AUTOMATED ELEVATOR WITH OVERLOAD ALERT

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ABSTRACT

The goal of this project is to create an efficient lift control system that can be reprogrammed to reduce congestion on a certain lane by guiding the lift to a specific floor using a time management scheme. The current scope of the project is to provide automatic congestion control, which has found value in a variety of domains of application. The project's fundamental idea is that preventive measures must take effect on their own. The suggested work consists of a sensor module that may be monitored and controlled via an internet service In contrast to the conventional lift system, which only provides limited information such as floor number under similar operating conditions, our proposed monitoring system can display the number of people who enter the lift as well as measure their weight and help itself in fault condition and rescue people in that condition. The primary goal of this Automated Elevator with Overload Alert is to keep the elevator safe from damage. This device employs sensors to detect when someone enters the lift and automatically increments the counter. The device uses a 7-segment display to show the number of persons inside a lift. Each pair is made up of two sensor pairs that are spaced apart in the opposite direction. Infrared Sensor pairs are installed at the lift door as part of the system. When a person enters a lift, these sensors open the door and concurrently increment the counter for the number of individuals entering the lift. We shall describe Automated Elevator with Overload Alert in this paper.

Keywords: *Elevator; Overload; Design; Elevator Control System; Management; Automatic; Capability; Control Sensor; Floor Buttons; Motor; Cables; Microcontroller; Control Circuit.*

INTRODUCTION

Elevator Overloads:

It is critical not to overload lifts. Each lift has a weight and passenger capacity that is displayed on the lift. If a lift gets overcrowded, it may stop working between floors, trapping you inside.

Automatic lifts operate without the use of floor buttons. When a passenger enters and/or exits the lift cab, door sensors identify them. When the doors are closed, the lift will begin to run on its own, stopping on each floor (if there are more than two). Except for the alarm and door control buttons, there are no floor buttons within the cab.

The lift will continue to run until the last passenger exits the cab, at which point it will park its wheels and remain there until the next passenger uses it.

Elevator, often known as a lift, is a car that moves vertically in a shaft to transport passengers or freight between the levels of a multistory building. Most modern lifts are propelled by electric motors via a system of cables and sheaves (pulleys) with the assistance of a counterweight.

The operation of a lift or lift is similar to that of a pulley system. The water is drawn from the well using a pulley system. A bucket, a rope, and a wheel can be used to create this pulley system. When the switch is switched ON, the lift's motor can be triggered when it moves up and down or stops. The primary goal of this Automated Elevator with Overload Alert is to keep the elevator safe from damage.

This device employs sensors to detect when someone enters the lift and automatically increments the counter. When the number of persons in the lift exceeds the limit, this buzzer begins to ring. A lift, often known as a lift, is a type of transportation that is very widespread nowadays. We use it every day to carry items or people vertically in high-rise buildings such as retail malls, offices, hotels, and others. It is a very useful equipment that quickly transports individuals to the specified floor. [1]

Elevators are often driven by electric motors that either drive traction cables and counterweight systems, similar to hoists, or pump hydraulic fluid to elevate a cylindrical piston, similar to jacks. As a result, these motors must be regulated by sophisticated control circuits. If the costs of these control circuits and other parts can be decreased, the lift's overall expenses will be reduced.

In this paper, we created a low-cost lift system with a microcontroller-based control circuit. Because the microcontroller has evolved as a low-cost controller IC, various works have been discovered in the literatures that use the microcontroller to reduce costs. However, the advantages of the electric lift, such as efficiency, low installation costs, and practically constant speed regardless of load, prompted inventors to look for a way to use electric motor power in skyscrapers. This project makes use of an 8051 microcontroller

In layman's terms, a lift is a sort of transportation that moves vertically while transporting people and luggage between the floors (or levels) of a building or other type of structure. Elevators, or lifts, come in a variety of configurations, but their primary function is to move materials in a continuous flow in a large skyscraper or building site. In general, electric motors are utilized to power lifts via driving hoist-like equipment. Elevators, whether utilized in agricultural fields or manufacturing businesses, serve the essential aim of minimizing manual labor required to transport heavy items from one location to another in any infrastructure. Elevators are a life-changing invention for handicapped and disabled individuals who cannot utilize stairs (or escalators in the case of wheelchairs) to ascend or descend in a multi-story building.

