

Cutting Edge Classroom for Futuristic Students

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Abstract :- In this paper it mainly presents the design of hi-tech classroom which is mainly embedded with different systems. This is the place where young minds are being developed with various technologies at different schools and institution. This system is mainly based on automation, in such a way that most of the electrical equipment and switches are controlled using GSM mobile phone without any human efforts. It also includes digital board which has replaced the traditional chalk and board system, the attendance system which uses the image processing technology for monitoring attendance. The main advantage in this system is that it can be implemented in any available infrastructure without much change. The outcome of the proposed system is to build an energy efficient system which has reduced lots of human efforts.

Keywords: - Automation, Smart Classroom, ICT, GSM, Arduino

I. INTRODUCTION

Now a days most of the classroom are equipped with the various advance technology such classroom are termed as smart classroom [1]. Such systems are readily implemented in the developed countries, but the implementation of such system is quite less in the developing system. Traditional teaching styles must be replaced with the advanced learning system as the technology is advancing at a rapid rate so we need to adopt this change. This classroom consists of image processing based classroom attendance system, which scans each and every student attending the lecture and thereby recording the attendance of each student [2]. E-learning is the most prominent change in the field of education. The boards which are being used in the smart classroom are interactive smart board which uses stylus/jockey to carry out different work. About 90% to 95% of the people in India are using cell phones which are equipped with the GSM technology. So this technology is being used in the classroom to control various devices, switches and instruments using cell phones. This can be achieved by interfacing GSM module with the arduino board and thus status of the load whether it should be on/off is being controlled through cell phones. Thus e-learning is the most prominent change in the field of education and has revolutionized the world.

II. CLASSROOM LOAD CONTROLLER USING GSM

Mobile phones and internet has transformed every individual's life. Their use and application in our day to day life is increasing at an vigorous rate. Their

advancement in the field of education has empowered the whole education system and has been taken to the most advanced level.

Thus each technology that we are using has its own advantages and disadvantages.

The users can openly access the information using the networking and web server. With the ICT communication takes place across any part of the world. It controls the information and get access over the various processes and can monitor the work.

With the advancement in the information and communication technology system has become much complex and with that special trained person should be assigned to operate it in efficient way. The person which is going to use that technology has to undergo special training to use it efficiently. This technology is open access to all so there is a threat of hacking, spams and virus spread over the system. Under such conditions if any part of system fails the whole system get affected

GSM is global system for mobile communication, which is mainly used for transmitting voice and data from over wide system. The rate of data transmitted through GSM is transmitted at the rate of 64KBPS to 120MBPS. It provides the voice and data service to the users. Any digital network can be easily connected and get access over it. It has improved the spectrum efficiency.

GSM based classroom automation system can be used to control different appliances. These appliances can be controlled by sending message to the GSM module. Any GSM mobile can be used to turn on or turn off the load, for this system it is not mandatory that mobile phone should be smart phone.

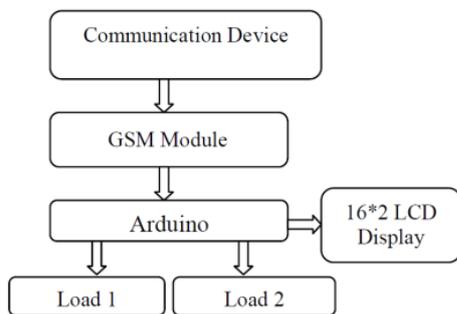


Fig. 1 Automatic Lighting System by Using GSM

Arduino is used for controlling the whole operation of the system. From the figure 1, signal is sent to GSM module through different communicating devices. Due to the interfacing between GSM module and arduino, signal is passed through arduino. And arduino sends signal to the relay and the load gets turn on or turn off depending on the nature of the given signal, Whether the signal is of turn on/turn off.

III. SMART APPROACH TO CLASSROOM DOOR LOCK SYSTEM

The advancement in the field of technology has replaced the traditional lock system with the digital lock system i.e. password based door lock system. The old traditional door lock system require lock and key arrangement, but this advance system is the combination of both mechanical and electronic technology. Auto door lock system mainly consists of electronic control assembly, when user enters the correct password they get access over the system. This system uses the 8051 microcontroller and a 4*3 keypad which is used to enter the password. When the password is entered by the user it compares the entered password with the predefined password which is defined in the code of microcontroller as shown in fig. 2.

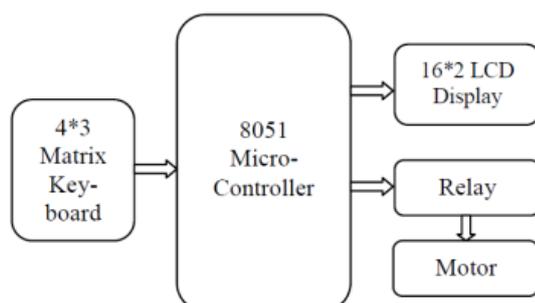


Fig. 2 Block Diagram of Automatic Door Lock System

If the password entered matches with the predefined password then signal is sent to the relay through microcontroller and thus relay operates. After the relay operates the motor starts to run and opens the door, and status of the door is indicated on the LCD screen as "DOOR OPEN". Fig 3 shows the simulation of door lock system on proteus software.

