Implementation of FATEK PLC Based Three Floor Elevator System

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Abstract:
The implementation of a low-cost FATEK PLC-based three-floor lift system is described in this study. Elevator systems are critical for vertical mobility in buildings, and their control methods have been revolutionized by the use of programmable logic controllers (PLCs). To control the motion of the lift, we use a DC geared motor. In this example, push buttons are used to direct the elevator to the desired floor. In this scenario, ladder diagram programming was utilized. Because the PLC is easy to programme**.**

Keywords: PLC, elevator

1. Introduction

Elevators allow for quick and easy vertical transportation of people and products in today's structures. Improvements in safety, reliability, and performance have resulted from the widespread adoption of sophisticated control systems, such as those based on programmable logic controllers (PLCs), in the lift industry. Highlighting its significance and benefits, this paper introduces the FATEK PLC-based three-floor lift system. The goal of this paper is to provide a high-level summary of the process by which a FATEK PLC-based control system for a three-floor elevator was put into action.

The PLC replaces more antiquated relay-based control methods as the primary controller for the lift. It has many benefits, including being adaptable to changing needs, scalable to accommodate growth, and simple to modify and programme. The elevator's performance and efficiency can be fine-tuned to meet individual needs with the help of a programmable logic controller (PLC).

The chosen FATEK PLC model must be able to process the lift control logic, receive inputs and outputs, and communicate with sensors and actuators. To fully comprehend the system's setup, we will examine its hardware configuration, which includes the cabling and connections between the FATEK PLC and various components.

Using a sensor-based check system, the author suggests, lifts may be made "intelligent" and more efficient, cutting down on trip time and energy use. If the lift reaches a floor in response to a hall call request and its load capacity is about to be exceeded, it will go on to the following order without stopping. When the lift doors are closed and it is determined that the cabin is empty, the lights in the cabin will switch off. Ladder logic for PLC has been used in our simulations to help us perfect our intelligent lift design.[1]. If the lift car is already full, it will not open for hall calls.

Therefore, in such instances, overriding the instruction might save a lot of time, which is especially important in high-rise structures like offices and hospitals [2]. Author describes the operation of a lift that uses an AC motor to drive the lift cabin. The lift indicated here is completely mechanized with PLC. Its control is based on the information provided by the operator as well as the sensors. PLC will cause the drive motor and door motor to act in accordance with that signal [3].

