Noise Informer Using Arduino Nano And GSM Module

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Abstract—**The proposed paper explains an alert system which informs about the exceeded noise at any place using announcing, SMS and phone call method. This system is designed using an Arduino Nano, Sound detection module, Micro SD card adapter, speakers with amplifier and GSM module as the main components. This system can be used in classroom to get informed about the exceeded level of noise. This system announces "Please Keep Quiet" for every detection of exceeded noise and waits for set duration for next detection and announcing. It does this process for set number of times and sends a message to the person whose mobile number in given in program after next detection of exceeded noise. It makes a phone call to set mobile number if it detects the next exceeded noise and restarts the process. This system reduces the dilemma of checking the noise status of a classroom during teaching hour from remote place.**

Keywords—arduino nano, GSM module, SD card reader, sound detector

I. INTRODUCTION

Now a day it is observed that the classroom control by the teacher in not possible for some teachers due to different reasons. This affects the neighboring classroom teaching and the daily routine causes the reason for making undisciplined student. The higher authority members have to take efforts to visit the classroom to get the actual status of the classroom to reduce this situation. Also, if the teacher is not available for some time in any classroom then students make noise and neighboring classroom gets disturb.

Taking care of this situation, a noise informer system is designed which first informs the students by making announcement of "Please Keep Quiet" for every time after detecting high sound in the interval of 2 minutes. The system repeats this process for five times and sends a SMS to the higher authority's mobile number which is set in the program on next detection. If the exceeded sound is detected again then this system makes a CALL to the person whose mobile number is set in the program. This system can send a SMS or make a CALL to different persons or same person depending on the mobile number given in the program.

II. BLOCK DIAGRAM OF SYSTEM

Figure 1 shows the block diagram of developed system. It consists of the following blocks.

1. Power supply using Transformer
2. Arduino Nano microcontroller
3. FC-04 Sound Sensor
4. Micro SD Card Adapter
5. SIM900A
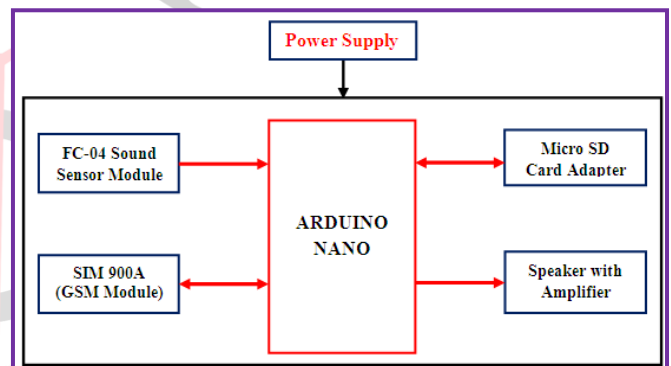**6.** Speaker with amplifier

Fig. 1. Block diagram of developed system

1. Power supply using Transformer

A transformer of (0-12V)/1A is used for designing the power supply of 5V. It consists of a bridge rectifier for rectification, capacitor for filtering and regulator IC7805 to get 5V regulated power supply as output voltage. This output voltage is used as power supply for all used modules and the components of this developed system.

2. Arduino Nano microcontroller

It is a small microcontroller based on ATmega328P-PU. Figure 2 shows the image of Arduino Nano board.
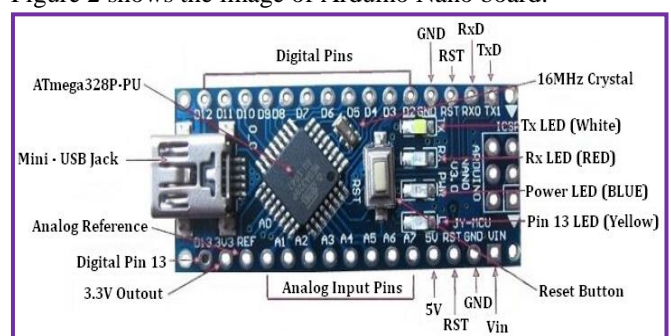

Fig. 2. Arduino Nano Board

Following are the features [1,2] of this controller.

- Its operating voltage is 5V
- Recommended input voltage ranges between 7-12 V
- Input voltage limit is 6-20 V
- It has 14 digital I/O pins
- 6 pins out of 14 digital I/O pins provides PWM output
- It has 8 analog input pins
- Current at each pin is 40mA
- It has 32KB flash memory
- 2KB of flash memory is used by boot loader

3. FC-04 Sound Sensor

It is a low cost and very sensitive to sound. It consist of a condenser MIC, level transducer, Op-amp comparator, Power and sound detection LEDs, POT and output connection point. Figure 3 shows the components of FC-04 sound sensor.

