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Implementation of Elevator with Weight and Breakdown Mechanism using Xilinx ISE

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Abstract: Elevator systems are an integral part of modern urban design, facilitating horizontal movement in multi-storey buildings. Ensuring the safety, reliability and efficiency of these systems is paramount. This work proposes a detailed design of an elevator control system using Xilinx ISE, with breakthrough features to enhance breakthrough detection and loading mechanism. Breach detection is an integral part of a system's security infrastructure. By continuously monitoring critical parameters such as motor speed and door status, it can immediately detect any abnormalities indicating a possible outage when detected, and the system immediately initiates predetermined routes , ensuring passenger safety and reducing downtime. Another important aspect of the system is the integration of containers. This system ensures that the elevator exceeds the specified load, thereby preventing dangerous overloads. Passenger and cargo weights are accurately measured by weight sensors, and system function is dynamically modulated to maintain the safety level the main aim to design an elevator that can solve the both overload and breakdown issues, rather than having each one implemented separately. To implement the proposed scheme, a hardware description language such as VHDL or Verilog is used to describe the behaviours of the individual modules. Extensive simulations are conducted to evaluate the performance of these modules under different operating conditions. The configuration is then created and modified using the Xilinx ISE tools.

Keywords: Elevator Control System, Xilinx ISE, Breach Detection, Overload Protection, VHDL/Verilog. .

1. Introduction

This project introduces an advanced elevator control device designed using Xilinx ISE, that specialize in improving safety and performance in vertical transportation. By integrating breakthrough capabilities like breakdown detection and weight management, the device objectives to pre-emptively deal with capability failures and make certain passenger safety. Implementation entails VHDL or Verilog coding, simulation, synthesis using Xilinx ISE tools. Through innovation and technological advancement, this project contributes to the evolution of elevator generation, fostering safer and greater green vertical mobility in cutting-edge buildings.

History: The history of elevators stretches returned hundreds of years, from primary systems in historical civilizations to the advanced answers of nowadays. Major milestones include Elisha Graves Otis' safety elevator in the 19th century, observed via electric elevators and automated manipulate systems developed by Frank Sprague. In the 20th century, elevators persevered to conform with innovations like computerized doors and computerized dispatching systems. Recently, digital technologies have further more desirable performance, and sustainability. Today, elevators are a crucial a part of present day urban infrastructure, with ongoing improvements promising persisted enhancements in vertical mobility.

Why we prefer Elevator than Stairs

Elevators stand because the desired choice over stairs for numerous compelling reasons. Primarily, they champion accessibility, presenting a critical solution for individuals with mobility demanding situations, the aged, dad and mom with strollers, or everybody harassed through heavy bags. By offering a reliable means of vertical transportation, elevators make certain that each person, regardless of bodily capacity, can get admission to

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numerous levels of a building easily and protection. This inclusivity aligns with current requirements of accessibility, fostering a extra inclusive surroundings within buildings and public areas. Efficiency emerges as some other paramount benefit of elevators, specifically in high-upward push buildings or bustling areas with heavy foot site visitors. Elevators correctly trip a huge variety of humans between floors unexpectedly and seamlessly, diminishing congestion in stairwells and notably saving time for building occupants.

This efficiency proves in particular important in commercial and residential complexes, where clean transit enhances productivity, comfort, and normal person enjoy. Safety constitutes a essential pillar of elevator superiority. Unlike stairs, which pose inherent risks, elevators provide a steady alternative, mainly for people with mobility obstacles or stability issues. Equipped with an array of safety features including handrails, emergency buttons, and advanced sensors, elevators mitigate the chance of injuries and make certain passengers tour with peace of thoughts, free from apprehension about safety dangers.

