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IOT BASED WIRELESS AUTOMATED BELL RINGING SYSTEM IN AN INSTITUTION

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ABSTRACT:

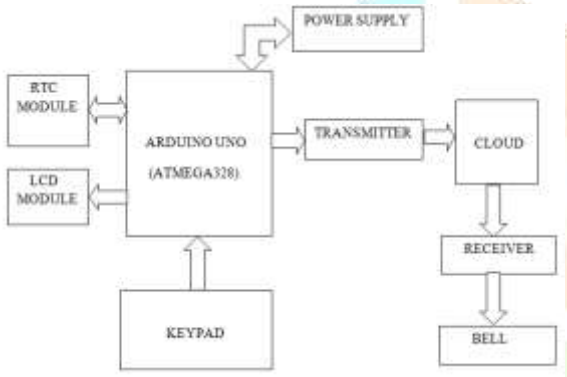
Implementation of an "Automatic college bell ringing system" using IoT is the main objective of our project. In our project, we use four major components which include IC RTC, Arduino Uno Board, 16x2 LCD modules and input provision to change the timing during Exam hours. Arduino is used here for reading time from RTC and display it on 16 x 2 LCD. An electric bell is used as alarm, which will ring when the alarm is activated, and so the date and time will be displayed on the LCD module. We have designed the code in such a way that the bell will be activated for every 50 minutes as per the college schedule. We have programmed in such a way that the bell would continue to ring for 10 seconds in every block of our college simultaneously by transferring the information via IoT, which will indicate the students and faculty of the institutions about the completion of a particular session in all the blocks in a simultaneous manner.

INTRODUCTION:

At present generation, wireless technology is adopted and used widely in every industrial and educational sector. In recent years, IoT play a major role in industrial area especially in automation and control sector. At present condition time is very important in everyone's life. Automation technology is used in various applications which involve controlled process machines, industrial processes, boilers and industrial ovens, telephone networking sites, stabilization and driving mechanism of ships and aircraft with minimal human application. Some of the industries and technologies are completely automated. Automation plays a major role in reducing labor, time and cost. It promotes to save energy, improve quality, accuracy, precision and efficiency. Usually, in a school or an organization a bell is used for the indication of start or stop of the process to the people, which indicates the status of the process. In recent days schools and college bells are manually operated. Manually operated systems lack in accuracy and also it involves manpower and money. Hence there is need of

automatic control system as it saves manpower and money and promotes high accuracy. In our project the main motive is to design an automatic bell ringing system and its implementation done on Arduino board microcontroller. An automatic bell ringing system is an electronic circuit which is used for automatic ringing of bell as per the given schedule without any human application. The primary aim of this project is to eliminate human intervention in the bell ringing process. The objective of our project is to construct an automatic bell system at low cost and robust model that could last for years with the least maintenance.

BLOCK DIAGRAM:



The block diagram consists of Arduino Uno, RTC module, LCD module, keypad, transmitter, cloud, receiver, relay and bell.

The Arduino microcontroller consists of EEPROM where the code is dumped and written in Arduino programming software using embedded C coding. RTC is added in the circuit, which counts every second automatically once enabled. The time intervals for which the bell should ring is preprogrammed and loaded in the microcontroller. If the present time matches with the time in the RTC clock, the bell will initialize to ring.

The trans-receiver module is used for sending and receiving the signal that is interfaced with the microcontroller. When the current time matches with the time in the program, the Arduino send the signal to the cloud via transmitter then the signal is received by the receiver.

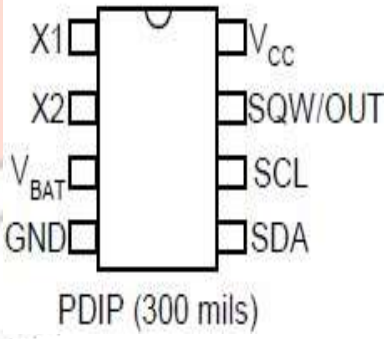
Once the signal is received by the receiver, the relay is set to logic HIGH, and then the bell will ring. Relay circuit is used to power the bell consequently for some seconds.