2 System Description

2.1 Block Diagram

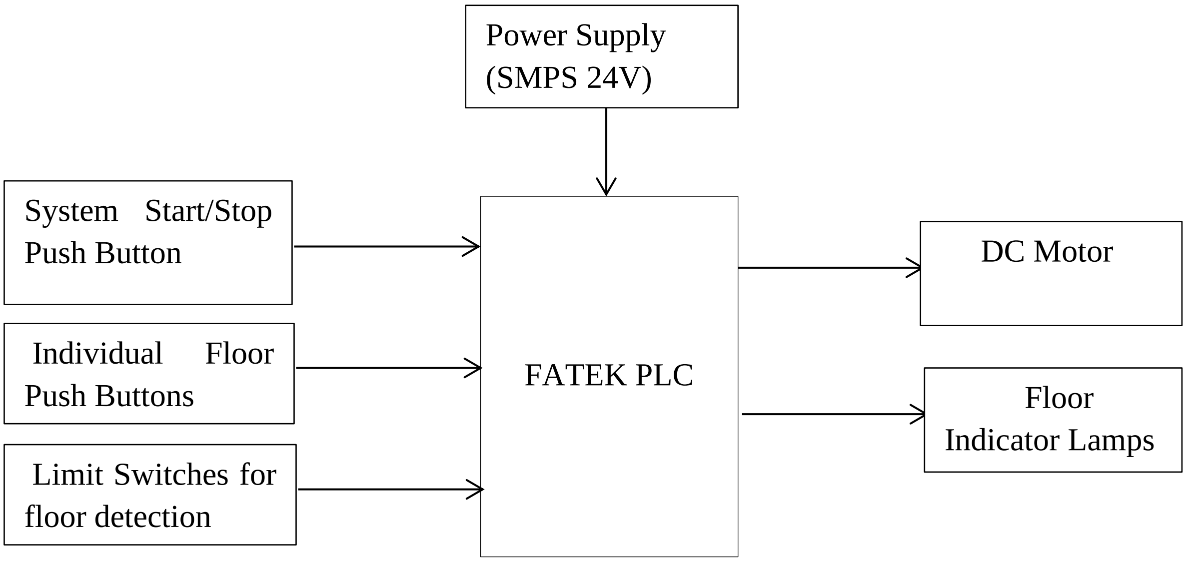

Figure 1 Block Diagram of PLC based three floor elevators System

The above block diagram consists of various components. NO push button is used for System Start and NC Push Button is used for System Stop. Along with for each floor three NO push buttons are used to call the lift to particular floor. Limit switch is used for floor detection .Presence of elevator to particular floor is indicated by floor indicator lamp. In this system I am using a small wooden box in place of original lift. Two rod which helps the lift to up & down smoothly and balanced a pulley & rope system. A D.C. motor, driving the pulley to make the lift up & down. The whole system is operating on 24V DC Power supply which is given from 24V SMPS.

2.2 Component Description:

2.2.1 FATEK PLC –

Figure 2 FATEK PLC B Series

14 points for PLC Digital input 24VDC (8@50KHz, 6@5KHz) ten points Transistor PNP output (4@50KHz)/ built-in two NO extendable communication ports (1 RS-232 and 1 RS-485)/ right side expandable to 80 I/O points. Power supply ranges from 100 to 240 volts. 14 point standard size 24VDC digital input (8 points 50 KHz, 6 total 5 KHz), 10 points relay output or transistor output (4 points 50KHz), built-in 1-2 communication ports, left side extendable 0-2 modules, right side expandable up to 80 I/O points.[4]

2.2.2 Push Button Switch

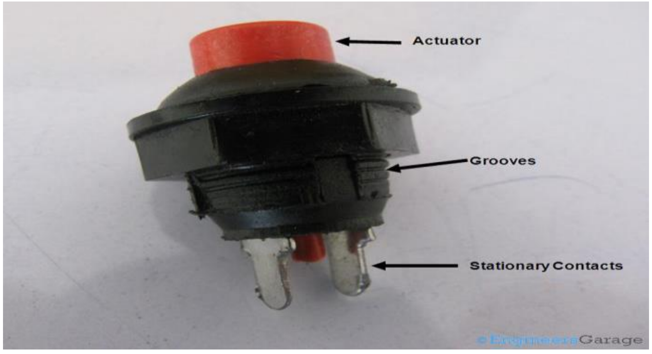

Figure 3 Push Button

A push button switch is one that operates with the pressure of one or two fingers. Push button switches are used in a wide variety of machinery and devices, from cars to cameras to lifts and beyond. The switch's outward structure reveals its inner workings for the most part. The red protrusion is the switch's actuator. The actuator protrudes from the bottom of the switch as a skinny cylinder. The two metal contact legs that remain stationary at the base are also notable additions. To facilitate installation, a hip design is included. Polymer polymers are commonly used for the outer body of push button switches, which come in a variety of forms, sizes, and output terminal configurations.

2.2.3 Limit Switch

Figure 4 Limit Switch

In mechanical systems, a limit switch is a switch that is activated by the movement of a part or the presence of an item. They are employed as part of a control system, as safety interlocks, and for counting how many things pass a certain point. An actuator is connected mechanically to a group of contacts in an electromechanical device known as a limit switch. The actuator is a device that, upon contact, activates the contacts to either form or break an electrical connection.