Fig. 3. Components of FC-04 sound sensor

The condenser MIC of the sensor module senses the present sound and gives to the level transducer. The output of this level transducer is connected to the input of LM393 Op-amp comparator[3]. This op-amp outputs a digital signal depending upon the pot setting which helps in changing the sensing level of sound.
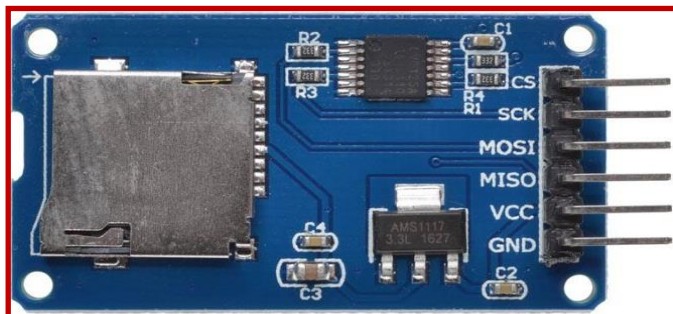
4. Micro SD Card Adapter

Fig. 4. Micro SD Card Adapter

This is a simple SD card reader module[4,5] which is generally used to communicate using SPI[6] interface with SD card. This module supports micro SD and micro SDHC which is used for high speed data transfer. It has total of six pins. These pins are CS, SCK, MOSI, MISO, VCC and GND. The pins SCK, MOSI and MISO are used for serial communication using SPI bus and CS pin is used to select the chip of this module.

5. SIM900A

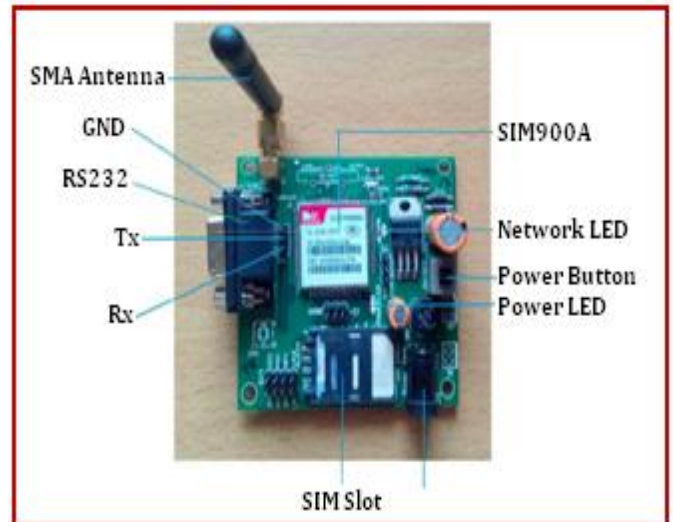Figure 5 shows the image of GSM Module (SIM900A).

Fig. 5. GSM Module (SIM 900A)

SIM900A is a GSM Module[7] that may be either any modem or a mobile. This module is used to make a processor to communicate over a network. This module establishes the communication at 900MHz frequency band. It uses a SIM card for its operation. It operates over a network range subscribed by the network operator. This module communicates with processor via Serial or Bluetooth connectivity. This communication is done using AT command[8]. The enhanced AT commands used by this module are 07.07, 07.05 and SIMCOM.

The following steps are used for the communication of this GSM module with any processor or controller unit.

- Insert the SIM card and lock it properly.
- Apply the power supply.
- If the network indicator LED blinks fast at the starting then wait till the network LED blinks with delay of 3 seconds.
- The blinking of this LED with delay of 3 seconds indicates the detection of network by the module and now it is ready for operation.

6. Speaker with amplifier

Figure 6 shows a speaker with inbuilt amplifier.

Fig. 6. Speaker with inbuilt amplifier

III.   WORKING OF SYSTEM

Arduino Nano controller is the heart of this system. The flowchart of the developed system is shown in figure 7. As soon as the power supply is given to the circuit, different modules get ready and the counter value sets to zero. The GSM modules starts to detect the network and as its network LED starts to blink after every 3 seconds. It indicates that the network is detected else it continuously blinks for every second. This network searching takes approximately 20 to 30 seconds. A reset switch available on Arduino Nano board helps for resetting the system.

The system waits for 2 minutes before starting the noise detection. After this delay, the output of sound detector module is checked by the controller. As soon as the first exceeded noise is detected by the sound detector module (FC-04), it gives a high logic level to Arduino Nano pin. This detection enables the Micro SD card adapter which holds a memory card with recorded sound. This sound is played using speaker having amplifier. The speaker announces "Please Keep Quiet".

