Design and Modelling of Multi-Level Inverter

Project synopsis submitted in partial fulfilment

for the Award of

CERTIFICATION

in

Electric Vehicle Course

by

Pavan Srinivas Marri, September 1st batch

DATE: 24th August, 2024

TABLE OF CONTENTS

INTRODUCTION

Project Overview:

The main aim of this project is to design a Multi-level Inverter which is a power electronic device that is capable to providing desired AC voltage level at the output using multiple lower-level DC voltage as an input. It has a wide variety of applications in Electric Vehicles.

Objectives:

The goal of this project is to design a Multi-level Inverter using MATLAB by understanding its performance in converting DC to AC power and its applications in EV drivetrains.

Significance:

This assignment helps to understand about the importance of the inverter in the Electric Vehicle technology because of its own nature of conversion of voltage from DC to AC.

Tools and Materials

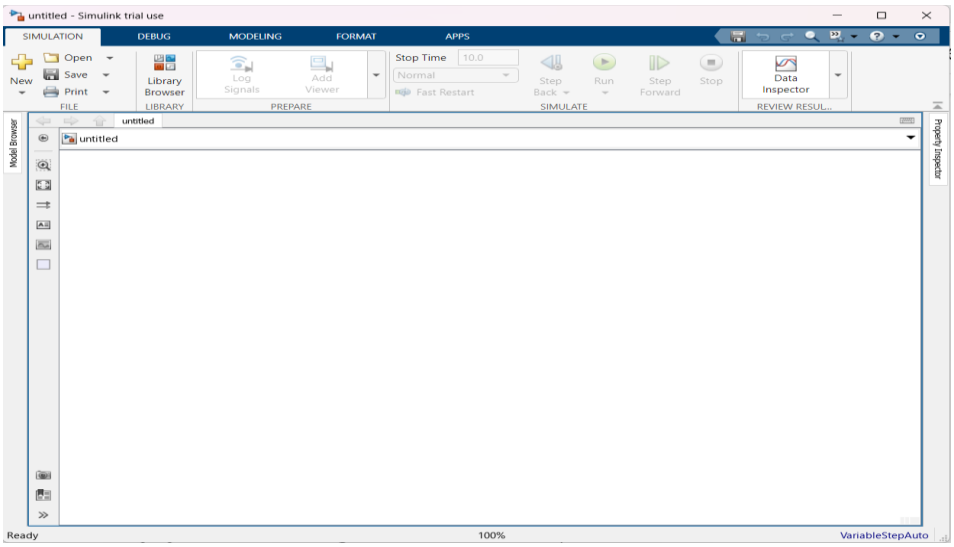
Software Tools:

The Multi – level inverter is designed by using MATLAB software of version R2023B. The Simulink environment is more used for the design and analysis of the Inverter.

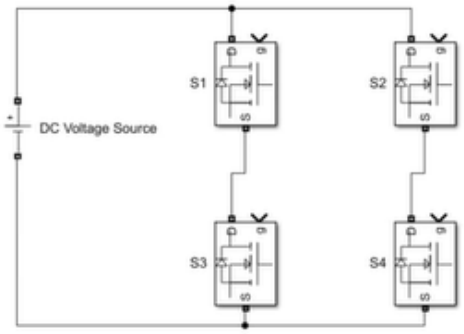
METHODOLOGY

Designing Procedure:

