Next Generation DSP Based Electric Drives Lab
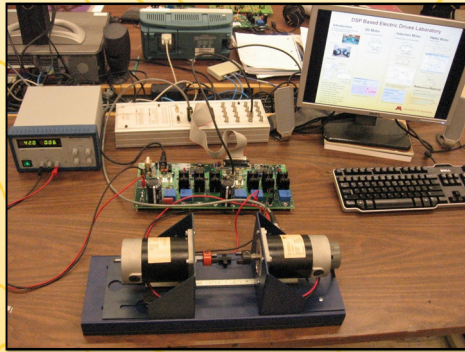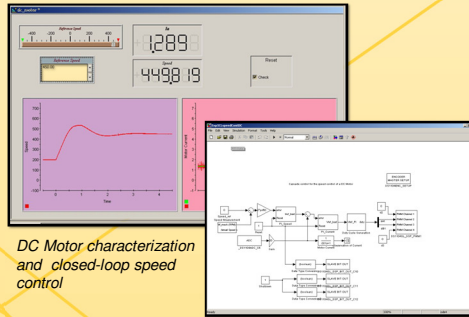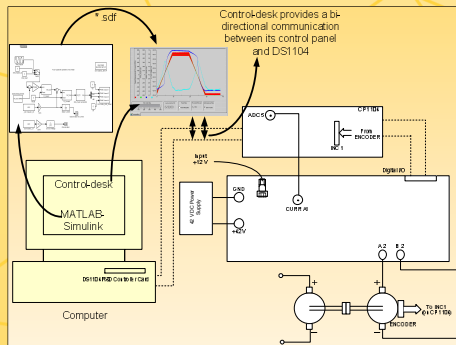
Undergraduate Education

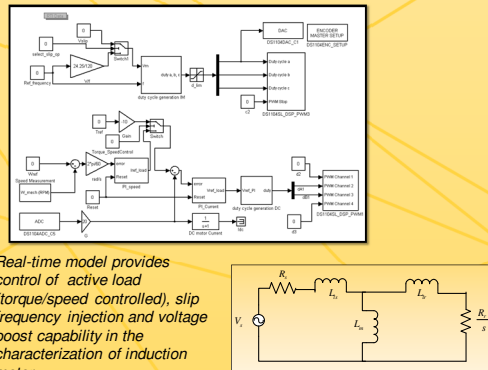## Graduate Lab (Under Development)

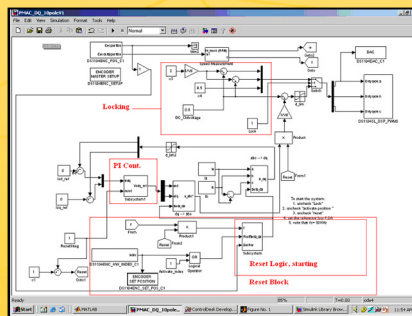**System Setup**

Computer

Developed Experiments

1. **Introduction to DSP Electric Drives**
2. **RTI of DC Switch Mode Converter**
3. **No Load DC Motor Test**
4. **Characterization of DC Motor**
5. **DC Motor Speed Control**
6. **Four Quadrant Operation of DC Motor**
7. **Characterization of Induction Motor**
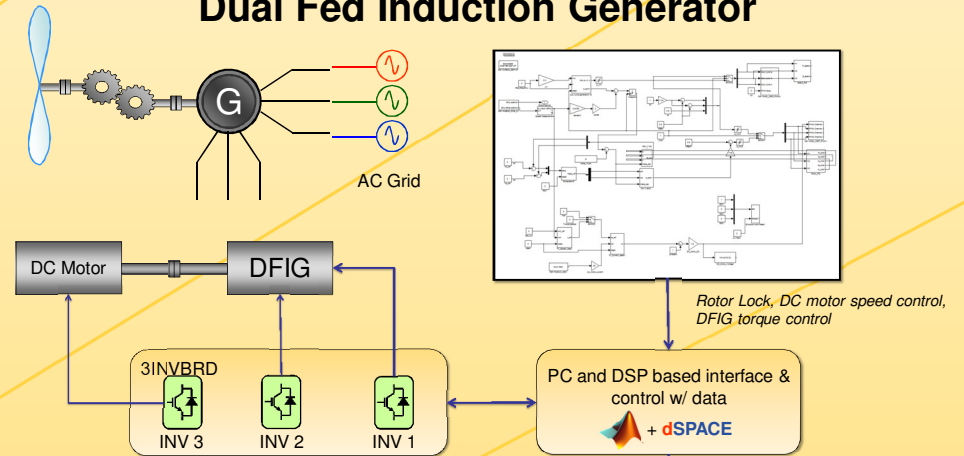8. **V/f Speed Control of Induction Motor**
9. **PMAC Motor Vector Control**

DC Motor

DC Motor characterization and closed-loop speed control

Induction Motor

Real-time model provides control of active load (torque/speed controlled), slip frequency injection and voltage boost capability in the characterization of induction motor

PMAC Motor

Simulink model of vector control

Dual Fed Induction Generator

AC Grid

DC Motor — DFIG

Rotor Lock, DC motor speed control, DFIG torque control

3INVBRD
INV 3   INV 2   INV 1

PC and DSP based interface & control w/ data
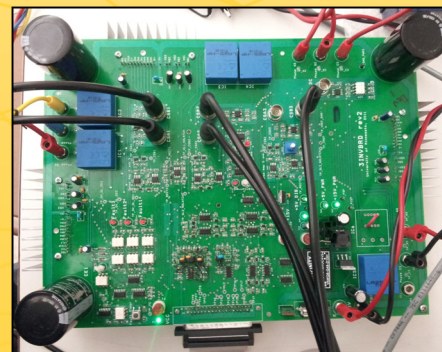+ **dSPACE**

Additional Experiments (in dev.):

- *d-q transforms and control*
- *DFIG Characterization*
- *Motoring and Generator*
- *Pos. and Neg. Reactive Power*
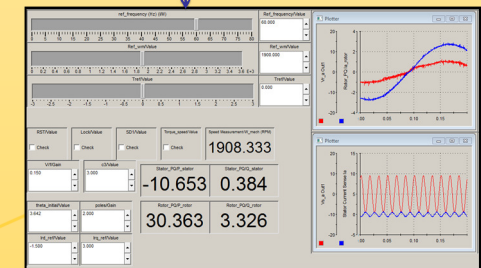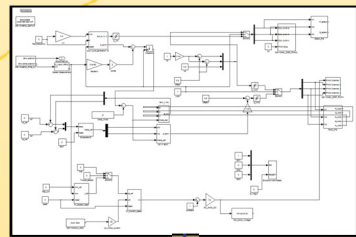
3 Inverter Board

Initial working prototype complete, rework in 2012

Reference Material

Lab Manual: Available online at
http://www.ece.umn.edu/groups/power/labs/ed_lab_man.pdf

Vendor Info and Budget: Available online at
http://www.ece.umn.edu/groups/power/labs/labs.html

Vendor information and laboratory budget:
- MOTORSOLVER LLC (www.motorsolver.com), for motors
- HiRel Systems LLC (LoisK@HiRelSystems.com), for drives board
- dSPACE (vmoudgal@dspaceinc.com), for DSP system
- Budget : $10,000 for one complete setup

UNIVERSITY OF MINNESOTA