Project Report

of

Bachelor of Technology

in

Electronics & Communication

(2EC201)

Submitted By:

Abhishree Ghariwala (22BEC003)

Hitarth Chudasama (22BEC019)

To:

Dr. Hardik Joshi

Department of Electronics & Communication Engineering

Institute of Technology, Nirma University, Ahmedabad – 382481

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Title : Elevator controller

Roll number : 22BEC003
22BEC019

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Guide names : Dr. Hardik Joshi
Dr. Mihir Shah

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Introduction

A lift controller, often referred to as an elevator controller, is a critical component in the operation of elevators or lifts. It plays a pivotal role in ensuring the safe and efficient movement of people and goods between different floors in buildings. This intelligent system is responsible for managing the lift's various functions, such as door operation, floor selection, and vertical movement, while maintaining safety, reliability, and smooth operation.

Lift controllers are equipped with a variety of sensors, buttons, and software algorithms to facilitate their operation. These components allow the controller to manage tasks such as opening and closing the doors, responding to floor selection inputs from passengers, ensuring the car moves smoothly, and stopping the lift in case of an emergency or malfunction.

In summary, a lift controller is the central brain of an elevator, responsible for coordinating its movements, managing user inputs, and prioritizing safety. As buildings continue to grow taller and the demand for efficient vertical transportation increases, lift controllers will continue to evolve, becoming more sophisticated and intelligent to meet the demands of modern urban environments.

Features of lift controller

1.Weight and Overload Sensors:

- Sensors to detect the weight of passengers and cargo to prevent overloading.

2.Communication Systems:

- Communication with building management systems for monitoring and control.
- Emergency communication with a building's security or management.

3.Door Controls:

- Open and close door buttons to control the elevator doors manually.
- Door open and close timing to ensure safety and efficiency.

4.Call Buttons:

- Floor call buttons inside and outside the elevator car to request a ride to a particular floor.

5.Maintenance and Diagnostics:

- Remote monitoring and diagnostics to detect and report faults for proactive maintenance.
- Service modes for maintenance personnel to perform tests and maintenance tasks.

Literature Survey

Lift controllers play a pivotal role in the efficient operation of elevator systems, which are indispensable in modern urban environments and high-rise structures. Elevators have come a long way from their manual and simplistic forms to the complex, automated systems we encounter today. This literature survey explores the evolution and current state of lift controllers, with a particular focus on their significance in the realm of building and transportation systems. Elevators have not only revolutionized the way people move within buildings but also contribute to energy efficiency and sustainability goals. This survey delves into the historical development of lift controllers, control algorithms, safety standards, energy-saving techniques, and emerging technologies that shape the field. Additionally, it discusses the challenges and future directions in this ever-evolving domain, acknowledging the critical role lift controllers play in the changing landscape of urban infrastructure and smart buildings.

The history of lift controllers is intrinsically tied to the evolution of vertical transportation itself. Early elevators were manually operated, requiring elevator operators to manually control the speed and position of the car. With the advent of electricity in the late 19th century, automatic control systems emerged, making elevators more practical and efficient. The introduction of safety features, such as emergency brakes and interlocks, further enhanced elevator safety. The shift from manually operated systems to automated controls marked a turning point in the history of lift controllers, leading to the development of advanced and efficient elevator systems we encounter in contemporary buildings.

Lift control systems are fundamentally responsible for the seamless and safe vertical transportation of passengers and goods within buildings. A typical elevator system comprises various key components, including the car, hoistway, doors, and control panel. The lift controller, often considered the "brain" of the system, plays a central role in coordinating these components, ensuring that passengers are transported efficiently and safely. Understanding these fundamental principles is essential for grasping the complexities of lift controller design and operation.

Future Scope

1.Smart Building Integration: The integration of lift controllers with broader smart building systems is on the horizon. This involves creating intelligent, interconnected ecosystems that allow for seamless coordination between elevators, security systems, climate control, and more. Such integration can enhance the overall building efficiency, user experience, and sustainability

2.**Machine Learning and Predictive Maintenance:** Machine learning algorithms will become more sophisticated in predicting elevator usage patterns, proactively identifying maintenance needs, and optimizing elevator dispatch. These advancements will reduce downtime and improve the reliability of elevator systems.

3.**High-Rise and Supertall Buildings:** As the world sees a proliferation of high-rise and supertall buildings, lift controllers will face new challenges in handling increased traffic and navigating the complex architectures of these structures. Research and innovation in elevator design and control strategies will be necessary to meet these unique demands.

4.**Elevator User Experience:** Improving the user experience will remain a focus of future research. This includes advanced user interfaces, touchless controls, and features that enhance passenger comfort, such as personalized elevator experiences based on individual preferences.