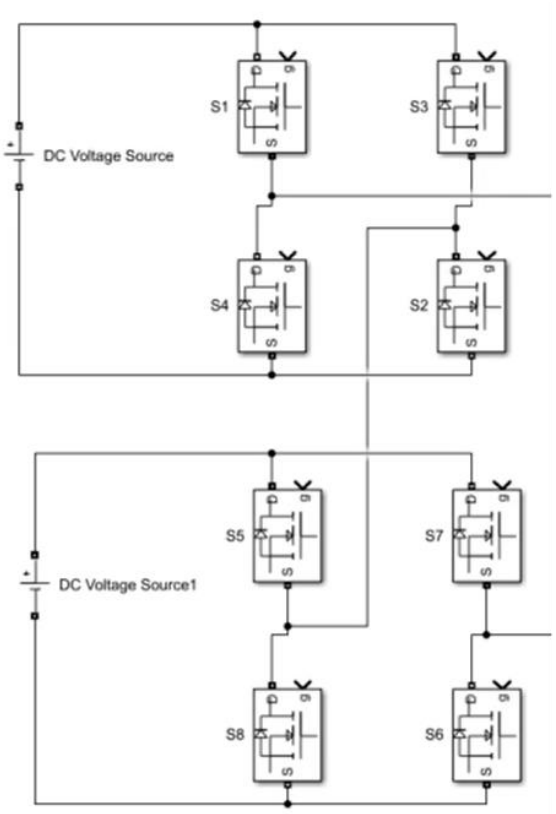
Step 1: Open the Simulink environment in the MATLAB Software.



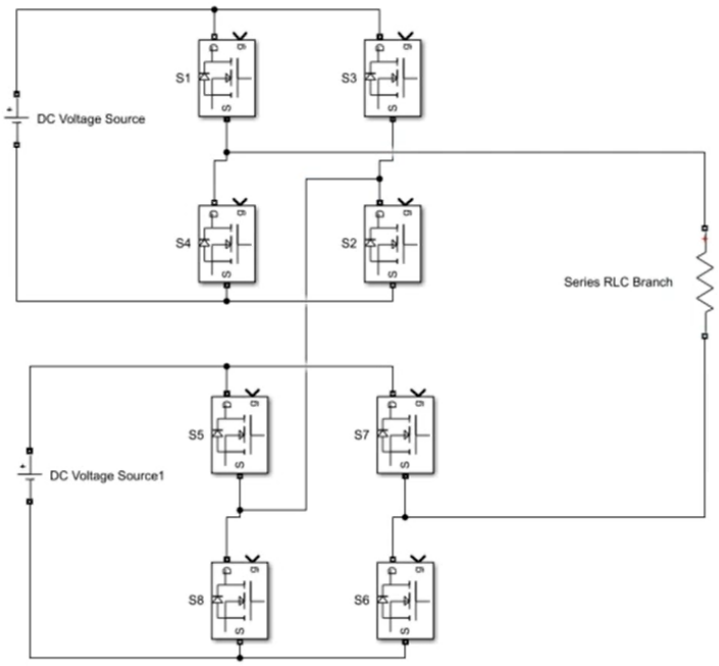
Step 2: Make the Connections for the DC Voltage Source and MOSFETs as Shown in the Figure below.



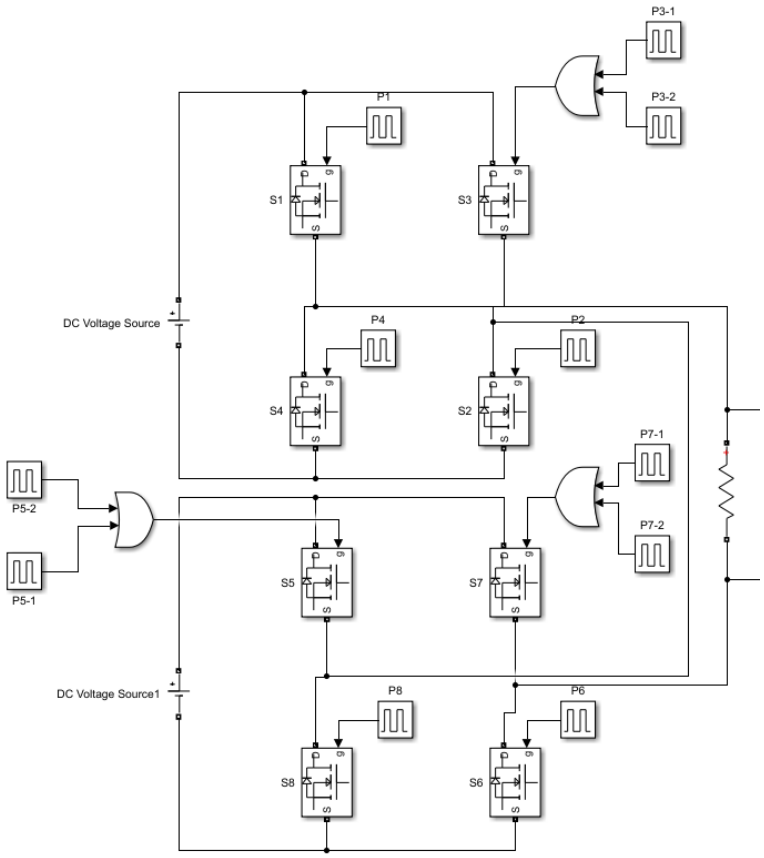
Step 3: Make a similar circuit as above and connect the two circuits as shown.



