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ELEVATOR CONTROL SYSTEM USING PLC

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ABSTRACT:

In this work, we design and build a three-level lift control system, increasing its stability and steady state by employing an Allen Bradley Micrologic -1400 BXBA programmable logic controller. RSLogix-500/5000 communication software is employed. PLCs are helpful in industrial automation since they replace several pieces of equipment with switches and contactors. A limit switch is used to indicate the floor of a lift, which is essentially a vertical transportation equipment for moving people and things. The lift cabinet is moved by a Direct Current (DC) motor, while the limit switch is utilised to position the floor. In a control circuit, an electromagnetic relay is utilised to control the lift's upward and downward motion. Given that India is a developing nation with a large Elevators are a necessary component of infrastructure, and as high-rise buildings and malls proliferate, we may minimise human labour and prevent accidents resulting from broken ropes. Additionally, by adopting such projects, the efficiency and speed of elevators can be enhanced.Using such a method can even take up time. The primary focus of this study is the construction of a lift model for seamless operation and the use of programmable logic controllers to regulate circuits.

Keywords— PLC, Elevator, Push Buttons, Limit Switch, Relay, Rope.

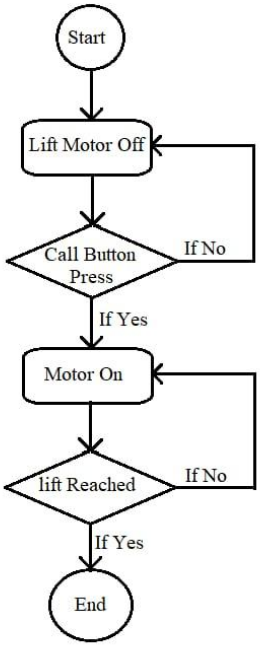
Introduction

Elevators are a basic need for all multi-storied buildings. Elevators make labour easier for people and keep them in a comfortable position. In practically all multi-storied buildings in urban areas, elevators are utilised. All lifts are is a vertical conveyance device for moving both humans and goods. Limit switches are used by lifts to indicate the floor. The construction of high-rise buildings and shopping centres is rapidly expanding, and lifts are a necessary component of the transportation network in these establishments. The efficiency and speed of the lift can be increased, human labour can be reduced, and accidents resulting from broken ropes can be prevented by putting in place plc-based smart lift projects.a plc-based lift controller system can even eat up time. Systems using PLC control are essential to lift stability and steady state. It directs the lift as to when to stop at floors and when to open and close doors. Three sensors are used in this plc-based smart lift control system project to sense the lift's load on each floor. The elevator travels to the second floor after two pushes of the start button. Moreover, the lift can be stopped by pressing the stop button. The lamp's colour shifts as it moves through each floor in the lift. As soon as the lift reaches the floor, each floor will receive a corresponding colour light bulb.

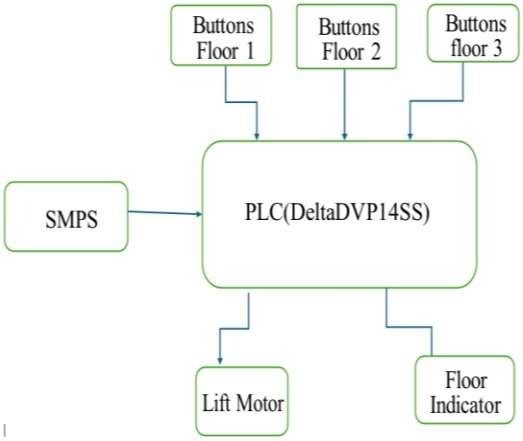
PROBLEM STATEMENT

The aim of this project is to search various elevator control methods and to find the more efficient, in terms of reduce energy and consume time, for certain buildings by programming simulator in which various control methods can be implemented. the goal Is to make the simulator as modern as possible so that different scenarios simulated and find the best control planning's. The absence of a user-friendly interface and manual override features makes it challenging for maintenance personnel to intervene manually when necessary, hindering the swift resolution of issues. The absence of remote monitoring capabilities hampers the ability to proactively monitor and address issues. Remote access for maintenance purposes is essential for quick response times and efficient problem resolution. The existing control mechanism does not effectively optimize energy consumption, leading to higher-than-necessary power usage. This contributes to increased operational costs and environmental impact. The lack of comprehensive diagnostic features makes it difficult to identify and address issues promptly, leading to increased downtime. The elevator system lacks the precision required for accurate floor positioning, resulting in inconsistencies in door opening/closing and floor alignment. This negatively impacts the overall passenger experience.