In order to meet people's transportation needs, automated lift systems strive to deliver the highest quality service possible. The automated elevators control system's major goal is to get the lift car to the correct floor when needed, to ensure a speed that is within the limits of safety, to minimize

travel time, and to provide comfort to the passengers. Lift control systems are programmed to maintain track of parameters such as accelerating and decelerating speed, door opening and shutting speed, hall lantern signals, and trip time, among others. [2]

Is the elevator car overloaded with automatic control:

The lift's weight capacity changes depending on the requirements. Only the specified load can be used to operate the lift. If the lift exceeds the limit, an alert will sound and the lift will be unable to operate. If the hall car door collides with persons or objects when closing the lift, the door will automatically restart and no one will be wounded. Because the door is equipped with a switch for the safety of the family, when the door comes into contact with persons or objects, the switch action prevents the lift from closing and reopening and then closes the door again. Furthermore, the closing force is determined by the degree that will not be accomplished. Manufacturer of residential lifts. [3]

Objectives:

- The system can be made far better and protected against factors such as vandalism and overload if an operator were to be present in the elevator at all times.
- To develop a more power efficient than that which is currently in use
- Infra- Red sensor pairs are placed near the lifts door that sense a person entering or leaving the lift.
- To understand interfacing concepts.

RESEARCH METHODOLOGY

This study's overall design was exploratory. The project's fundamental premise is that preventive measures must be taken on their own. The preventive measures will be controlled and monitored by 8051 microcontroller in collaboration with a few sensors and output devices; the theme is that a weight and counting parameters will be calculated during lift car operation by the pressure and IR sensors, ventilation duct will be activated automatically when man trapping scenarios occur, and so on.

RESULT AND DISCUSSION

The lift vehicle overload warning system of the present invention includes a weight sensor for sensing the weight of a load in the car and a control unit attached to the sensor for detecting signals generated by the sensor and calculating the weight of a load in the car. An annunciator is connected to this control unit and placed within the automobile, directly informing the passengers that the load limit of the car has been surpassed.

The annunciator may include a taped voice message that, in any case, advises passengers that the vehicle will not run until the overload condition is addressed and that passengers must escape the lift immediately. Such a technology would have prevented the tragic accident already mentioned.

The lift would not have worked, and an announcement would have been made to the passengers that some of them would have to evacuate the car immediately before the lift would work. The prior art overload detecting monitors did not directly alert the passengers, and so could not avert such a tragic disaster. [4]

