Controlling and Monitoring of Classroom Using Programmable Logic Controller (PLC)

Kruthika B.S[1], Jeevitha J[2], Harshitha B.M[3], Meghana K.S[4], Prof Hemanth Kumar S[5]
[1,2,3,4,5] *Department of Electrical and Electronics Engineering, Vidya Vikas Institute of Engineering and Technology, Mysuru, VTU Belagavi Karnataka, India*

***Abstract*- Technology updating in day today's life likewise in education system as well where automation up gradation has to be done hence our project is trying to put an effort to make a normal classroom into the an updated version of classroom .**

"Controlling and Monitoring of Classroom using Programmable Logic Controller (PLC)" is an intelligent system mainly focuses on managing all the electrical system and monitoring the classroom using automation technology. It is the dual functioned project where both controlling the loads in which Fans and lights are turned ON/OFF and monitoring the classroom is done which counts the number of students presence and absence. It is employed to improve the energy saving of the classroom. The serves is done by providing a right amount of electric where and when it I s needed.

PLC is utilized extensively for automation of electromechanical process. It provides reliable communication of classroom automation with reduced cost. In this project, we propose the idea of designing a smart energy saving classroom to optimize the energy consumption. The PLC is easy to understand and the system provides multiple solutions using single component. Although new but more efficient than previous systems, the PLC can become the epicenter to many new applications. Once the system is designed and implemented the only cause is that of maintenance. Each component serves a purpose in this system. Relays are used to control the output mode of operation. SMPS (Switch Mode Power Supply) works as a rectifier which used to convert AC current to DC current. So we can say that this new idea will be an innovative in the field of automation and smart technology in classroom.

***Index terms*- PLC, Relay (DPDT), SMPS, Infra-Red through Beam Sensors, Temperature Sensor, Light Intensity Sensor**

I.INTRODUCTION

Nowadays electricity usage is more as technology updating day by day. As every equipment is run by giving power supplies in automated version and its demand also increasing because of its usage also more. Since it's became necessary to wise usage of electricity and not to waste the power. These situation can be commonly found in schools, collages where after using of fan and lights according there comfort zone either faulty in charge of the classroom or student of that particular classroom forget to turn it off by leaving the classroom and the security guard will takes time to check each classroom in the building which leads to loss of power. Hence By using PLC (Programmable Logic Controller) an automated version of hardware machine which runs the fans and lights whenever is needed by detection of signal though sensor installation energy usage will be done precisely by this we can reduce the power losses and also students monitoring will be done which reduces time consuming as well.

Energy is expensive, every appliances which is been in daily life is run by electric energy either in industrial or residual field.

The number of Students presence in the classes which is majorly must be taken into the consideration in a classroom. By taken this into the consideration students monitoring has done where it helps to reduce attendance recording. Student's class session held in sunny days will save electricity but in other season days we need to save electricity. Monitoring student's attendance will help to record student academic performance. It integrates the lightning and fan control system. Therefore, energy saving is very essential in reducing the costs of the energy.

II PROBLEM FORMULATION

In Education system both students and lecturer comfort zone consideration is important like usually classrooms are made up of concealed building where not much air can come through windows especially

in summer season, hence fans are necessary so that fans and lights which are already installed as well as we need to think of wise usage of electricity is also important. This project proposes a smart energy saving and monitoring of classroom using PLC which gives both comfort zone and efficient use of electricity. Since it often happens with students and faculties forgot to turn off the electrical components before leaving their class rooms and security staffs need to check all the classrooms one by one weather all electrical components are switched off or not. It takes a lot more time to the staffs to check the status of all the electrical components. And also in a school or colleges maintaining the students attendance every day and record it, is also one of the difficult part which consumes a lot of time.

III PROBLEM SOLUTION

The above problem statement can be minimized by designing a Network that contains relays, SMPS, PLC, and Sensors which provide the easy access. By using the sensor students presence will be detected, through counter it counts the number of students which will be recorded and also turn ON/OFF the loads (Fans and Lights). IDE is used to program the PLC in Ladder logic programming language and Relays are used for latching and interlocking and to protect the outputs. The Source type input wiring and Sink type of output wiring is carried out in PLC input/output ports. In the source type of wiring 24V is supplied common .The sink type of wiring is mostly preferred in case of output wiring so that the outputs can be protected. The use of this technology results to reduce the wastage of electricity, fatal accidents and also will help to monitor the classroom.

IV MATERIALS

A. Programmable Logic Controller(PLC)

A programmable logic controller (PLC) is an industrial grade computer that is cable of being programmed to perform control functions. The programmable controller has eliminated much of the hardwiring associated with conventional relay control circuits. Other benefits include easy programming and installation, high control speed, network compatibility trouble shooting and testing convenience and high reliability.

The programmable logic controller is designed for multiple input and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance vibration and impact. Programs for the control and operation of manufacturing process equipment and machinery are typically stored in battery- backed or non- volatile memory. A PLC is an example of a real time system since the output of the system controlled by the PLC depends on the input conditions.

