RTC(DS1307) ST microelectronics STM32. MCUs give a 32- bit product line that combines extremely high performance, real- time capabilities, digital signal processing, and low- power, low- voltage operation. This is fulfilled while maintaining complete integration and development ease.The unique and expansive range of STM32 bias, grounded on an assiduity-standard core and accompanied by a wide range of tools and software, makes this product family the right result for both small systems and platform opinions. The Arm Cortex- M cores(M0, M0, M3, M4, and M7) are now available in the STM32 range. This allows inventors the freedom to elect the stylish STM32 for their operations. Particular care is taken to accommodate operation porting from one device to another. When working with the STM32 family, the double comity, analogous leg out assignment, tackle IP proliferation, and advanced- position programming language make the development job significantly more accessible.

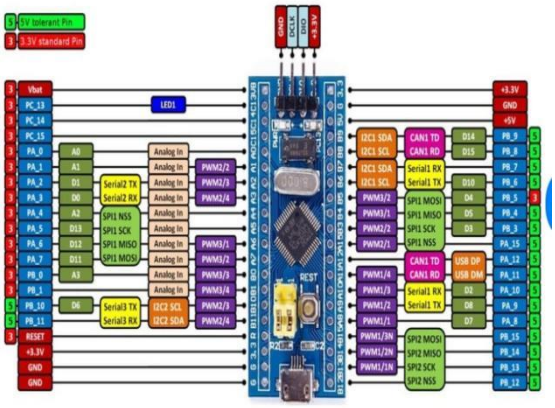


Figure 2 : STM-32 microcontroller

5. BLUETOOTH MODULE

Alarm systems are being employed in a variety of sectors similar as seminaries, modalities, and offices.However, the maturity of them are homemade automatic admonitions that work without mortal intervention.We want to produce a council bell grounded on RTC. It generates admonitions when the matching time triggers

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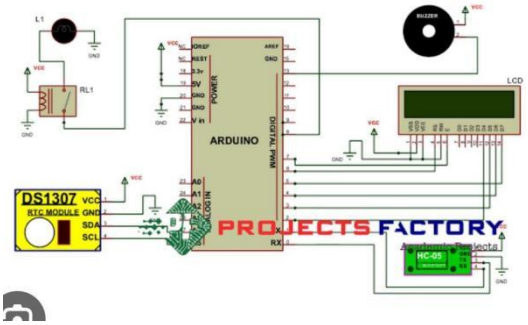


FIG 3 .BLUETOOTH GROUNDED COLLEGE BELL WITH RTC

The stoner can acclimate the date and time settings over Bluetooth. This design includes a Bluetooth(HC- 05) module that's linked to an Arduino through the periodical harbor age. The RTC Module(DS1307) is linked to the Arduino 12C connector and operates on demitasse frequency.The relay may operate the bell, which is linked to an Arduino digital pin.We may alter the date and time in this design using the Bluetooth app.The time is displayed in 24- hour format here.The stoner can make changes grounded on his needs.Relay- controlled bell with loud sound.All of these alarm settings are saved

in the Arduino EEPROM, so the cautions remain the same when we turn the Arduino out andon.The RTC time is always shown on the 16 x 2 TV display.

6. BELL BUZZER

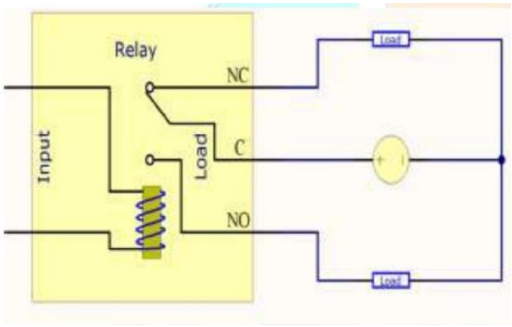
This autonomous college bell system's operation begins with the Real Time Clock module DS1307.This module provides real-time data to Arduino and maintains track of it.The time and date values from this chip will be routinely obtained by Arduino via the polling procedure.In addition, the user has five button inputs that they may use to set the hours, minutes, date, month, and year in the RTC chip.Continuously toggling these buttons will change the relevant values and save them in the RTC chip.The automated bell timer is operated by a relay controlled by a transistor switch.Because Arduino cannot supply enough current to activate the relay directly, the transistor switch is required. Adding a flywheel diode D1 will safeguard the remainder of the circuit. when the relay is turned OFF.

The buzzer emits the BEEP sound at the specified time.