The system announces every time after detecting the exceeded noise with interval of 2 minutes. This announcing is done 5 times in this system which is the counter value of the program. It sends a SMS to higher authority of the institution (or to any person whose mobile number is set in the program) indicating that the particular hall is noisy due to any reason after 6th detection of exceeded sound. If the exceeded sound is detected for the next time then it directly makes a phone call using the SIM of GSM to the person whose mobile number is set in the program. The delay of 2 minute of the system makes the total 10 minutes noise detection with announcement, at 12th minute it sends SMS and at 14th minute it makes a CALL to person whose mobile number is set in program.
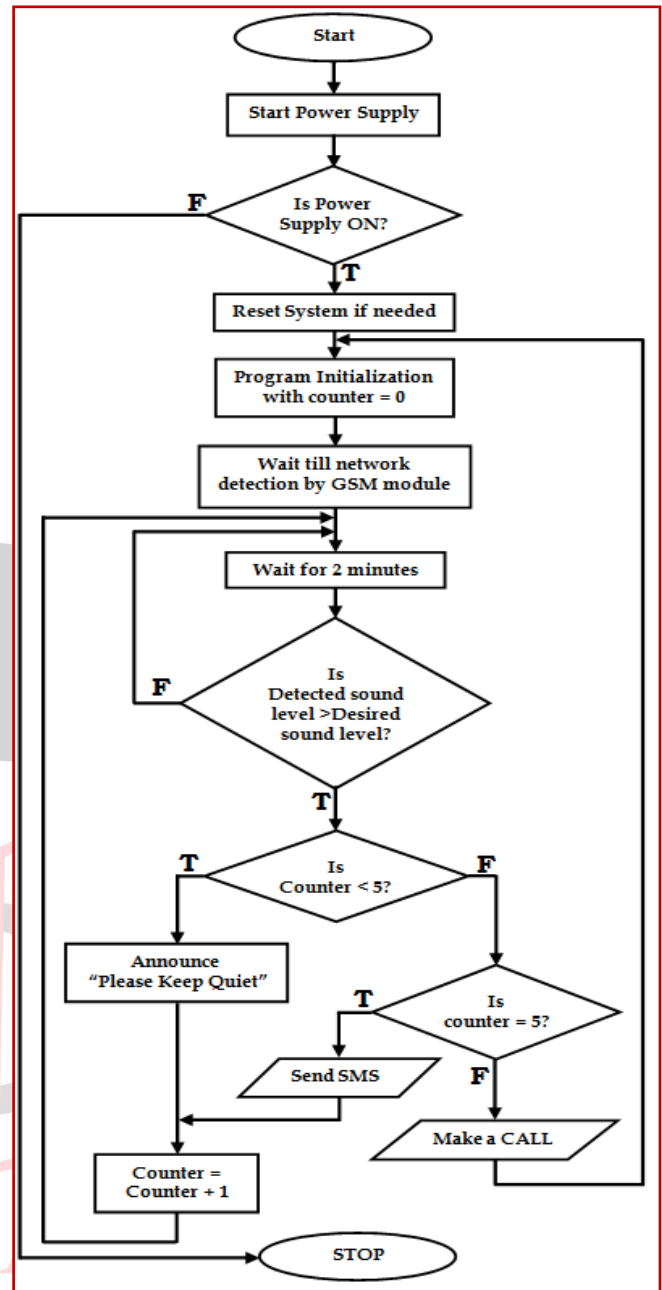

Fig. 7. Flowchart of Developed System

So this developed system can be used to monitor the classroom of any school, college, coaching class or any hall. Its reset switch can be use to reset the counter for every start of new period or lecture. This system can also be used in Hospital, Meeting hall or practical laboratory.

IV.   SOFTWARE AND HARDWARE IMPLEMENTATION

The complete system is designed using Arduino Nano as the central control unit. Arduino IDE(Integrated Development Environment) is used to program the Arduino Nano module. The FC-04 is the sound detector sensor module used to detect the noise beyond the set level. A Micro SD card reader module having a SD card holder is used to read the pre-recorded file saved in SD card.

A GSM Module (SIM900A) is interfaced with Arduino Nano to communicate with it. This module is used to send SMS and make a CALL to set mobile number as in program. A speaker with inbuilt amplifier is used to generate the sound of recorded file. The proper communication between all these devices makes this unit successful for using at any desired place. Figure 8 shows the image of developed system.
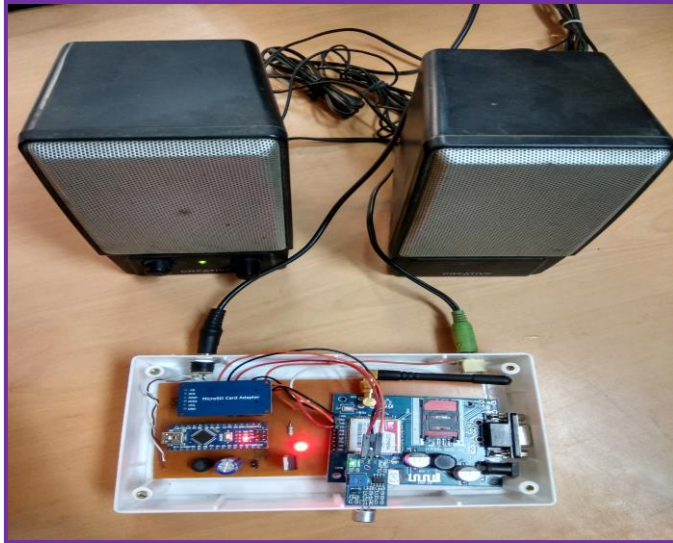

Fig. 8. Image of Developed System

V. CONCLUSION

The developed system is checked several times with every type of sound and successful result was observed. The announcing, sending SMS and making the call was properly done by this system. The delay in sending SMS and calling was observed same as the normal delay between establishing the connection between two mobiles. So the developed system can be used at the place where monitoring of noise level is necessary.

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