FLOW-CHART



BLOCK DIAGRAM



CONCLUSION

The PLC-based elevator control system incorporates multiple safety features, such as emergency stop buttons, overload protection, and door interlocking mechanisms, which significantly reduce the risk of accidents and ensure passenger safety. The PLC logic allows for optimized elevator operation, including floor selection, door opening and closing, and fault detection. It can also efficiently manage elevator calls and prioritize them based on demand, reducing wait times for passengers. The PLC system can quickly detect and diagnose faults in the elevator, making maintenance and repair easier and more cost-effective. It also records data for performance analysis and predictive maintenance. The flexibility of PLC programming allows for customization of elevator behaviour to suit specific building requirements, such as adjusting door opening times, managing energy consumption, and integrating with building management systems. Many modern PLC-based elevator control systems can be remotely monitored and controlled, enabling building operators to keep track of elevator performance, respond to alarms, and make adjustments as needed.

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MOTIVATION

PLCs (Programmable Logic Controllers) are commonly used in elevator control systems because they offer reliable and efficient automation. The use of PLCs allows for precise control of elevator movements, safety features, and efficient energy management. They can handle complex logic and provide real-time monitoring and fault detection. PLCs also offer flexibility for system modifications and upgrades. Overall, using a PLC for elevator control ensures safe and efficient operation. PLCs provide precise control over the elevator's movements, allowing for accurate floor positioning and smooth transitions between floors. Fine-tuned control ensures that the elevator stops at the correct floor level, enhancing the overall passenger experience. The ability to adapt the control logic makes it easier to integrate the elevator system into buildings with varying usage patterns and traffic demands. PLCs are known for their reliability and robustness in industrial applications. This reliability is crucial for elevator systems, where safety and dependability are paramount. PLC-based control systems simplify maintenance tasks through modular programming and diagnostic capabilities. Troubleshooting and debugging are more efficient with PLCs, as they often provide detailed error logs and real-time monitoring features. PLCs enable the integration of advanced safety features, such as
emergency stop protocols, door interlocks, and fail-safe mechanisms. Safety-critical functions can be implemented with redundancy and thorough testing, minimizing the risk of accidents. PLCs allow for the optimization of energy consumption by controlling the operation of the elevator motor and lighting systems. Energy-saving algorithms can be implemented to reduce power usage during periods of low demand or in standby mode. PLCs facilitate seamless integration with other building systems, such as fire alarms, access control, and building management systems. This integration enhances overall building safety and enables coordinated responses to emergencies. Remote access enables technicians to diagnose problems, update software, and perform maintenance without being physically present. The modular nature of PLC programming can lead to cost savings in terms of maintenance and upgrades. PLCs often provide a cost-effective solution for elevator control, offering a balance between performance and affordability.

REFRENCES

1. EN 81 - Safety Rules for the Construction and installation of Lifts: If you're working in Europe or other regions that follow European standards, EN 81 provides guidelines for elevator design and safety.
2. Elevator Control System Design Guides: There are various books and guides available that offer in-depth information on elevator control system design. A good example is "Elevator Traffic Handbook: Theory and Practice" by Gina Barney, which covers many aspects of elevator systems, including control algorithms.
3. IEEE Xplore: IEEE (Institute of Electrical and Electronics Engineers) publishes technical papers and articles related to elevator control systems and technologies. You can search for relevant research papers and articles on IEEE Xplore.
4. Jack H., Programmable Logic Controller