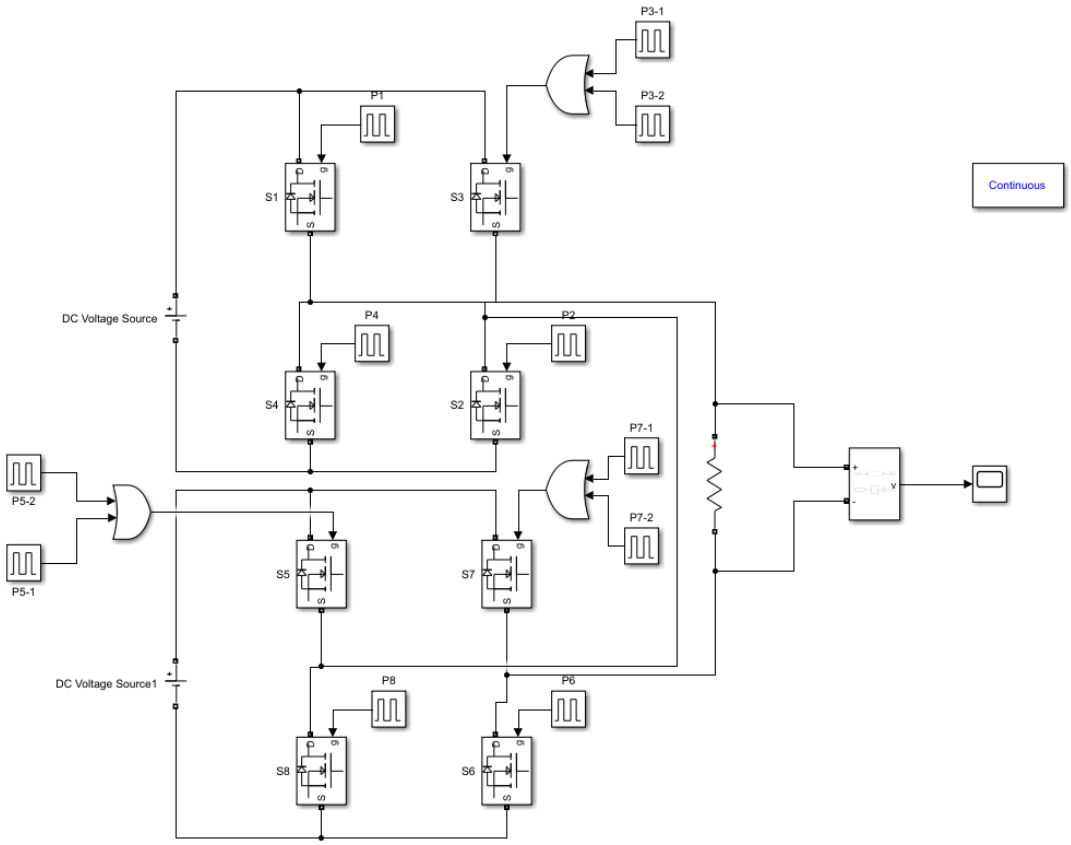
Step 4: Connect the load to the circuit as shown in the figure. This makes a basic circuit of the multi-level inverter.