Because of their durability, simplicity of installation, and dependability of functioning, limit switches find employment in many different contexts and settings. They can detect whether something is there or not, when it has passed, where it is located, and when its journey has come to a conclusion. The term "Limit Switch" originates from their original function in establishing a boundary for an object's permitted range of motion. A roller-lever operated limit switch that is mounted on a canal lock gate to report the gate's position to the control system.

2.2.4 DC Geared Motor

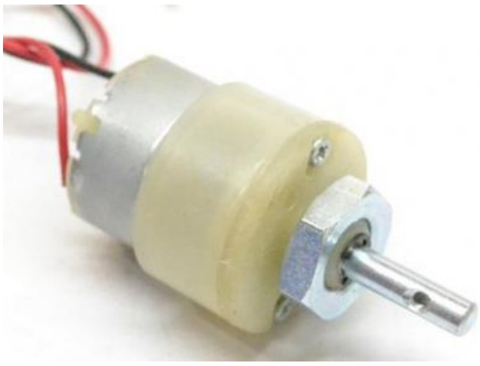

Figure 5 DC Geared Motor

Geared motors are typically just a standard DC motor with a gearbox attached. All-terrain robots and other robotic uses can benefit from this. Connecting these motors to the wheels or any other mechanical assembly is a breeze thanks to the 3 mm drilled drill hole located in the center of the shaft.

Geared motors that turn at 30 RPM and run on 12V DC are frequently used in robots. Simple to operate and the standard size is readily available. Motor control using an Arduino or similar device is also rather inexpensive. This motor, with a voltage between 5 and 35V DC. The shaft has both an external nut and threads, making it simple to attach to the wheel the shaft has both an external nut and threads, making it simple to attach to the wheel.

2.2.5 Indicator Lamp (24V DC)

Figure 6 Indicator Lamp (24V DC)

The above indicator lamp is used to understand present floor condition. When lift is moving then indicator lamp is blinking and when lift reaches to destination then floor indication lamp become steady.