Initially the PLC was used to replace relay logic, but it's ever increasing range of functions means that it is found in many and more complex applications. In addition to cost saving, PLC provide many more other benefits including increased reliability, more flexibility, communications capability, faster response time.

B. Power Supply

Switched-mode power supply (SMPS) is an electronic power supply. Switching regulator to convert electrical power with efficiently. SMPS transfer power from DC (or) Ac source DC loads, switching mode supply continuously switch between low dissipation, full On and full OFF status. SMPS output voltage and current can changes by switching ideally losses storage elements it is used to drive the switching elements, switching transient and ripple introduced into the output waveforms can be filtered with a small LC filter.

C. Relay

It is a switch which can be operated both electrically and mechanically & also consist of an electromagnet with set of contacts. A relay is a switch one or more poles each pole has contacts that can be thrown in mainly three ways. DPDT is also one of that which is used to control a NO and NC contact with common terminal. They are called by names brake before make and make before break contact.

D. Beam Sensors

Infrared (IR) break-beam sensors are the motion sensor which detaches an object or a person around it. As an object/ person who come across this beam sensor it detects the presence of it by infrared radiation.

E. Temperature Sensor

It is a device to measure the temperature through an electrical signal. It is require a RID [Resistance Temperature Detectors] or thermocouple. Temperature sensor is a measurement of the hotness or coldness of an object. This sensor is working base of the sensors of the sensors, voltage that read across the diode.

F. Light Intensity Sensor

This sensor is a device which converts light energy of various waveforms from infrared to UV into the Electrical energy. So that it is called as photoelectric devices this sense the light during this process, so can be called as Photo sensors. It varies from that respond to changes collect current or hold voltage depending on light levels.

V IMPLEMENTATION DETAILS

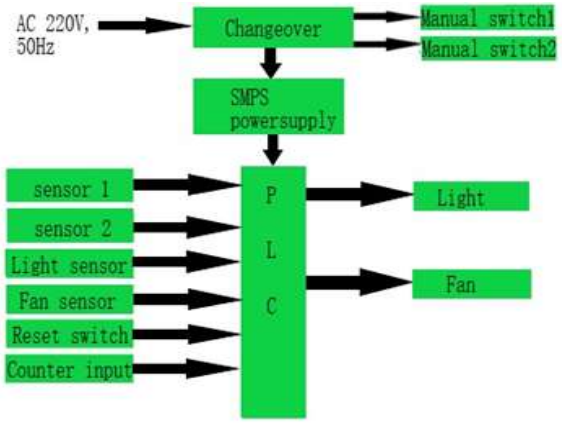
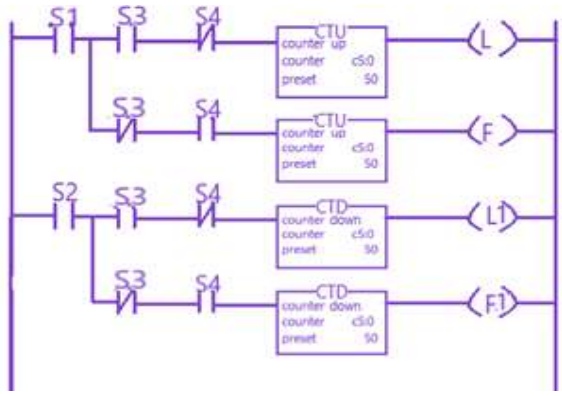


Figure 1 Architecture of Smart Classroom

In this block diagram there are fans and lights, these appliances are automated. There are two doors one for entry and one for exit. Through the two beam sensors installed at the door for sensing the entry and exit. A temperature sensor and light intensity sensor is also installed in room. The working of block diagram in two modes: first is manual mode in which all the appliances get turned ON/OFF through switches and other one is automatic mode that is PLC mode. In PLC mode all the other appliances of the room get turned ON/OFF automatically through switching and also though counter the students attendance will be recorded.

There is a changeover is installed for switching between PLC mode and manual mode. Other controlling consists of four toggle switches. These switches are for pre-setting the appliances to control in PLC mode.

PLC Ladder Logic:



(S1- Motion sensor[entry], S2- Motion sensor[exit] , S3- light intensity sensor , S4- temperture sensor) inputs; (L- light on, F- fan on, L1-lighs off, F1- Fan off) outputs;

When an student entry the motion sensor detects likewise number of students will be entered the counter up will countdown the number of students attending the class, even its one more students as it will be already feeded as the dark atmosphere surrounds the class the light intensity sensor detects then Lights are turned ON, correspondingly as the temperature increases though temperature sensor it detects then Fan is turned ON. Also after the class as student exit from class the number of students presence will be reduced by counter down and after all students exit Lights and Fans are tuned OFF.

VI CONCLUSTION

This work is the result of finding a solution for building a smart classrooms which help in both energy saving and monitor the classes in schools and college campuses. The modernization of the electrical control system can be effectively achieved by designing a control panel having the automation equipment like PLC, Sensors and Relays. This control panel can provide the easy access of electrical equipment to the user and can also save time. This project can help to minimize the wastage of electricity, save time and reduces the complex conventional wiring system.

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