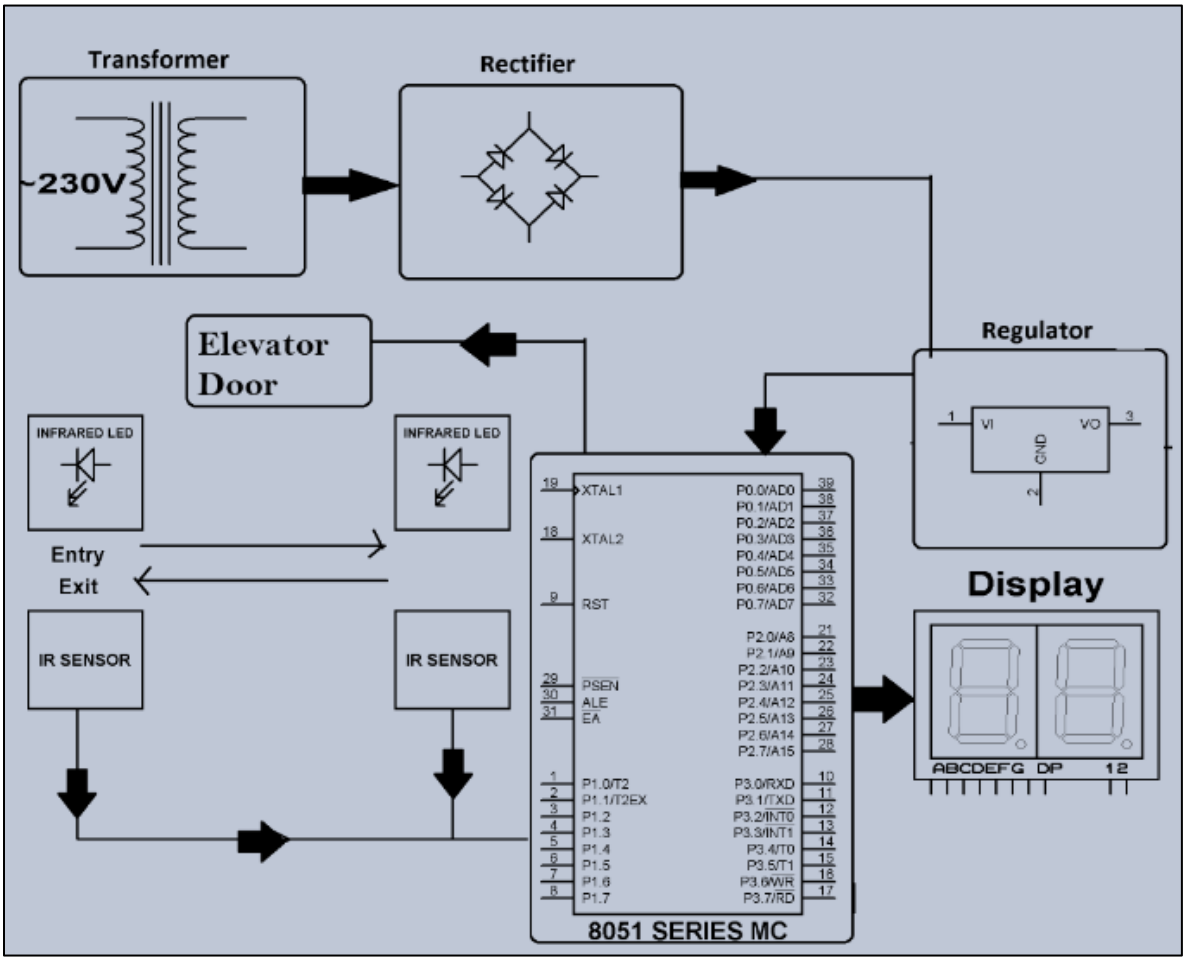

Figure 1: Block Diagram

This system helps to indicate limit of an elevator, which is how many people can be inside an elevator at a particular time. The system displays the number of people inside an elevator with the help of 7 segment display. The IR transmitter is used to transmit IR rays straight to the receiver which receives the input and feeds this to an 8051 Microcontroller. The microcontroller processes this input received. At this time the system also counts the number of people present and increments a counter on each arrival and decrements when a person exits from the elevator. The

system even includes a buzzer for demonstrating an alarm. The buzzer starts ringing as soon as a greater number of people enters the elevator than the limit of the elevator which is already set and the buzzer stops ringing only when the people inside the elevator come outside the elevator. This will cause the counter to be decremented and the buzzer stops ringing as soon as the counter is less or equal to the limit of the elevator set. [5]

The Role of The Load Cell:

Each lift has a certain load that is connected to its capacity, design, and intended application. If the total weight of passengers or products in the cabin exceeds the load, the lift will stop working and produce an overload alert. A correctly built overload warning system allows the lift to identify permitted overload.