Research paper

Link : https://www.ijedr.org/papers/IJEDR1503094.pdf

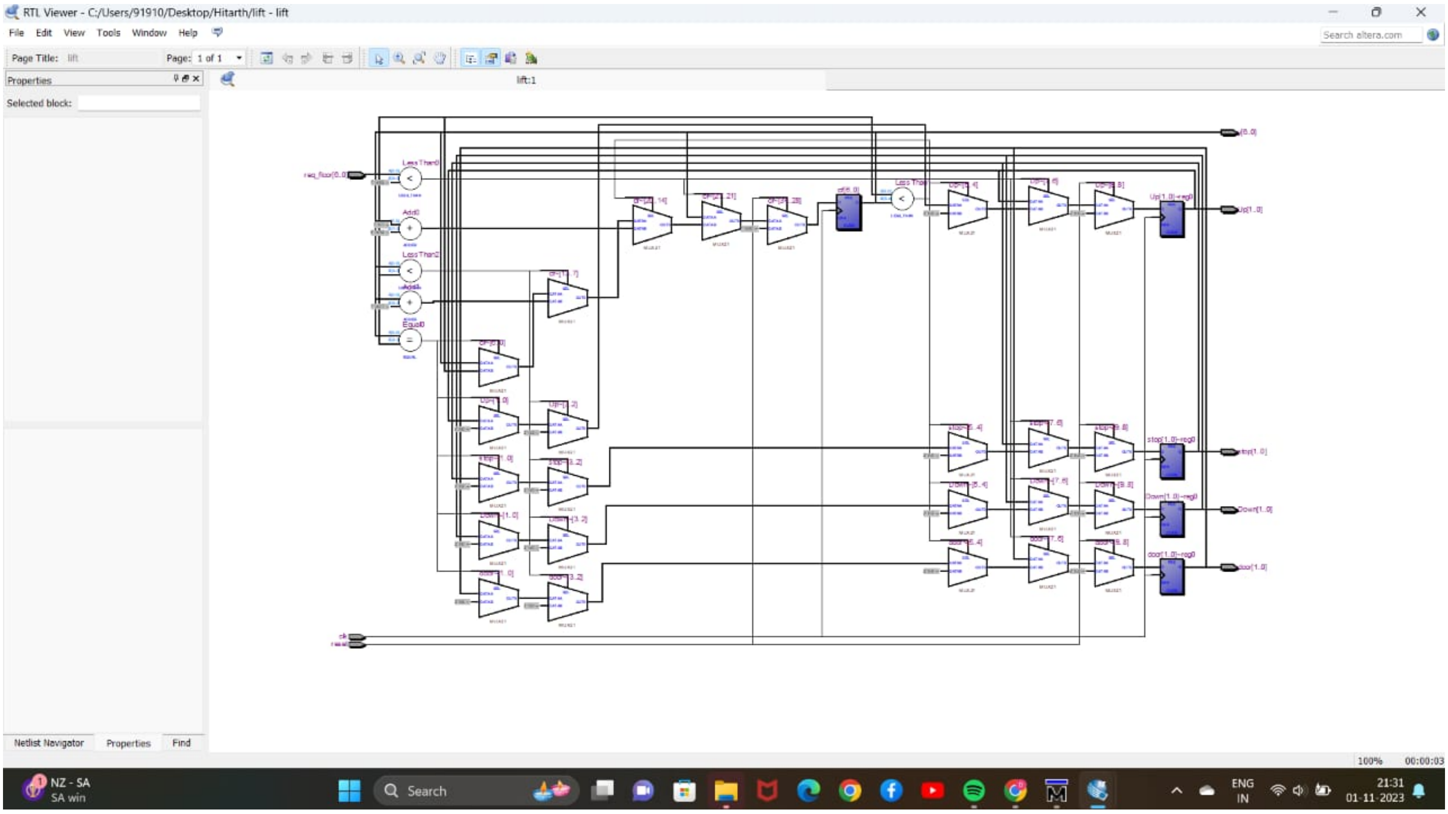
Title : Synthesis & Simulation Model of Parallel Lift Controller Using Verilog

Conclusion :

In this project the proposed design used Model Sim tool for Simulation and Precession Synthesis Tool for synthesizing the Design and target technology is Sparton3A device is 3a50tq144. Figure 4 shows the simulation result of the designed elevator controller and Figure 5 to 6 shows the RTL schematic of the design.

Three Parallel elevator controller is implemented successfully on FPGA board using Precision Synthesis tool.

