Simulink Workshop

Drexel IEEE Graduate Forum
Khalid Hurayb
Drexel IEEE Graduate (DIG) Forum

• Be a board member of DIG
  • Technical Chair
  • Assistant Operation Officer

• Do you have something to share?

• Contact us: DIGIEEE@Drexel.edu
Outcomes

- Learn to use Simulink to create power electronics devices
- Three Phase Rectifier
- Create Pulse With Modulation Generator
- Three phase 4-leg Inverter
- Encourage you to convert 50Hz system to 60Hz
Three Phase Rectifier Components

- Go to: Simscape -> Electrical -> Specialized Power Systems -> Fundamental Blocks

![Diagram of three-phase rectifier components](image)

- Diode
- Series RLC Branch
- AC Voltage Source
- 50ohm
- 470e-8F
- Vp = 650V
- f = 50Hz
- Powergui
- Scope
- Ground

![Diagram of Simscape library](image)
Three Phase Rectifier Schematic

\[ V_{out} = V_{1\phi} \sqrt{3} \]

\[ I_{out} = \frac{V_{out}}{R} \]
Rectifier Model

• https://tinyurl.com/SimulinkWorkshopRectifier
Three Phase Rectifier Parameter modification and Output Saving

Command Window

```matlab
>> Vin=650

Vin =
   650```

Scope settings for configuration properties.

Workspace:
```
Name         Value
---         ------
RectifierOutput 1x1 struct
tout          16001x1 double
Vin           650```
Pulse With Modulation Generator Components

- Repeating Sequence
- Relational Operator
- Switch
- Logical Operator
- Scope
- Sine Wave
Pulse With Modulation Generator Parameters

- Repeating Sequence
  - Time value: \([0 \ 5e-5 \ 1.2207e-04]\)
  - Output values: \([-400 \ 400 \ -400]\)

- Sine Wave
  - Amplitude: \(120\sqrt{2}\)
  - Frequency: 60
  - Phase: 0; -2\(\pi/3\); 2\(\pi/3\)

- Relational Operation: \(\geq\)
  (Boolean)
  - Switch: \(u2\sim=0\)

- Logical Operator: NOT
  (rectangular)
  - Run time: 0.0003 second
Pulse With Modulation Generator Schematic
Pulse With Modulation Generator Results

- Create a subsystem from selection
Pulse With Modulation Model

• https://tinyurl.com/SimulinkWorkshopPWM
Three 4-leg Inverter Components
Three 4-leg Inverter Schematic
Three 4-leg Inverter Results

Voltage [V]

Current [A]
Inverter Model

• https://tinyurl.com/SimulinkWorkshopInverter
Test Your Understanding

- Design a 3-phase sinusoidal generator with the frequency of 50Hz
- Convert the 3-phase AC signal to DC
- Convert the DC signal to 3-phase AC signal with the frequency of 60Hz
Conclusion

- Designed 3-phase rectifier
- Created pulse with modulation generator
- Designed three phase 4-leg Inverter
- Encourage you to convert 50Hz system to 60Hz
Thank you!