Working of an Normal Elevator

A typical elevator is a well-organized process designed to ensure the safe and efficient transportation of passengers between floors in a building It begins with passengers on a particular floor indicating which way they want to accessed by pressing the call buttons near the elevator doors. Whether they wanted to go up or down, this signal was sent to the elevator control system, which allowed it to determine which elevator vehicle was most suitable to answer the call based on factors such as proximity and current load. Once the elevator control system has made its decision, it moves the selected elevator to the specified floor. Upon arrival, the elevator doors open either automatically or upon passenger request, providing access to the building. Passengers then enter the elevator greeted by a familiar control panel, where they select their preferred floor by pressing the corresponding button. Once the destination is located, the elevator begins its journey, moving the rod at a controlled speed.

As the elevator ascends or descends, passengers feel a gentle sensation as the building moves between floors. When the desired floor level is reached, the elevator slows down and aligns perfectly with the floor for proper standing. The doors then open, allowing passengers to exit the elevator and proceed to their destination. characterized by exceptional computational speed and efficiency. Safety is paramount in elevator design, and modern elevators are prepared with numerous protection functions to shield passengers for the duration of their journey. door sensors ensure that the doorways stay open best whilst it is safe to accomplish that, stopping any injuries or obstructions. An safety lock is implemented, this safety lock just locks the elevator doors after they closed, so that they cant be open during moving the elevator and this safety lock is opened when the desired floor is reached. After the safety lock is open then the elevator doors are going to open and the passengers can come out. Regular renovation is crucial to make sure the right functioning of elevator systems. Maintenance technicians behaviours habitual inspections and servicing to keep the elevator in most suitable condition, minimizing the risk of malfunctions and ensuring passenger protection.

In the occasion of an emergency, including a strength outage or mechanical failure, elevators are prepared with backup structures to make certain the safety and luxury of passengers. These may include battery-powered lighting, emergency communique structures, and protocols for thoroughly returning passengers to a designated floor till assistance arrives. Overall, the operation of an ordinary elevator is a unbroken and dependable procedure, offering passengers with secure and green vertical transportation within buildings. From the initial name to the final vacation spot, elevators play a crucial position in facilitating motion and accessibility in modern systems.

Reasons for Overload In Elevator

Elevators are overloaded when the weight of passengers or cargo is greatly exceeded. This can happen for a variety of reasons, including too many passengers, heavy luggage, improper loads, incorrect load calculations, improper elevator use, lack of maintenance, inadequate safety equipment and human error Too many passengers may exceed the design capacity of the elevator, while heavy loads may exceed the limit. Improper loading, such as uneven load distribution, can also cause overloading. An inaccurate weight estimate may not reflect the weight of passengers, baggage, or both. Like moving very heavy objects, elevator abuse can lead to overloading.

Neglecting routine maintenance can lead to wear and tear on elevator components, inadequate safety features, such as missing or malfunctioning load sensors or excessive detectors can have increased the risk of overloading Human error by passengers, operators, or maintenance workers can also contribute to overloading . An overload situation can have serious consequences, including elevator failures, accidents, or even death. It is therefore important to comply with load limits and proper handling to ensure proper operation and efficiency of the elevator.

Reasons for Breakdown In Elevator

A breakdown in an elevator happens when it fails to characteristic nicely, inflicting disruptions or maybe complete stoppage. Mechanical failures, along with tired or broken components, can reason the elevator to malfunction or prevent operating altogether. Electrical problems, like faulty wiring or circuit breakers, can also prevent the elevator from working. Power outages can purpose the elevator to shut down, trapping

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passengers interior. Overload, exceeding the elevator's weight potential, can lead to breakdowns or injuries. Improper upkeep, neglecting normal tasks like lubricating shifting components or changing worn-out additives, can result in breakdowns.

Human errors, mistakes made by passengers, operators, or renovation employees, also can cause breakdowns. Aging infrastructure, previous or out of date elevator structures, can be greater prone to breakdowns. Manufacturing defects, flaws within the elevator's design or manufacturing method, can cause breakdowns or malfunctions. Natural disasters, like earthquakes, floods, or fires, can damage or break elevators. Breakdowns can lead to inconvenience, damage, or even protection dangers, emphasizing the importance of normal upkeep and proper usage.

