ST: T&D APPLICATIONS OF VOLTAGE SOURCE CONVERTERS

ECE 404-TD / 504-TD

SESSION no. 32
I. Averaged Converter model in PSCAD/EMTDC

- Switching Power circuit
Gate Control and Modulation

- Gate Control and Modulation

1600 Hz

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Generate Gate pulses

- Produce
Averaged Model: Control Equations

\[ v_+ = m \frac{v_{dc}}{2} \]

\[ i_p = \left( \frac{1 - m/2}{2} \right) i_{out} \]

\[ i_n = \left( \frac{1 - 3m}{2} \right) i_{out} \]

Inverter Case: Change sources and modulation function
• Closed loop control (DC-DC first)
  → Add control measurements

Averaged Model

→ Control circuit

PI

Ki = 1.176
Kp = 0.138

PLUS1
MINUS1

Gain
Input Filtering and Phase Correction

Synchronization

- Detect zero crossing of input fundamental frequency waveform
  - Possibly delay by 90 degree to get peak
  - Proper delay requires knowledge of actual system frequency (not the ideal value)
- Inputs include phase error (from measuring circuit and system drift), and base frequency
- Note use of "analog" signals, could do this digitally as well

Synchronization