Step 5: Connect the pulse generators to the MOSFETs according to their switching frequency as shown below.



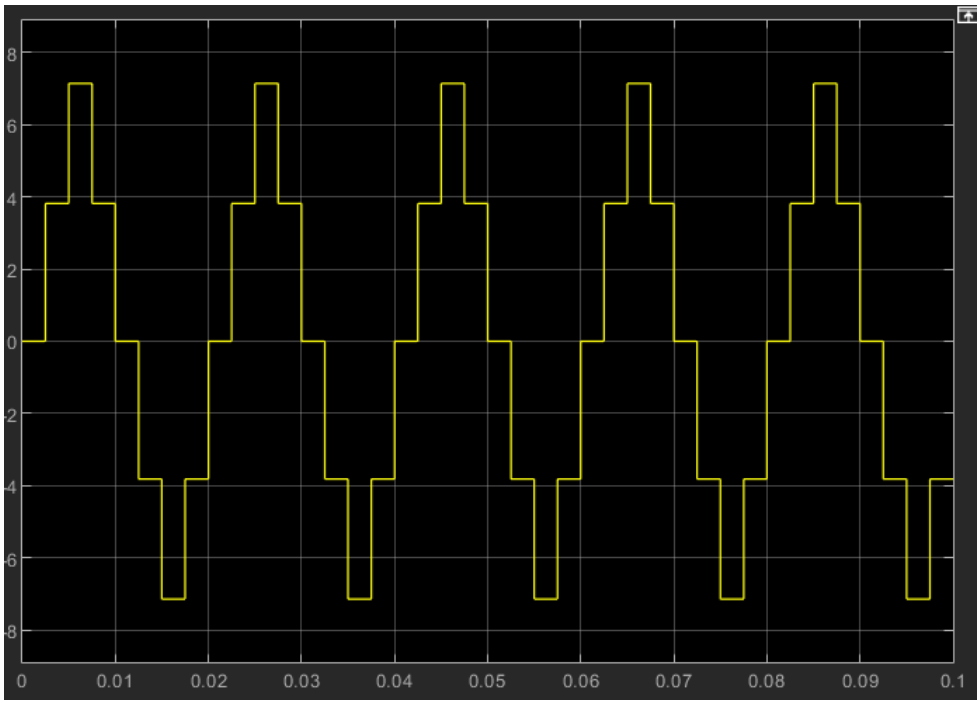
Step 6: Then connect the Voltage Measurement block and scope block to identify the results.



RESULT AND ANALYSIS

Final Outcome:

The Design of the Multi-level inverter is achieved by following the steps which are mentioned above. By simulating the model, the results are obtained as shown in the graph below.



Result Analysis:

By observing the above graph, it is clear that the voltage had raised step by step in case of the multi-level inverter whereas it raises and falls steadily in the Normal Inverter. If the levels are increased then we can expect a smooth Sinusoidal voltage curve.

CONCLUSION

Summary:

Since the aim of the project is fulfilled by designing the multi-level Inverter which is used in Electric Vehicles to get desired AC voltage level at the output using multiple lower-level DC voltage as an input.

Final Thoughts:

Through this project I have understood the significance of the multi-level inverter and the its role in the Electric Vehicle. The Multi-Level Inverter is more efficient than the normal inverter.

References:

Dhanamjayulu, C., et al. "Design and implementation of multilevel inverters for electric vehicles." *IEEE access* 9 (2020): 317-338.

Corzine, Keith. "Operation and design of multilevel inverters." *Developed for the office of naval research* (2005).