Working of Elevator with breakdown and weight mechanism

As now you all know how an normal elevator works but by using this elevator the people may face some problems like breakdown and weight issues. In order to overcome this issues by using an elevator with breakdown and weight mechanisms.so that the people travel safely in the elevator. Lets us know, how this elevator with breakdown and weight mechanism works. To reduce the overload problem we need to have the weight of every person that are entering the elevator.

For calculating or measuring the weight of the persons in the elevator , we use weight sensors which are inbuilt somewhere suitable position in elevator. The weight sensor has given a value like Threshold or predefined value, when the persons weight in the elevator is exceed the predefined value, it stops the elevator motor and displays the overload signal or indicator. So that the peoples in the elevator understand that the elevator is overloaded and they need to reduce some peoples in elevator.

In this way we can solve the overload problem that occurs in elevator. The breakdown occurs many ways as we mentioned earlier, when this breakdown happens the elevator stops at anywhere in the building, its not not guarantee that it stops at the exact floor, it can also stop between two floors. When that happens the operator arrives late because of late intimation the problem.

To avoid this type of problems the solution we are providing is to call the operator or send an message to the operator telling that an elevator breakdown occurred by pressing an breakdown button which is inbuilt in elevator..so that he can solve the problem Fastly, because he intimated about the problem exactly few seconds after it happens. In this way we can solve the problem of breakdown and overload problem in elevator.

2. Implementing the Elevator with Breakdown and Weight Mechanism using Verilog HDL

The block diagram of this design is shown below, which shows the inputs and outputs. With the help of these inputs the corresponding outputs are obtainedd

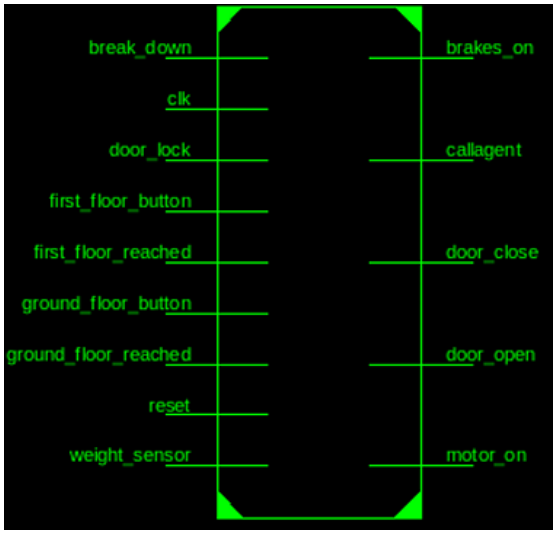

Figure. 1 Block Diagram

The Block diagram represents the normal operation of an elevator. The operation is as follows: initially the elevator at ground floor and doors are open. A person enters the elevator and push the button of first floor. Now the elevator motor is ‘ON’ and doors are closed and safety lock is applied to the door. Then the elevator starts going to first floor.

Test Case - 1

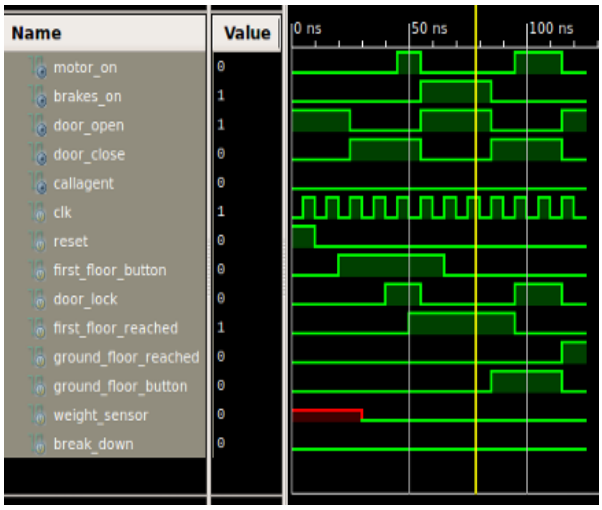

Figure. 2 Result waveform of elevator with no break down and no overload(Normal Operation)

The above waveform is the result of the normal operation of the elevator, so the elevator is working normally that’s why the weight sensor is ‘OFF’ and breakdown not happens.