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2.3 Connection Diagram

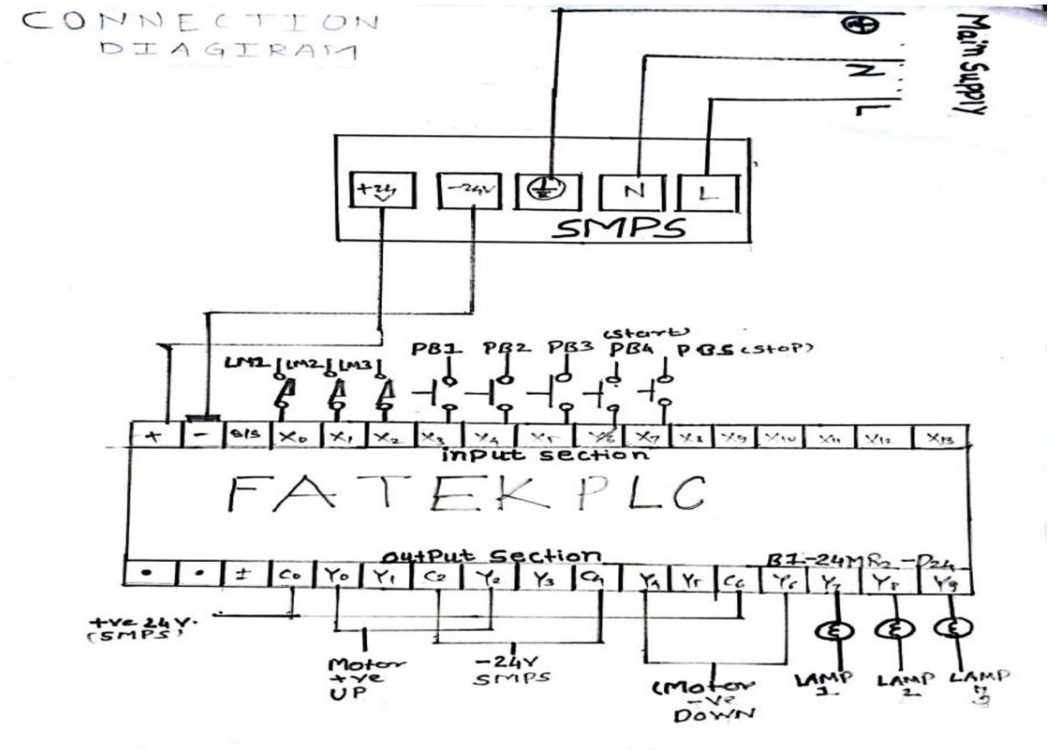

Figure 7 FATEK PLC Interfacing Diagram of System

The figure 7 shows FATEK PLC Interfacing Diagram of System. Start/Stop Push Button, Floor Push buttons ,Limit Switch are connected to input module between X0 to X13.Outputs such as Indicator Lamps and DC Motor are connected to output module between Y0 to Y9.

3. Winproladder Software

The above system programing, Win Pro ladder logic software is used.[4] The ladder logic programming language is used .It is shown in figure 8

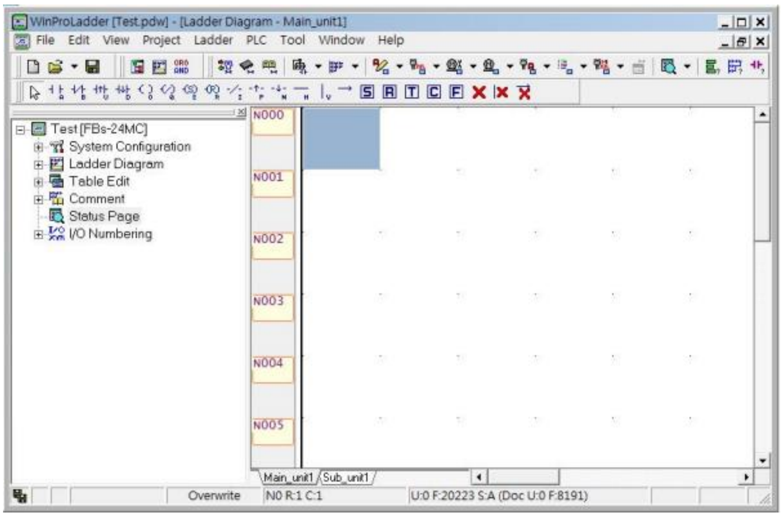

Figure 8 WinproLadder software window.