REAL TIME CLOCK:

RTC (Real time clock) measures the actual time which includes seconds, minutes, hours, date, day, week and year. It consists of non-volatile RAM of 56-bytes for data storage. Automatic power-fail detects and switches circuitry. It consumes less than 500 nA in battery backup mode with oscillator running. Optional industrial temperature ranges from -40°C to +85°C

OPERATION:

The RTC is a slave device. A START condition is implemented to obtain access to the bus. When a STOP condition is implemented, registers can be sequentially accessed. The device terminates the access and the device address counter is set to reset mode when main power falls below VBAT. Thus, when main power falls, the device switches to battery power mode. During this time the inputs are restricted to prevent error in the data. When power is on, the device is connected to main power from battery power and when input power is greater than 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 provided for tracking the time when power is turned off.



Pin diagram of RTCDS1307

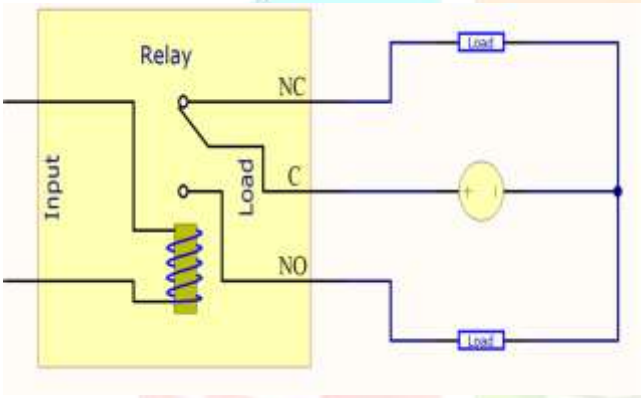
TRANS-RECIEVER MODULE:

The operating range of voltage and current of the receiver circuit is 3-12V. The receiver operating is 5.5mA. Without antenna the signal can be transmitted to a maximum distance of 3 meters. But with the help of antenna signal can be transmitted over a distance of 100 meters. The data transmission speed is about 10Kb per second. Circuit type of this RF module is Saw resonator.

RELAY

Relay is electro-mechanical device which is used for the isolation of electrical circuit from one circuit to another. It is used to isolate the high current in the path circuit. Relay provides complete isolation between the input and the output terminal. This feature differentiates relay from other integrated circuits.

This type of feature is only found in relay circui. A 12V magnetic relay is used in this circuit. An insulated copper wire coil is used to provide magnetizing effect which is to attract the plunger in the magnetic relay. The plunger is normally connected to NC terminal. The plunger is attracted to upper direction by connecting it to the spring in the relay. The plunger is attracted by the spring when the relay receives the output and thus, the bell is activated.



Relay Circuit

KEYPAD:

The eight pins of the microcontroller are used as outputs and inputs. For proper functioning of the keypad, pull down resistors are used in the microcontroller's input pins and thus, the logic gates are defined when the input pin is pressed. Then, output pins are set to logic 1 and input pins logic state is read.

Keypad inputs and readings:

Column	0111	1011	1101 s/ Rows
0111	1	2	3
1011	4	5	6
1101	7	8	9
1110	*	0	#

BELL:

The electric bell is connected to the Arduino board. It is connected through a switching transistor. The base of the transistor is connected to a 1K ohms pull-up resistor and the collector terminal is connected to the bell of the transistor. The emitter terminal is of the transistor is grounded. When the real time matches the predefined time, the relay set to logic HIGH. When the relay set to logic HIGH, the bell is set to ON state. When the relay is logic LOW, the bell is set to OFF state.