When the person reached the first floor brakes are applied and elevator motor is ‘OFF’. Safety lock of

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the door is open then the doors are open and person left the elevator. In this way a person reaches the First Floor. If another person is enter the elevator and he want to go to Ground Floor. He push the ground floor button, then doors are closed and safety lock is applied to the doors. Now the brakes are 'OFF' and elevator Motor is 'ON' and elevator starts to going down to ground floor. When the person reaches the Ground floor the doors safety lock is open and elevator motor is 'OFF' and the person left the elevator. The weight sensor always monitors the weight and informs when the weight exceeds the predefined value and a call is going to the agent when the breakdown happens. You can observe it figures. The simulation of the normal operation is given in Fig- 2

Testcase 2:

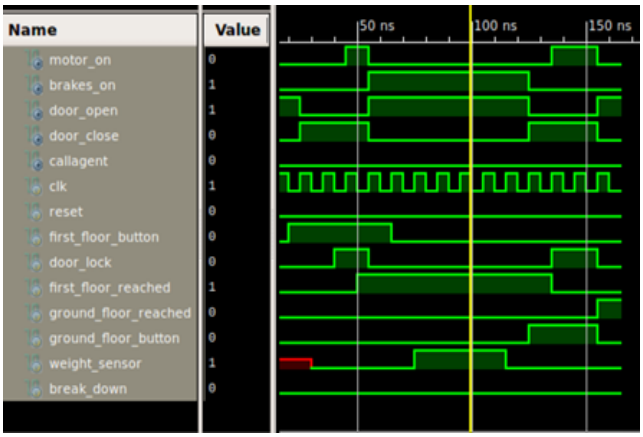

Figure. 3 Result waveform of elevator with overload and without breakdown

The above waveform is obtained when there is a overload occurs in first floor, hats why the weight sensor is 'ON' on that time and motor is 'OFF', after that the weight is reduced so the weight is below the predefined value, hats why the weight sensor is 'OFF 'then the motor is 'ON' and elevator going down to ground floor.

Testcase 3:

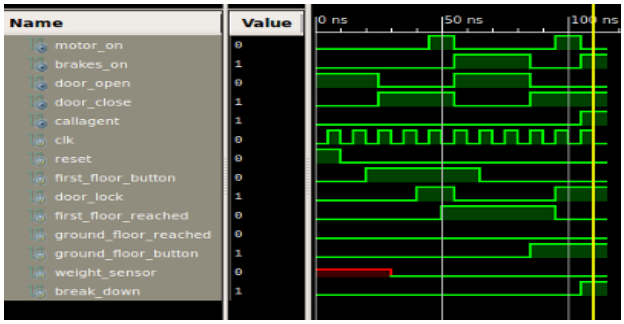

Figure. 4 Result waveform of elevator without overload and with breakdown

The above waveform is obtained when there is a Breakdown occurs in first floor,thats why the 'break_down=1'and motor is 'OFF', means the breakdown button is pressed and this breakdown occurs when the elevator going to first floor to ground floor thats means the elevator is stops between first floor and ground floor. A message or a call is send to the agent immediately when this breakdown happens,that why the 'callagent=1'.so the opertor or agent is going to solve the problem fastly.

Testcase 4:

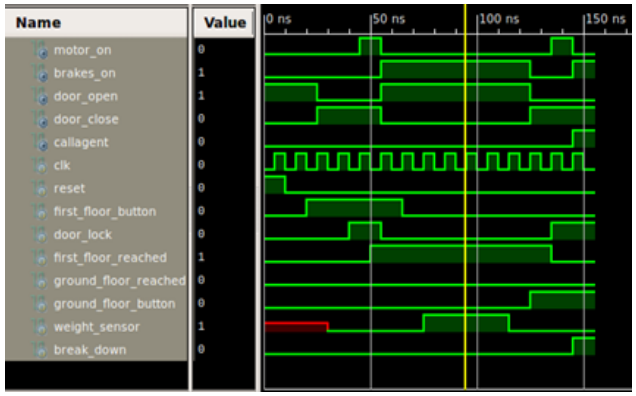

Figure. 5(a) The result waveform of elevator with breakdown and with overload(when overload)