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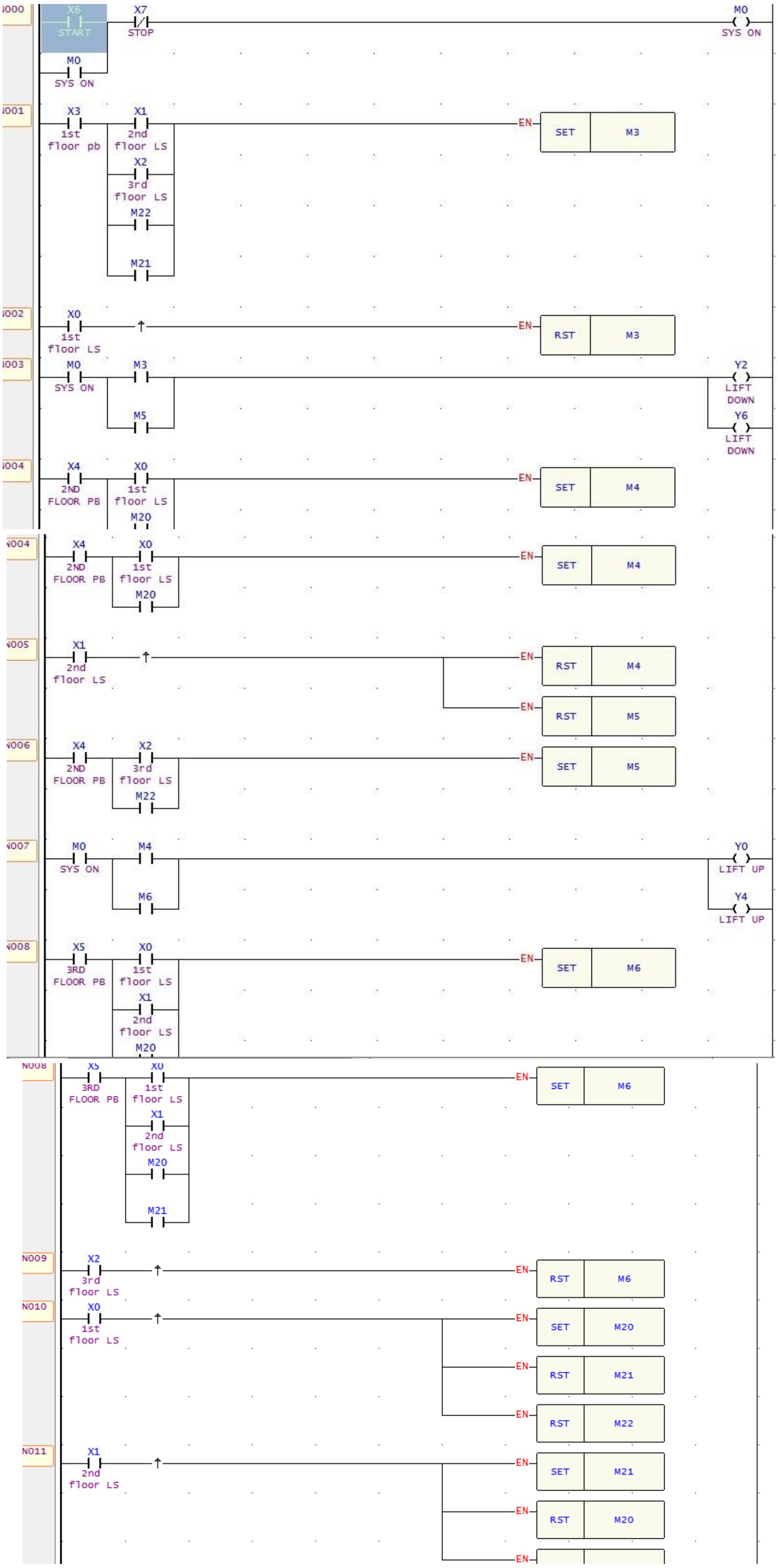

