EasyChair Preprint

№ 2956

Building Automation using PLC

Rehan Sayed, Bhupendra Bomble, Ariz Usmani, Ajay Chaudhary and Sangeeta Pattankar

March 14, 2020

Building Automation using PLC

[1]Rehan Sayed, [2]Bhupendra Bomble, [3]Ariz Usmani, [4]Ajay Chaudhary, [5]Mrs.Sangeeta.k.Pattaankar
[12345]Department of Instrumentation Engineering
A.C.Patil College Of Engineering, Navi Mumbai, Maharashtra 410210
[1]sayedrehan65@gmail.com, [2]bhupendrabomble@gmail.com, [3]usmani.ariz@gmail.com,
[4]aj.illumuinati369@gmail.com, [5]skpattankar@acpce.ac.in

ABSTRACT

Building automation is an integral part of modern lives that help to monitor and control the home electrical devices as well as other aspects of the digital home that is expected to be the standard for the future building With the rising power of technology, It is able to accomplish things at a much quicker rate .By simply at the touch of a button access to large amounts of information due to the capability of computers and the Internet. Not only has technology given us more information, but it also has given us the ability to communicate, organize, and manage our time. This gives the solution for controlling the building appliances with the less man power in a different way by using programming logical devices(PLC).The numerous benefits of to days building automation solution includes safety and security, energy savings ,money savings, convenience and control .It improves the daily life of seniors and disabled by offering voice control and safety items.

I. INTRODUCTION

The building automation has always been to make home more comfortable and secure, as well as to reduce the time spent managing an building by letting it do the work than a human would normally do, in essence making an home work for us. In addition to comfort and security, automating the home is the best way to regulate energy usage and reduce costs for heating, cooling and lighting. Home automation is taking centre stage in home technology circles for its ability to let home owners greatly reduce their energy consumption without changing their lifestyle, therefore helping them do their part to slow global warming, as well saving them money. Home automation can be an exciting, new innovations that make home appliances fun and easy to use for every member of the family. For example, a scenario such as I'm Home could be triggered by pressing one button from your vehicle as you approach the driveway. There were many papers presented before such as home automation using android application by remote control. It is used to design a home automation system with Android application that can be controlled remotely. This proposed system uses an Android OS based smart phone or tablet [9], upon a graphical user interface based touch screen operation. In order to achieve this, Android application acts as a transmitter, which sends the ON/OFF commands to the receiver. The project is touch screen based home automation is to design a system with touch screen based control panel. In order to achieve this, a touch panel is interfaced to the microcontroller on the transmitter side which sends ON/OFF commands to the receiver where

II. COMPONENTS

1. PLC

A programmable logic controller (PLC) or programmable controller is an industrial digital computer which has been ruggedized and adapted for the control of manufacturing processes, such as assembly lines, or robotic devices, or any activity that requires high reliability control and ease of programming and process fault diagnosis. PLCs were first developed in the automobile manufacturing industry to provide flexible, ruggedized and easily programmable controllers to replace hard-wired relays, timers and sequencers. Since then, they have been widely adopted as high-reliability automation controllers suitable for harsh environments. A PLC is an example of a "hard" real-time system since output results must be produced in response to input conditions within a limited time, otherwise unintended operation will result. PLCs can range

from small modular devices with tens of inputs and outputs (I/O), in a housing integral with the processor, to large rack-mounted modular devices with a count of thousands of I/O, and which are often networked to other PLC and SCADA systems. They can be designed for multiple arrangements of digital and analog I/O, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed-up or non-volatile memory.[1] It was from the automotive industry in the USA that the PLC was born. Before the PLC, control, sequencing, and safety interlock logic for manufacturing automobiles was mainly composed of relays, cam timers, drum sequencers, and dedicated closed-loop controllers.[2]

2. IR sensor

Infrared Obstacle Sensor Module has built in IR transmitter and IR receiver that sends out IR energy and looks for reflected IR energy to detect presence of any obstacle in front of the sensor module. The module has on board potentiometer that lets user adjust detection range. The sensor has very good and stable response even in ambient light or in complete darkness.