7. RELAY

Relays are electromechanical devices that are used to isolate electrical circuits from one another. It is utilized to isolate the route circuit's high current. The input and output terminals of a relay are completely isolated. This property sets relay apart from other integrated circuits.

This sort of functionality is only seen in relay circuits.This circuit employs a 12V magnetic relay.An insulated copper wire coil is utilized to generate a magnetizing effect that attracts the plunger in the magnetic relay.The plunger is generally attached to the NC terminal. By connecting the plunger to the spring in the relay, the plunger is drawn upward.When the relay gets the output, the plunger is drawn in by the spring, and the bell is triggered.



RELAY CIRCUIT

8. REGULATOR CIRCUIT

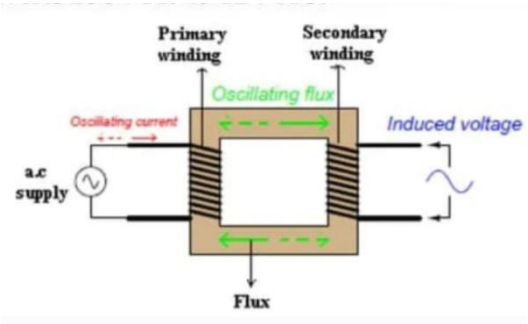
A voltage regulator is a circuit that generates and maintains a constant output voltage regardless of input voltage or load circumstances.

Voltage regulators (VRs) regulate power supply voltages within a range that is compatible with the other electrical components.

9.TRANSFORMER

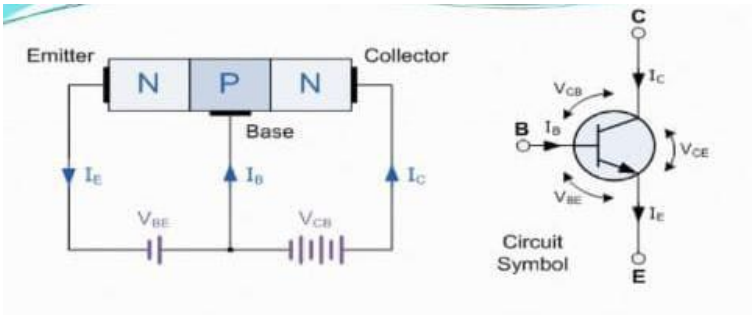
A transformer is a device that transmits electric energy from one alternating-current circuit to one or more other circuits, either increasing (stepping up) or decreasing (stepping down).

We employ a step down transformer in the power supply. It converts 230V AC to 12V AC.



10. BC547(NPN-Transistor)

The BC547 transistor is a silicon NPN Epitaxial transistor. The BC847/BC547 series 45V,100mA NPN general-purpose transistors are used for general-purpose switching and amplification.



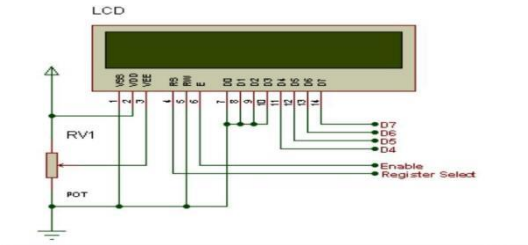
The ratio of two currents (Ic/Ib) is referred to as the device's DC current gain and is denoted by the symbol Beta(). The current gain from the emitter to the collector terminal, Ic/Ie, is referred to as alpha and is a function of the transistor itself.

11. LCD DISPLAY

LIQUID CRYSTAL DISPLAY

The most popular LCDs that are linked to a microcontroller are 16 x 2.

This translates to 16 characters per line by 2 lines. The standard is known as HD44780U, which refers to the regulator chip that takes data from an external source(and communicates directly with the TV).



If an 8- bit data machine is used the TV will bear 11 data lines(3 regulator lines plus the 8 lines for the data machine). The three control lines are appertained to as EN, RS, and RW

EN = Enable(used to tell the TV that you're transferring it data)

RS = Register elect(when RS is low(0), data is treated as a command)

when RS is high(1), data being transferred is textbook data)

R/ w = read/ write(when RW is low(0), the data written to the TV)

(when RW is low(0), the data reading to the TV)