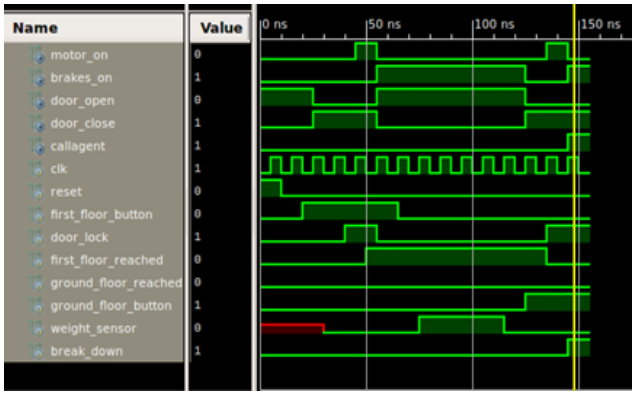

Figure. 5(b) The result waveform of elevator with overload and with breakdown(when breakdown)

The above two waveforms from Fig 5a and 5b are the outputs of the one testcase when the breakdown and overload happens .firstly the overload happens at the first floor and solving the problem is also solved after the overload occurs,thats why the weight sensor is 'OFF' after solving the overload problem. After that elevator is going down and the breakdown happens between first and ground floor thats why the 'break_down=1'and motor is 'OFF'.message sent to the agent or operator and the operator solve the problem.

Advantages

An elevator with a Breakdown-and-weight mechanism has many advantages. First, it improves safety by preventing overloads, reducing the risk of accidents and damage. In addition, the load system provides energy efficiency by adjusting speed and power according to the weight and number of passengers, resulting in better energy efficiency The system also offers an enhanced user experience, with advanced features such as floor reports and voice announcements. Additionally, the spoiler detects problems early, reducing downtime and maintenance costs. This increases capacity, reduces waiting times, and improves building efficiency. The elevator's

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advanced technology integration capabilities allow it to be tailored to meet specific building needs, such as access control and security features Similarly, the system enables real-time monitoring and monitoring, and enables customization something quick on information and efficient. This makes it ideal for modern buildings, which prioritize safety, efficiency and user experience. Overall, the elevator with break-load mechanism offers a variety of benefits, including improved safety, energy efficiency, improved user experience, cost savings and its cargo capacity face and integration capabilities make it value for money for any building, ensuring reliable and efficient vertical ship.

Disadvantages

Elevators have many disadvantages, including high initial costs, maintenance costs, and space requirements. Especially for tall buildings, installing elevators can be expensive, and maintenance costs can add up over time. In addition, elevators take up valuable space in a building, reducing the space that can be used for other purposes. They also consume a lot of energy, increase energy costs, and contribute to environmental impacts. Lifts are also limited in capacity, causing confusion and waiting times, and can break down, leaving users confused and confused They can also be a safety hazard if not properly maintained or taken improper handling, noise pollution during assembly and maintenance and production . Additionally, elevators rely on complex technology, which can fail or become obsolete, and may not be accessible to people with disabilities or certain travel issues Overall, when an elevator provides convenience and efficiency, their shortcomings should be considered in housing design and operation.

3. Conclusion and Future scope

The future of disruptive elevator systems using Xilinx ISE holds great promise, opening the way for important improvements and innovations One way to achieve further improvements is through the use of artificial intelligence (AI) and machine learning (ML) and predictive maintenance will combine power Empower elevator systems By using data analytics, AI algorithms can predict potential outages in advance, enabling them repair priorities and reduce service interruptions, thus increasing reliability In addition, future lift systems are set to incorporate advanced safety features, including biometric identification and real-time monitoring of passenger health data These developments aim to improve passenger safety and security, and ensure a safe and

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