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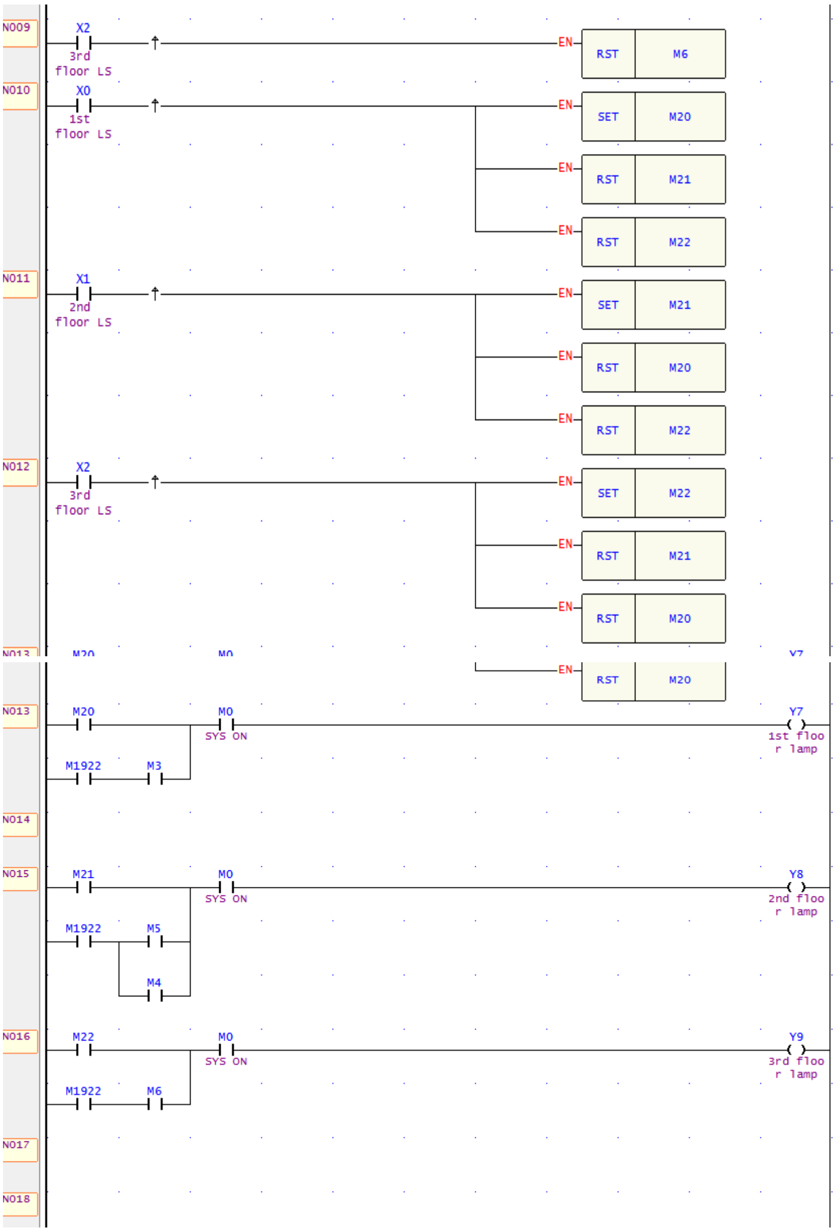

Description of Ladder Diagram Units

PLC Connections

Inputs to PLC		Output from PLC	
X0	LIMIT SWITCH1st FLOOR	Y0-Y2	Lift Up
X1	LIMIT SWITCH –2nd FLOOR	Y4-Y6	Lift Down
X2	LIMIT SWITCH –3rd FLOOR	Y7	LAMP OF 1ST FLOOR
X3	PUSH BUTTON – 1st FLOOR	Y8	LAMP OF 2ND FLOOR
X4	PUSH BUTTON – 2nd FLOOR	Y9	LAMP OF 3RD FLOOR
X5	PUSH BUTTON – 3rd FLOOR	C0-C6	+VE OF SMPS
X6	PUSH BUTTON – START (system)		
X7	PUSH BUTTON – STOP (system)		

4. Result and Discussion

Figure 8 Prototype for 3 floors Elevator System

The figure 8 shows Prototype for 3 floors Elevator System. Left Side three push buttons are used to call the lift .Top Side two Push Buttons for System Start/Stop. Three Indicator Lamp to understand Present floor location. Limit switch are used to detect particular floor. The above system is working very smoothly on first cum first serve basis.

5. Authors' Biography

The author Mr. S. R. Kale has competed BE form Pune University in 2007. ME completed from BAMU University. Presently working as Assistant Professor in PREC Loni. I have 12 years of teaching Experience and 2 years of Industry Experience in the field of Automation

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6. Conclusion and Future Scope

Finally, a PLC-based control system for a three-floor lift has many benefits in terms of security, dependability, and productivity. For precise control and monitoring of lift operations, a programmable logic controller offers a versatile and adaptable solution. In future, The lift system will be modified for precise floor identification, efficient door operations and prevents overloading by including various sensors, such as position sensors, door status sensors and weight load sensors, thereby improving passenger safety and comfort.

7. References

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