Block diagram



Verilog code

```
 module lift(clk,reset,req_floor,stop,door,Up,Down,cf1,y);
//output reg a;
input clk,reset;

input [2:0] req_floor;
output reg[1:0] door;
output reg[1:0] Up;
output reg[1:0] Down;
output reg[1:0] stop;

output reg[2:0] y;
reg [2:0] cf ;
input [2:0] cf1 ;
reg reset_f;
reg [2:0] i;
reg [2:0] j;
initial
begin
cf <= cf1;
end

always @ (*)
begin
cf<=cf1;
if(reset)
begin
```

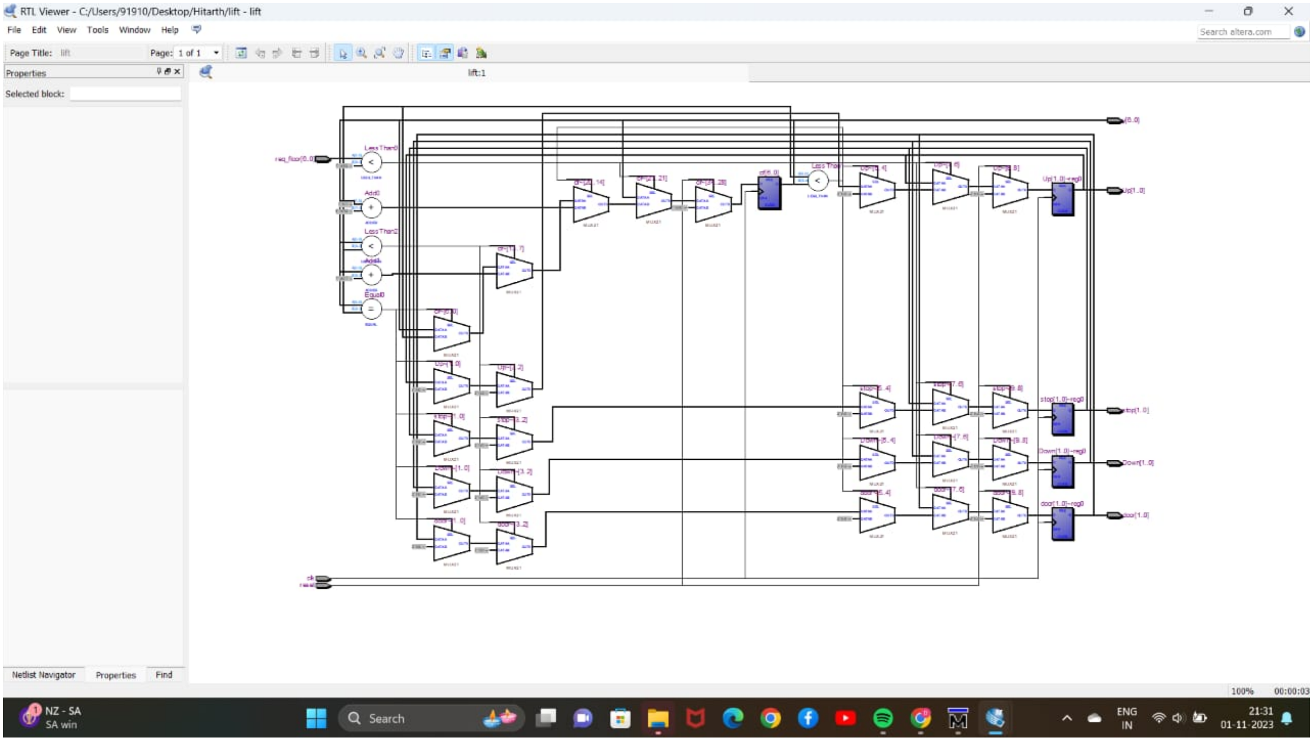
```
y=3'd0;
stop=1'd1;
door = 1'd1;
cf<=y;
end
else

begin
//if(req_floor < 6'd6)
//begin
if(req_floor < cf )
begin
i=cf-req_floor;
y<=cf-i;
door=1'd0;
stop=1'd0;
Up=1'd0;
Down=1'd1;
cf<=y;
end
else if (req_floor > cf)
begin
j=req_floor-cf;
y<=cf+j;
door=1'd0;
stop=1'd0;
Up=1'd1;
//a = 1; yeh on hona chahiye
Down=1'd0;
cf<=y;
```

```
end
else if(req_floor == cf )
begin
y=req_floor;
stop=1'd1;
door=1'd1;
Up=1'd0;
Down=1'd0;
cf<=y;
end

//else
//begin
//a = 1;
//end
end
```