An IR sensor consists of an IR LED and an IR Photodiode; together they are called as Photo{Coupler or Opto{Coupler. As said before, the Infrared Obstacle Sensor has built in IR transmitter and IR receiver. [3] Transmitter is a light emitting diode (LED) which emits infrared radiations. Hence, they are called IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye. Infrared receivers are also called as infrared sensors as they detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors.

Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation. When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of the reception by the IR receiver, the output of the sensor is defined.

3. L298n motor driver

The L298N is an integrated monolithic circuit in a 15- lead Multi watt and PowerSO20 packages. It is a high voltage , high current dual full-bridge driver designed to accept standard TTL logic level sand drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device inde- pendently of the input signals .The emitters of the lower transistors of each bridge are connected together rand the corresponding external terminal can be used for the connection of an external sensing resistor. An additional Supply input is provided so that the logic works at a lower voltage.

4. Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy.[4] There most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current low in part of the motor .DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications

5. Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof. Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. The traditional form of a relay uses an electromagnet to close or open the contacts, but other operating principles have been invented, such as in solid-state relays which use semiconductor properties for control without relying on

moving parts. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protective relays. Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to a second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling.

6. MQ6

Using an MQ sensor it detects a gas is very easy. You can either use the digital pin or the analog pin to accomplish this. Simply power the module with 5V and you should notice the power LED on the module to glow and when no gas it detected the output LED will remain turned o meaning the digital output pin will be 0V. Remember that these sensors have to be kept on for pre-heating time (mentioned in features above) before you can actually work with it. Now, introduce the sensor to the gas you want to detect and you should see the output LED to go high along with the digital pin, if not use the potentiometer until the output gets high. Now every time your sensor gets introduced to this gas at this particular concentration the digital pin will go high (5V) else will remain low (0V).The MQ-6 Gas sensor can detect or measure gases like LPG and butane. The MQ-6 sensor module comes with a Digital Pin which makes this sensor to operate even without a microcontroller and that comes in handy when you are only trying to detect one particular gas. When it comes to measuring the gas in ppm the analog pin has to be used, the analog pin

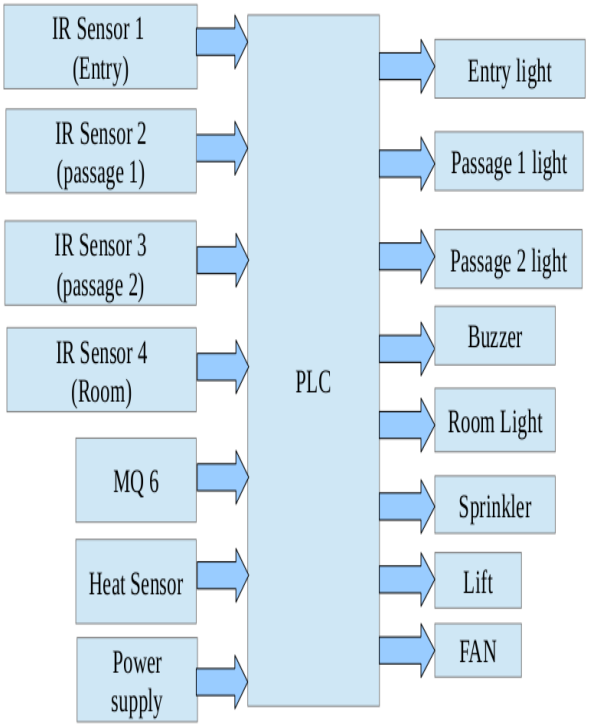
7. Buzzer

A buzzer is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perfect Board and even on PCBs which makes this a widely used component in most electronic Applications. There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customized with help of other circuits to easily in our application.