After the door opens the delay of 10 seconds is given by the microcontroller, after 10 sec microcontroller sends signal to the relay. After the relay operates it rotates the motor in reverse direction and door closes.

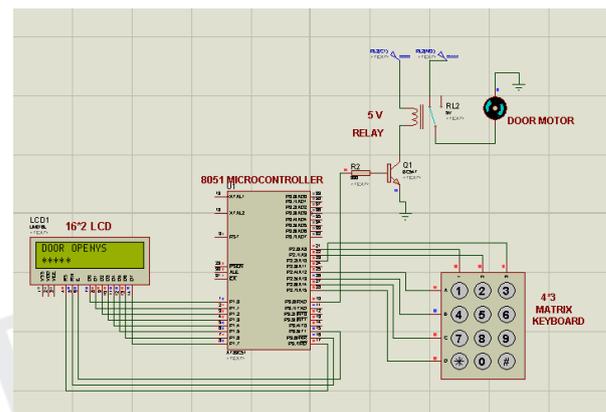


Fig. 3 Simulation of Door Lock System

IV. AUTOMATIC PROJECTOR SCREEN CONTROLLER

The use of projector has been widely increasing, especially in the educational sector. The use of conventional method of teaching is being extinguished. It helps the student to visualize the concept with the help of videos, slides, animation images, etc. In most of the school and colleges the projection screen which is being used are mostly operated manually.

For the smart classroom this operation of projection screen should be done without any human intervention. Driver shaft and crown adapter which are rotating part are coupled at both the ends with the motor which is stationary part. This whole assemble is enclosed in the hollow cylindrical tube around which the projection screen is wound.

This cylindrical tube is placed in the molded hollow case. The tubular motor is connected to the up and down counter. So when the down counter is applied to the motor then it will unwind the projection screen similarly for the up counter it will wind up the projection screen.

Consider the motor requires total 10 rotations to unwind the projection screen, if during unwinding of screen due to power cut-off the motor get stopped after 7 rotations then after regaining of power the

motor will complete its remaining 3 rotation so that complete unwinding of projection screen takes place.

In this system, the tubular stepper motor is used which runs on 230 V 50HZ AC supply.

Calculations: Input voltage = 230 V,

Input Current = 0.58 A

Output Power = 132 Watts,

Rotations per Minute = 15

$P_{in} = V \cdot I = 133.4$ Watts

$\omega = 2 \cdot \pi \cdot N / 60 = 1.57$ Rad/sec

$P_{out} = T \cdot \omega$

Motor Torque $T_m = 0.8403$ N-m

Load Torque $T_L = 0.5 \cdot D \cdot W$

$= 0.5 \cdot 0.045 \cdot 19.62$

$= 0.4414$

(1 Kg = 9.81 N)

Diameter of Tube = 4.5 cm

Projection Screen Wound in 1 Rotation = $2\pi R = 14.13$ cm

For 10 RPM 141.36 cm Required

For 10 Rotation 40 Sec Required

V. AUTOMATED SUNSHADE CONTROL

This system is mainly implemented to open and close the window curtains. So every time we don't need to close and open the curtains manually. This system is mainly used for medium sized doors and windows. Due to the compact size of this whole system, it can be easily fixed with the curtains of the doors and windows. Different adapters which are available in the market can be used to provide power to the system.

Depending on the intensity of sunlight outside the window the position of the curtains vary according to it i.e. if the intensity of sunlight outside the window is more then the curtains should be totally closed and if the intensity of sunlight is below the set threshold value then curtains should remain open [4].

BH1750 is the light sensor which is used to measure the intensity of light which is in the range of 0-65,535 LX. Intensity of sunlight is ranging from 30,000 LX to 1,00,000 LX. If we set the threshold value at 28,000 LX. If the measured intensity of light is above 28,000 LX the light sensor sends the signal to the arduino and thus command is given to the motor to close the curtain. Same in the case of opening the curtains but here the value measured by the light sensor is below 28,000 LX. The light sensor sends the signal to the arduino and thus /arduino commands the motor to open the curtains.

In this whole procedure complete operation is carried out without any human intervention.

VI. CLASSROOM ACOUSTICS

Classroom acoustics are not given much preference while building particular classroom. Various noises, echoes, reverberation are to be considered. If the outside noise is more then the students will face difficulty in hearing direct speech from the lecturer. Normally intensity of human voice is less than 55dB which is up to 3ft beyond it the intensity of voice decreases.

Reflected sound can be utilized in order to increase the hearing capacity of the students. In order to get maximum benefit of these reflected sound energy following are the conventional methods:

- Surface must be flat, sharp edges must be avoided instead of it use curve edges so that it reflect sound energy easily and thus intensity of it get increased.
- Classroom sidewalls and ceiling must be reflective in nature in order to maximize intensity of sound signal.
- Cover the surface which are not useful in reflecting the sound signal. E.g. cover the entire floor with carper, which will also helps in reducing the noise.
- Cover the back wall of the classroom with the absorbent materials in order to reduce the effect of reverberation and echoes.

