PROJECT REPORT

“PLC BASED ELEVATOR CONTROL SYSTEM”

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of
BACHELOR OF ENGINEERING
in
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VADODARA INSTITUTE OF ENGINEERING

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DECLARATION

We hereby declare that the PSAR Reports, submitted along with the Project Report for the project entitled “PLC BASED ELEVATOR CONTROL SYSTEM” submitted in partial fulfillment for the degree of Bachelor of Engineering in (ELECTRICAL ENGINEERING) to Gujarat Technological University, Ahmadabad, is a bonafide record of the project work carried out at VADODARA INSTITUTE OF ENGINEERING under the supervision of (Prof. Shruti Khatri) and that no part of any of these PSAR reports has been directly copied from any students’ reports or taken from any other source, without providing due reference.

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This is to certify that the PMMS reports, submitted along with the project entitled **PLC BASED ELEVATOR CONTROL SYSTEM** has been carried out by KRUPAL R BHOI, PRIYANK R PATEL, DHAVAL S SUKHANANDI, AVADHESH R YADAV under my guidance in partial fulfilment for the degree of: *Bachelor of Engineering* in *(ELECTRICAL ENGINEERING)* 8th Semester of Gujarat Technological University, Ahmadabad during the academic year 2014-15. These students have successfully completed PMMS activity under my guidance.

Internal Guide

Head of the Department
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INTRODUCTION

The aim of our project to control the elevator with the help of PLC. We use the three floor elevator model to show the PLC controlling on elevator. It is easy to control the elevator through PLC.

Fast and Easy PLC Control The object of a PLC simulator is to 'fake out' the input into a PLC so that the programmer can test and debug the program before installation into its operating environment. Our patent pending PLC simulators achieve this by mounting on the existing terminal strip of the PLC card and providing easy controls to turn digital inputs on/off or adjust analog signals.

PROBLEM SUMMARY OR INTRODUCTION

In our project following problems are made:

- Overweight or over loading
- Natural calamities
- Priority of operation in elevator
- Back up by inverter
- Fire emergency exit
- Potential brake
AIMS AND OBJECTIVES OF THE WORK

In our project Elevator is controlled by PLC. We can make the hardware model of the three floor Elevator. This elevator is operate by using of dc motor.

PLC is gives the command to the relay. Relay is operate the dc motor in forward direction and reverse direction. Based on this relay operation elevator is move up and down.

BCD to seven segment circuit is used for to show the current position of elevator. CONTROL CIRCUIT is controlling the elevator in upward and Downward direction. It is also control the door close and open of the elevator. It is a control by the electro-magnet relay when the two relays are energized lift is moving upward and other two relays are energized lift is moving downward.

If the two relays are energized than gate is open and if the other two relays are energized than door is close of the elevator.
BRIEF LITERATURE REVIEW

PLC is an industrial microcontroller system (in more recent times we meet processors instead of microcontrollers) where we have hardware and software specifically adapted to industrial environment. Blocks came with typical components, which PLC consist of, is found in the following picture. Special attention needs to be given to input and output, because in these blocks you find protection needed in isolating a CPU blocks from damaging influences that industrial environment can bring to a CPU via input lines.

fig. Delta PLC
Program unit is usually a computer used for writing a program (often in ladder diagram). Central processing unit is the brain of a PLC controller.

CPU itself is usually one of the microcontrollers. CPU also takes care of communication, interconnectedness among other parts of PLC controller, program execution, memory operation, overseeing input and setting up of an output.

PLC controller can be reprogrammed through a computer, but also through manual programs (console). This practically means that each PLC Controller can be programmed through a computer if you have the software needed for programming.

In this PLC design of I/O-pin obtain as X0-X7 are 8-input pins and Y0-Y5 are output pins.

**Advantages of PLC:**

- Smaller physical size than hard-wire solutions.
- Easier and faster to make changes.
- PLCs have integrated diagnostics and override functions.
- Diagnostics are centrally available.
- Applications can be immediately documented.
- Applications can be duplicated faster and less expensively.
PLC OPERATION:

1. INPUT SCAN: Scans the state of the Inputs (Sensing Devices, Switches and Pushbuttons, Proximity Sensors, Pressure Switches etc.).

2. PROGRAM SCAN: Executes the program logic.

3. OUTPUT SCAN: Energize/de-energize the outputs (Valves, Solenoids, Motor, Actuators, Pumps).

4. HOUSEKEEPING: Communication checking with the software and perform other requests according to their preference.

Basic Requirements:

In PLC programming in order to create or change a program, the following items are needed:

-PLC, -Programming Device, -Programming Software, -Connector Cable
**PLAN OF WORK**

For planning of our project work it is divided into two parts:

1. Making the control circuit for elevator
2. Making the hardware model of three floor elevator

**Full description of planning of our project work:**

1. **Making the control circuit for elevator:**
   For control the elevator system through PLC we can making the control circuit.

   Following circuit are made:
   1. **BCD to seven segment display circuit:**

   ![fig. BCD to seven segment display](image)

   (Diagram of BCD to seven segment display)

   fig. BCD to seven segment display
Description:

The display uses seven (7) segments in order to represent the decimal numbers 0-9. The numbers are formed when they light some of the parts of the seven segment display.