8. Fire sprinkler

A fire sprinkler or sprinkler head is the component of a fire sprinkler system that discharges water when the effects of a fire have been detected, such as when a predetermined temperature has been exceeded. Fire sprinklers are extensively used worldwide, with over 40 million sprinkler heads fitted each year. In buildings protected by properly designed and maintained fire sprinklers, over 99% of fires were controlled by fire sprinklers alone. Each closed-head sprinkler is held closed by either a heat-sensitive glass bulb (see below) or a two-part metal link held together with a fusible alloy such as Wood's metal and other alloys with similar compositions. The glass bulb or link applies pressure to a pipe cap which acts as a plug which prevents water from
owing until the ambient temperature around the sprinkler reaches the design activation temperature of the individual sprinkler. Because each sprinkler activates independently when the predetermined heat level is reached, the number of sprinklers that operate is limited to only those near the fire, thereby maximizing the available water pressure over the point of fire origin. The bulb breaks as a result of the thermal expansion of the liquid inside the bulb. The time it takes before a bulb breaks is dependent on the temperature.

III. BLOCK DIAGRAM



- When IR sensor 1 is(placed on entry of building) is Detect some Object in front of them Then signal is send to the PLC to turn ON the Entry Light.
- When IR sensor 2 is (placed on Passage 1)is detect some is Detect some Object in front of them Then signal is send to the PLC to turn ON the passage 1 Light.
- IR sensor 3 is(placed on Passage 2) is Detect some Object in front of them Then signal is send to the PLC to turn ON the Passage 2 Light.
- IR sensor 4 is(placed in Room) is Detect some Object in front of them Then signal is send to the PLC to turn ON the Room Light and FAN.
- When MQ6 sensor is(placed in Room) is Detect some Hazardous condition then Then signal is send to the PLC to turn ON the Sprinkler and Buzzer.
- When Heat sensor is(placed in Room) is Detect some Hazardous condition then Then signal is send to the PLC to turn ON the Sprinkler and Buzzer.
- When Any hazardous Condition is Occur in Building that time Lift is coming to the ground floor.

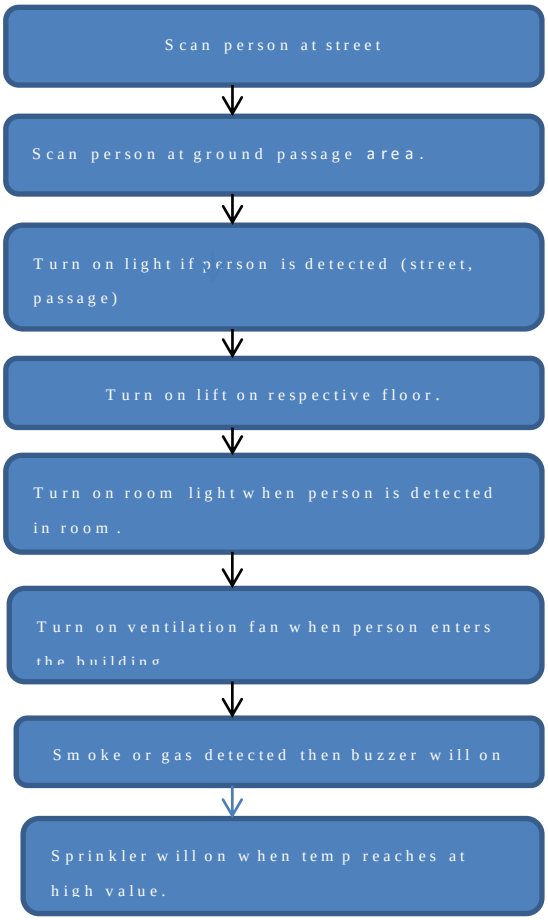
IV. PROJECT CONCEPT

The project has a concept of Energy saving, Safety purposes, Emergency situation. Our project starts When a person enter into a building the light will turn on as it crosses the path the light goes off. Further same process will follow in the passage and in the room when the person enter. This is the concept for Energy saving.

As the person enters in the room the and the fan will turn on for the ventilation purpose.

In any hazardous situation when any person is using the lift will be in a worst situation to escape form it so for such situation the lift will automatically comes to the ground floor . In any fire catching situation Sprinklers are placed to resolve the fire and a Smoke detector MQ6 is placed to detect the smoke

V. ALGORITHM



VI. REFERENCES

[1] L.A. Bryan, E.A. Bryan, 1997. Programmable controllers: theory and implementation.

[2]ikipedia.org/wiki/Programmablelogiccontroller:

[3] https://www.electronicshub.org/ir-sensor/

[4]robu.in/product/l298-based-motor-driver-module-2a