Modern Method

It is the most effective, affordable and widely accepted way for enhancing the learning in various classroom i.e. use of sound system. This system consists of the sound speakers which are placed at different locations in the classroom. This system allows the student to easily listen to speech which is delivered by the teacher.

Thus above two methods must be taken into consideration in order to build acoustically best classroom

VII. GARBAGE MONITERING SYSTEM

People are too busy that they had no one time to look after their thrash cans and empty it when it get completely filled with thrash. Sometimes the cans get overfilled with the thrash and the it get accumulate around the cans. So this pollutes the environment.

IOT inter-relate the physical world with the electronic system i.e. computers, mobiles, etc. IOT is one of the innovative and best available method which can be used for automation purpose.

IOT based smart garbage system can be used to indicate the level of the thrash cans and can be

monitored from anywhere in the world using internet server [3]. The model is so compact that it can be fitted at the top of the cans and thus the level of the cans is indicated on the device.

This system uses ultrasonic sensor to determine the level of trash. Which is fitted at the top of the can and according to the size of the cans i.e. in terms of height we will set the threshold value. If the value is less than threshold value then it will show the "can is full" otherwise it will show the "can is empty". WIFI module is used for interfacing between arduino and web server.

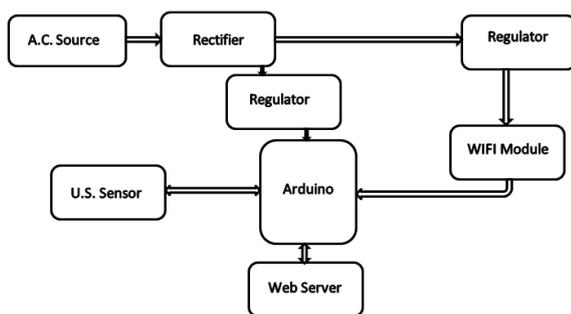


Fig. 4 Block Diagram of Garbage Monitoring System

Transformer steps down the ac voltage and provides required voltage for the circuit. This voltage is feed to the rectifier and thus the rectified dc voltage is passed through regulator for obtaining pure dc voltage. This DC voltage is feed to the arduino and Wi-Fi module through different regulators. The Wi-Fi module is further connected with arduino which operate on 3.3v. Ultrasonic sensor is further connected to the 5 V and ground of the arduino. Fig.4 shows the block diagram of garbage monitoring system.

Ultrasonic sensor emits sound waves of 40 KHz, it travels at a speed of sound and if any object come in its way it reflect back. So by knowing the time required to strike the object and reflect back we can calculate the distance of that object from sensor. Depending on the distance arduino will send signals to the web server.

Smart Board

The traditional white board is being replaced by the interactive smart board. The computer and the projector system are interconnected through these interactive whiteboards. Here human acts as input device just like mouse in computers.

The computer system is connected to the projector, thus it projects the computer display on the projection screen i.e. on interactive white board. The motion of our finger or the stylus are detected by the infrared light at the surface of the interactive board.

When we move the stylus over the interactive whiteboard because of software embedded in the system it move the pointer according to the movement of stylus. When stylus is pressed against the interactive whiteboard in one way it act as a left click of the mouse. If it is pressed against the board in some other way then it acts as a right click of the mouse.

Various software which provides different tools just like virtual notebook which has tools like pen, eraser, set square, protractor, scale, etc. It gives a sensation as if we are writing in the notebook. Audience response system is uses to increase the interaction between audience and presenter. It helps the presenter to get to know the views of the students over the topic. Any time the presenter can conduct the test using the audience response system and gets instant result. Thus presenter get to know in which part students are actually lagging and revise that part again.

VIII. IMAGE PROCESSING BASED CLASSROOM ATTENDANCE SYSTEM

This system is mainly designed to record the attendance of the student attending the lecture. There are different methods such as finger print based attendance system, NFC based attendance system and many more. So in such systems student has to rush towards attendance machine for the attendance. As technology is advancing rapidly so most of the work are being done automatically.

In this system we are using two cameras one on the ceiling and other in front of seats so that it should be facing the students. First of all camera determine the seating arrangement of the students. First it capture the image of the vacant class and then it captures the image of the class occupied by the students. By using the image-frame subtraction system get to the seating arrangement of the students in the classroom. So the other camera select the student from the seating arrangement provided by the first camera setup, and capture the image of the student's one at a time. The captured image of the students is recognized by the system. Thus attendance of that particular student gets counted.

If the student is absent for particular lecture then message will be sent to the parents as well as student. And by every month end student get to know that in which subject he/she is lagging i.e. attendance is less than 75% through message.

IX. CONCLUSION

We have designed this system in order to decrease the human efforts to the maximum extent. We have not given much importance to build the energy

efficient system but surely it will help to reduce human efforts. This system is safe, reliable and easy to install in any classroom.

- The fusion of different technologies and practicing along with it results in much high rate of success.
- Different activities being performed in classroom will significantly related to the development of various skills in them.
- Importance of software is significantly more than that of Hardware when trying to achieve success.

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