12. PCB BOARD

where factors are attached to the board and the PCB is tested.A published circuit board(PCB) is an electronic construction that employs bobby cables to link factors electrically. published circuit boards support electronic factors mechanically, allowing a device to be put in an quadrangle. A published circuit board design must follow a certain set of processes that correspond to the manufacturing process, integrated circuit quilting, and bare circuit board structure. Bobby woolgathering, pads, and conductive aeroplane are exemplifications of conductive rudiments on published circuit boards. The mechanical structure is composed of an separating substance concentrated between captain layers. To give a legend for electronic factors, the whole structure is plated and covered with anon-conductive solder mask, and a silk screen material is published on top of the solder mask.Following completion of these manufacturing procedures, the bare board is delivered to published circuit board assembly

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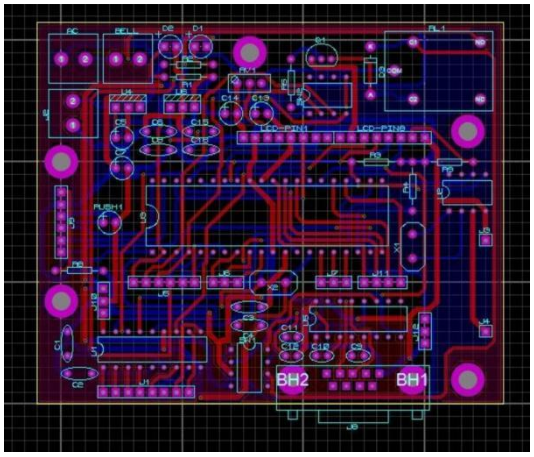

13. CLOUD STORAGE

The data sent by the microcontroller is stored in the cloud.The purpose of an API (application programming interface) is to store data in the cloud. To get data from the cloud, HTTP and MQTT protocols are utilized instead of the internet or a LAN.

The cloud is utilized to facilitate IoT applications. It has access to MATLAB, which is numerical computer program used for mathematical tasks. It enables users to study and view the type of data that must be supplied using MATLAB without obtaining a MATLAB license for MathWorks performance.

14. WORKING PRINCIPLE

In our project, an Arduino-based RTC is employed to maintain regularity in the bell ringing system across many locations. A RTC is made consisting of a battery that serves as a backup power source, allowing the clock to keep time even when the external power supply to the RTC fails. If the RTC time has changed owing to a power outage, the microcontroller must be reprogrammed with Arduino. An RTC uses an LCD display to show the time and date.The RTC is powered by 3V. The output of the stepdown transformer is 5V. As a result, a 2 Ohm resistor is used to communicate with the RTC. When the power is restored, the RTC displays the current time, regardless of how long the power has been off.RTC is utilized in all time-sensitive applications. The clock function offers all required information about the current time, such as seconds, minutes, and hours, whereas the calendar function provides information about the current day, date, month, and year. This clock can function in both 12 and 24 hour formats.

Arduino reads data and displays it on the LCD screen. utilizing Arduino code, data is delivered equally every 50 minutes to different receivers at various places utilizing IOT. The receiver system data storage cloud is employed for this data transmission between the main block and additional sites.

By applying the software, a signal is transmitted from the Arduino board to the cloud via transmitter every 50 minutes previous to the precise time. The cloud signal is delivered to the receiver at the precise time, the relay is closed, and the bell is activated. The same method sends another signal to the receiver to turn off the bell after 10 seconds. In addition to the standard time of class hours, there is an opportunity to vary the timing during examinations. The times are preprogrammed in both circumstances. It may also be switched from auto to manual. If a problem occurs, the system will be reset to its default settings.

15. SOFTWARE REQUIRED

Keil is an ARM company that produces C compilers, macro assemblers, real- time kernels, debuggers, simulators, integrated surroundings, evaluation boards, and parrots for the ARM7/ ARM9/ CortexM3, XC16x/ C16x ST 10,251, and 8051 MCU families. Compilers are programs that restate high-position programming languages into object law. Desktop compilers induce object law for the underpinning CPU but not for other microprocessors. The Programs Written in one of the HLL, similar as' c,' the law will be collected to execute on the system for a certain processor. For illustration, a compiler for the Dos platform differs from a compiler for the Unix platform, thus if one wishes to describe a compiler, a compiler is a software that converts source law into object law. .

16. CONCLUSION

Ringing the bell in a college or school nowadays is done manually. The biggest drawback is that just one person has to be aware of this. To address this, we have decided to design a circuit that will run automatically, and the ringing of the bell will begin at the specified time.

17. FUTURE SCOPE

As there may be numerous departments at a university at a distance on the same campus and desire to synchronize all department bells, the automatic college bell system employing lab VIEW may be expanded for further development.

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