There are displays which use light emitting diodes (LEDs) for the construction of their segments. They are constructed in two types, common anode where all the diode anodes of the segments are connected together and the ones of the common cathode where all the cathode diodes of the segments are commonly connected.

This BCD to seven segment display indicates the current floor position of elevator in our project.
2. IR object sensor circuit:

Fig. sensor circuit

Description:

Here three sensors are required for different three floor model. IR object sensor detect the object (elevator) current position.

One IR sensor is installed into elevator and three IR sensors are also installed at three different floors. When the elevator is reach at any floor than that particular floor sensor communicate with it and receiving the signal value which is comparing the value.

For comparing signal value comparator IC LM358 is used. Which is comparing this value with the preset value in IC. If the signal value is greater than the preset value it is shows the floor number in display neither do not shows any result.
3. Relay control circuit:

CONTROL CIRCUIT is controlling the elevator in upward and downward direction. It is also control the door close and open of the elevator.

It is a control by the electro-magnet relay.

When the two relays are energized lift is moving upward and other two relays are energized lift is moving downward.

Here this figure shows that if the two relays are energized than gate is open and if the other two relays are energized than door is close of the elevator.
3. Making the hardware model of three floor elevator:

For the making of three floor elevator hardware model we are using the acrylic material which is easy to construct and transparent material.

For elevator door we are use the CD drive box to door open and closed.

MATERIAL AND METHOD USED IN PROJECT:

As material of our project we are using the different component follows:

COMPONENT:

1. DC MOTOR
2. ELECTROMAGNET RELAY
3. OPTOCOUPLER(PHOTO TRANSISTOR)
4. IC 7447
5. PUSH BUTTTON SWITCH
6. COMMON RESISTOR ANODE DISPLAY
7. BC547 TRANSISTOR
8. LM358 COMPARATOR IC
Description for all above components as following:

1. DC MOTOR:

The dc motor works on the principle of Fleming’s left hand rule. When current carrying conductor is kept in the magnetic field a force is produced on the conductor in a definite direction. A 24vdc motor is used.

2. COMMON ANODE DISPLAY:

Common anode display circuit

All anodes are short. In it input is 1 than LED on.
3. **OPTOCOUPLER:**

OPTOCOUPLER is combination of light source and light detector. It is also called as optoisolator. It provides complete electrical isolation between a low power control circuit and high power output circuit to protect control circuit.

**PHOTO TRANSISTOR OPTOCOUPLER:**

In this infrared LED acts as the light source and the photo transistor acts as a detector when pulse input goes high, LED turns on, light emitted by LED is focused on the collector base junction of the photo transistor. Collector current starts flowing when the pulse input reduces to zero, LED goes off, collector current becomes zero.

**Merits:**

- Small size, light weight
- Control circuit is protected due to electrical isolation
- Unidirectional signal transfer
- Logic circuit is easy.
Demerit:

- Slow speed

Applications:

- Ac to dc converter use for dc motor speed control
- High power chopper
- High power inverter

4. ELECTROMAGNETRELAY:

Electromagnet type of relay that can handle the high power required to directly drive an electric motor is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching.
5. IC 7447:

IC 7447 is a one type of BCD to seven segment decoder IC. It accepts binary coded decimal as input and convert into drive seven segment for displaying digits 0 to 9. BCD is an encoding in which each digit of number is represented by its own binary sequence.
5. **BC547 TRANSISTOR:**

![Transistor Diagram]

Fig. shows a NPN transistor. It can be used as the active component for switches and amplifiers.

To make use of a transistor as an audio preAmplifier, a direct current is needed such as a 24V Power supply in a common emitter configuration. The negative side of the power supply is ac coupled to the emitter via capacitor. There is also a small resistance connecting the power supply to the emitter.
7. LM358 comparator IC:

It is a one type of operational amplifier. It consist of two independent high gain operational amplifier in one package. This IC can be operated on wide range of power supply from 3V to 32V for Single power supply.

Positive pin is use for positive feedback and negative pin is use for Negative feedback. When voltage at pin2 is more than voltage at pin3 it will raise the Output towards the positive maximum voltage and a slight Increase at negative pin compare to positive pin will lower the Output towards the negative maximum.
Ladder Diagram of Elevator:

[Diagram of elevator control system with various ladder rungs and symbols, including X0, X1, X2, M0, M1, M2, Y4, M10, Y5, M10, M3, Y3, M4, M5, M6, Y2, and M6. The diagram shows logical connections and control sequences for the elevator system.]
Description of Ladder Diagram:

In this PLC design of I/O-pin obtain as X0-X7 are 8-input pins and Y0-Y5 are output pins.

Input pins: -  
Output pins: -

X0 – IR sensor 1  
Y0 – Door Open output
X1 – IR sensor 2  
Y1 – Door Close output
X2 – IR sensor 3  
Y2 – Lift Up
X3 – Switch – floor 1  
Y3 – Lift Down
X4 – Switch – floor 2  
Y4 – BCD 0
X5 – Switch – floor 3  
Y5 – BCD 7
X6 – Door Open input
X7 – Door Close input
CONCLUSION:

From this project work during whole year we are made this project model or elevator is work in emergency situation and It is work easily with PLC. It’s applications are mostly used in regular life.