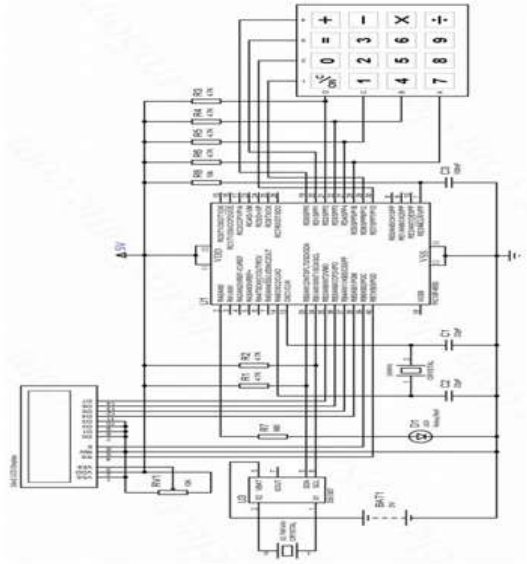
DISPLAY UNIT:

In this project, 16 x 2 LCD display is used. It is used to display the time, date and day. It also displays changes made by the authorized person in the keypad. LCD contrast is controlled by using 10k potentiometer. Current consumption is 1mA without backlight. The power supply can be set to 5V or on onboard +5 regulators. Each character is build by a 5×8 pixel box. LCD also displays the time.

CIRCUIT DIAGRAM:

There are three major interfacing circuits:

The microcontroller is interfaced with bell via relay. The microcontroller is interfaced with cloud via transmitter. The microcontroller is interfaced with the LED display board. The code is embedded into the Arduino Uno board by using the Arduino programming software. The RTC module and keypad module is given as the input to the Arduino board. The LCD display is the date and time program in the Arduino. The power supply of +5V is given to the Arduino. The RTC tracks the current time and send the time continuously to the Arduino. When the current time matches with the time in the program, the signal is send to the cloud via transmitter. Then the signal is received by the receiver from the cloud and the relay set to logic HIGH. When the relay set to logic HIGH, the bell will invoke.



Circuit Diagram

CLOUD STORAGE:

Cloud storage is used to store the data send by the microcontroller. API (Application Programming Interface) is to store data in the cloud. And to retrieve data from the cloud, HTTP and MQTT protocol is used instead using the Internet or a LAN (Local Area Network).

Cloud storage is used to support IoT applications. It has an access to MATLAB which is numerical computing software and it is used for Math Work. It allows the users to analyze and visualize the type of data that needs to be uploaded using MATLAB without purchasing the MATLAB license for performing MathWorks.

WORKING:

In our project, an Arduino based RTC is used for a uniformity in bell ringing system through different location. A RTC consists of battery which is used as a backup power so that the clock measures the time even when there is fault in external power supply given to the RTC. If the RTC time has changed due to power failure the microcontroller has to be reprogrammed using Arduino. An RTC displays the clock and calendar with help of LCD display.

The input to the RTC is 3V. The output from the step-down transformer is 5V. So 2 Ohm resistor is interfaced with the RTC. When the power is restored, RTC displays the real time irrespective of the duration for which the power is off.

RTC is used for all time oriented applications. The clock function provides all necessary details about the present time which includes seconds, minutes and hours, whereas the calendar functions provides details about the present day, date, and month and year. This clock can operate both in 12 -24 hrs format.

Arduino takes data and display it on the LCD screen. By using the Arduino programming, for every 50 minutes the data is sent uniformly to different receivers in every locations using IoT. For this data transfer between the main block and other locations receiver system data storage cloud is used.

By implementing the program, for every 50 minutes signal is sent from the Arduino board to the cloud via transmitter prior to 10 sec from the exact time. At the exact time the signal from the cloud is transferred to the receiver and the relay gets closed and the bell is set ON. Another signal is sent to the receiver to set the bell OFF after 10 sec by the same process. In addition to regular time of class hours there is an option to change the time during examinations. The timings are preprogrammed for both the cases. It can also be changed from auto to manual. If some error occurs there will be a master reset which sets back the system to normal condition.

CONCLUSION:

This project elaborates the drawbacks of manually operated bell ringing system and how this automatic college bell ringing system deals with these drawbacks. This automatic bell ringing system not only used for lecture schedule but we can also use it for examination purpose. We have constructively combined the college bell with RF module and LCD to display the notices. This project helps to ring the bell with high accuracy in time in all locations.

FUTURE SCOPE:

In this design, more advancement and upgrades can be done. The timings can only be edited by an authorized person. Another advantage is that the timings can be edited more number of times as per their wish. Another advantage is that it provides security since it uses a password. It can also be made by using GSM. Through GSM, the RTC can be controlled and so the timings can be edited.

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