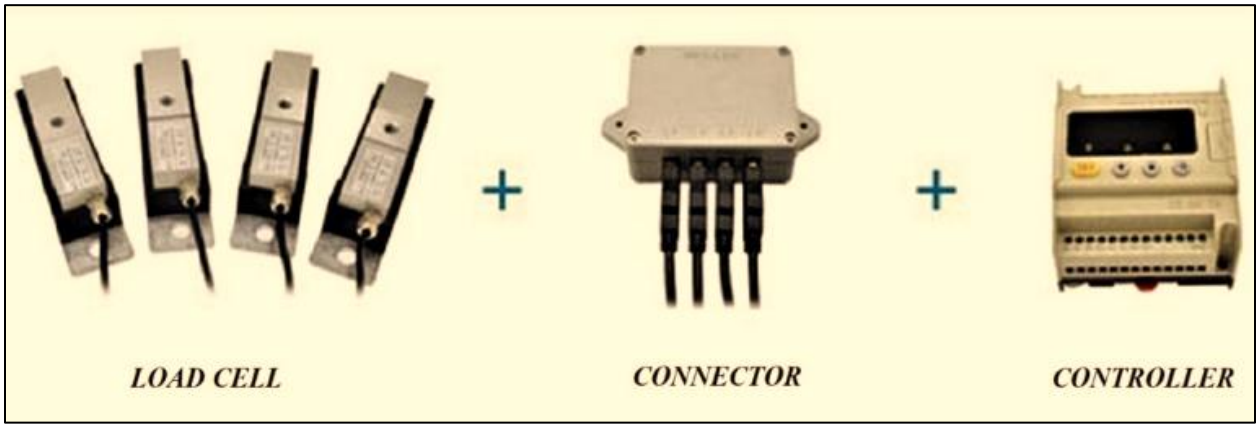

Figure 2: Load cell, Connecter, Controller

Diagram of an overload warning system in the cabin:

A load cell, junction box, controller, and signalling device (sound, warning light) are often included in a lift overload warning system. The loadcell is the most essential of these.

The type and number of load cells will vary depending on the design of each lift manufacturer.

The loadcell's operation is based on the Wheatstone concept. This is the balanced resistor bridge principle. Loadcells are sensors that transform force or weight into electrical signals. The change in induced resistance in the resistor bridge is proportional to the active value, yielding a proportional voltage signal. [6]

A three-story elevator was constructed for this elevator system. It has three floors: the ground floor, the first floor, and the second story.

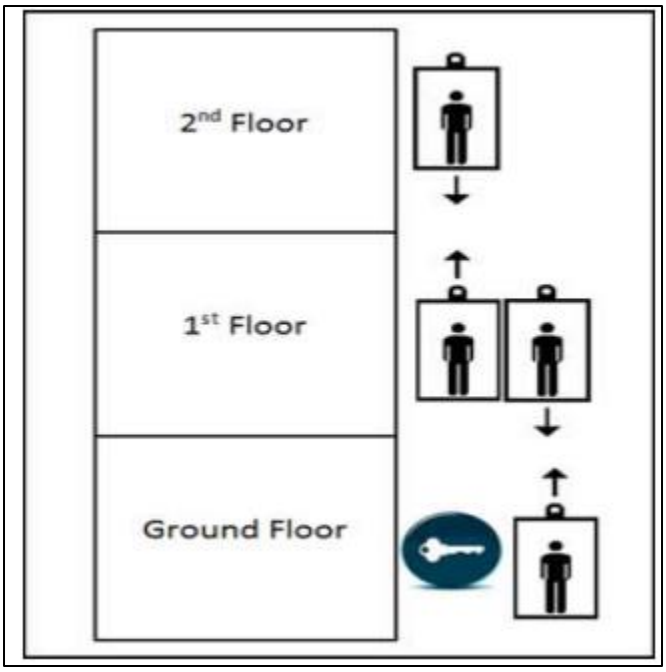

Figure 3: Elevator System

So, in order to move up to the first or second floor, the user must enter the floor number. those on the first floor can opt to travel up to the second story or down to the ground floor, whilst those on the second floor can only go down.