RTL view


RTL Viewer - C:/Users/91910/Desktop/Hitarth/lift - lift
File Edit View Tools Window Help
Page Title: lift
Page: 1 of 1
Properties
Selected block:
lift:1
Netlist Navigator
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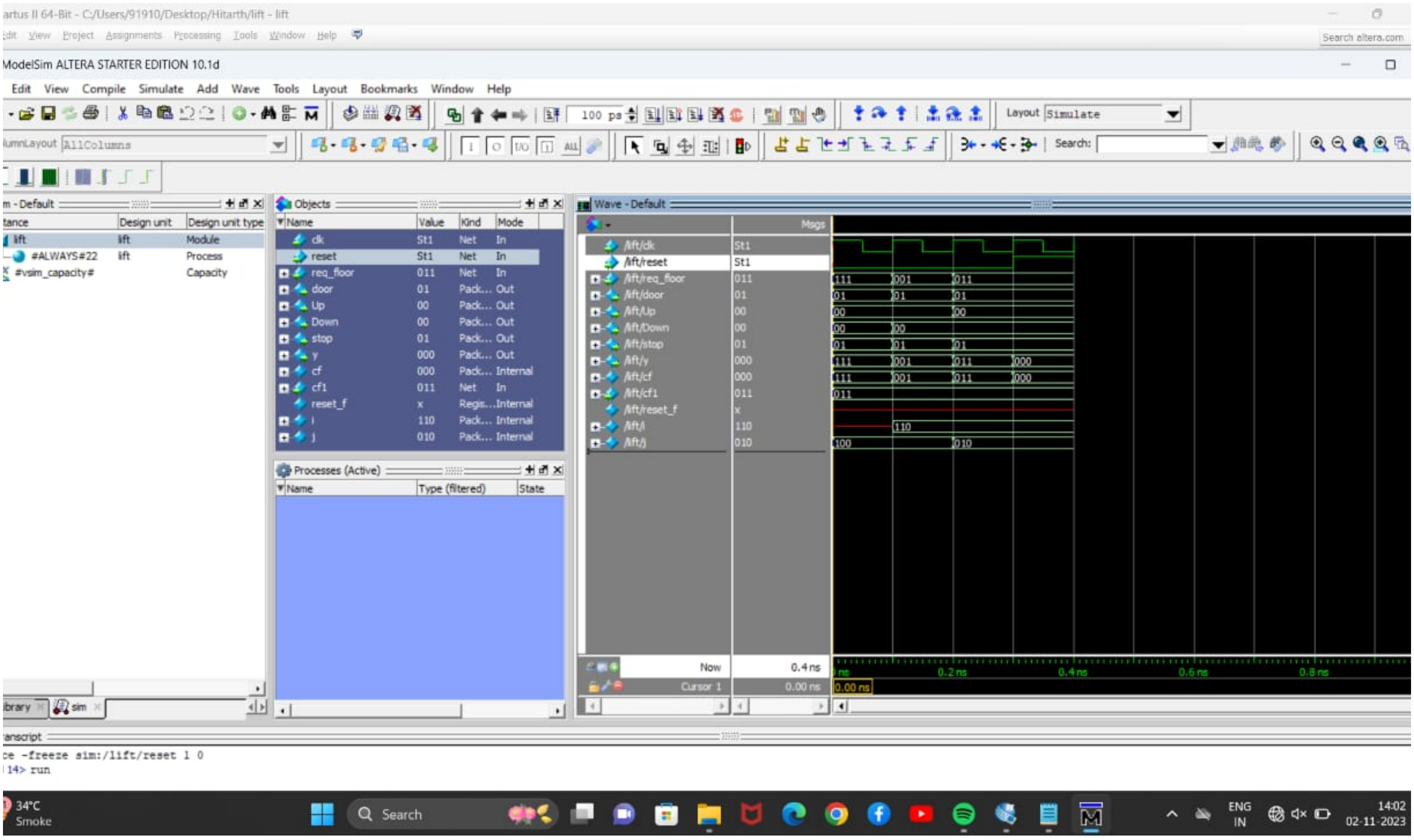
Simulation waveforms



Applications

- **Residential Buildings:** High-rise apartment complexes and condominiums often rely on lift controllers to provide residents with convenient access to their homes and amenities on various floors.
- **Healthcare Facilities:** Hospitals, clinics, and medical centers use specialized lift controllers for the transportation of patients, medical equipment, and staff. These controllers are designed to meet strict safety and accessibility standards.
- **Hotels and Resorts:** Lift controllers are essential for providing guests with access to rooms, restaurants, and amenities in hotels and resorts.
- **Retail Stores:** Some larger retail stores and shopping malls feature escalators and elevators with lift controllers to enhance the shopping experience for customers.
- **Cruise Ships and Ferries:** Cruise ships and ferries incorporate lift controllers for passenger transportation between decks.

Conclusion

In conclusion, an efficient lift controller is a critical component of modern buildings and plays a pivotal role in ensuring safe, convenient, and timely vertical transportation. Whether it's a residential, commercial, or industrial setting, a well-designed lift controller can enhance user experience, improve energy efficiency, and minimize wait times. With advances in technology and innovative control algorithms, lift controllers continue to evolve, offering greater reliability and adaptability to the complex demands of urban infrastructure. As the world urbanizes and skyscrapers become more prevalent, the importance of lift controllers in optimizing the flow of people and goods within these structures cannot be overstated.

References

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