The number of people an elevator can hold calculated:

There are three different ways to calculate the number of people that an elevator cab can safely carry.

1. Max Loading:

The maximum number of people that a lift can hold is referred to as its max loading. It is the lift's capacity; however it should only be utilised in dire circumstances. If you were fully loaded, the ride would not be particularly comfortable.

Allow 1.5 square feet of space per person when calculating the maximum load.

Figure 4: The number of people an elevator

2. Normal Loading

Normal loading refers to the maximum number of persons that can ride in a lift. Despite the fact that it is stated to as typical, most people regard it as a crowded lift and will wait for the next lift if traffic is heavy. The lift should be able to transport 10-12% of the building's population in five minutes, according to the recommended target.

Allow 2.3 square feet of space per person when calculating the typical load.

3. Special Loading:

Special loading, as the name implies, is for a distinct set of circumstances than the previous two forms of loading. It is intended for buildings with passengers who may require things or equipment that take up a lot of room. This lowers the amount of passengers that the lift can transport.

Allow for approximately half of the regular loading when calculating the special load. [7]

The parameters' specifications are shown in Table. When the user presses the lift call button, the microcontroller gets the signal from the relay. The microprocessor also checks the status of the lift, switches, and other safety parameters at the same time. If all of the components are verified to be functioning properly, the signal is sent to the optocoupler by the controller.

The relay is controlled by the optocoupler. The relay operates the contactor and transmits a signal. The motor is operated by the contactor until the target floor is achieved. The controller also

determines which floor the call button was pressed from. The controller sends the command to the LCD, which displays the status. The Ethernet shield is linked to an RJ-45 connector. In an emergency, the controller uses the Arduino instruction. If any safety or sensor switch is turned off, the cabin comes to a halt and sends a warning signal to the user at the office via Ethernet. The cabin will remain stationary until the safety or sensor motion begins to function properly.

How to Fix Overload:

The lift load is proportional to the lift cabin; for example, with a heavy weight, the cabin will be large, as will the pit space. Naturally, they must adhere to technical regulations and requirements.

When installing a lift, you must first select a lift with a load adequate for the intended function. This saves clients' money, installation space, waste, and undesired overload.

Figure 5: Overload Elevator

If the lift is frequently overloaded for any reason, such as a weak person who frequently has to carry too much weight, the lift's electronic equipment and components will swiftly degrade.

Frequent overloaded elevators also cause significant friction between the elevator's mechanical parts, leading these devices to quickly wear down, damage, and impact the elevator's overall operation, among other things.

Elevators with a load capacity of 200 kg should be used by 2-3 people. 300 kg load elevator for 3-4 people; 400-500 kg load elevator for 5-7 people; and 525-630 kg load elevator for 5-8 people.

When an overload alert sounds, the persons nearest to the lift door must swiftly exit to avoid altering the lift travel time of the surrounding areas, potentially causing problems for the passengers and lift. [9]

Standard Overload System with Rope Clamp Load Cell.

This system consists of a rope clamp load cell and a single Set Point Controller.

Benefits

• 24V Operation

• (1% +/- 0.1%) accuracy

• If an overloaded is achieved the system will reset at roughly 96%-97% of the maximum value

• Simple adjustment of the maximum load and at what weight you want the relay to activate

• Ability to alter the overload percentage between 0% and 20% (Default Value 5%)

• Ability to set an overload time delay ranging from 0 to 5 seconds

• Option to prevent the lift door from closing once an overload is reached

• Warning buzzer [10]

CONCLUSION

Use tactics such as Floor-Having-More-People. First, install a weight sensor to each floor to determine which floor has the most people. The project's current scope is to provide automatic congestion control. As a result, it has gained prominence in a variety of domains of application. It can also be extended to include many storylines. It is advised that an elevator overload sensor be placed and that a qualified technical team be employed to design and install elevators in compliance with international standards and the newest technology.

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