EE409(C) - PETS HARDWARE IN THE LOOP (HIL)

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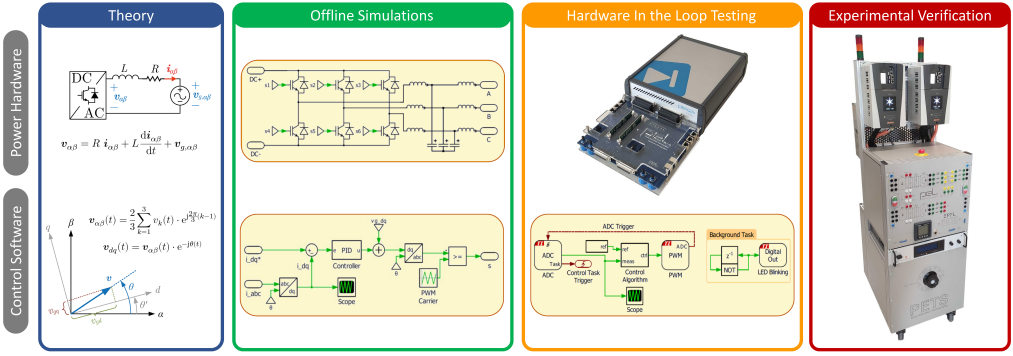
COURSE OVERVIEW



Simulation in PLECS

- W1-W6

RT-HIL simulation

- W7-W9

PETS Experiments

- W10-w12

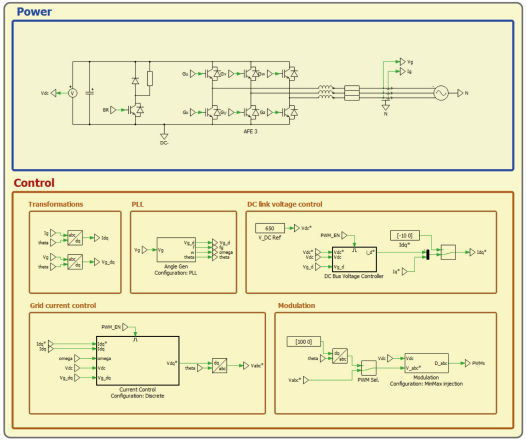
PETS HIL

Simulation in PLECS + RT BOX

- Implementation of your control strategy in a real-time simulation
- Template ready-to-use for PETS

Goals:

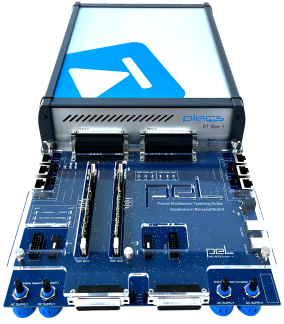
- Develop your control strategy and test with RT-BOX
- Fix the unforeseen problems before testing it with PETS.
- Define and validate test procedures



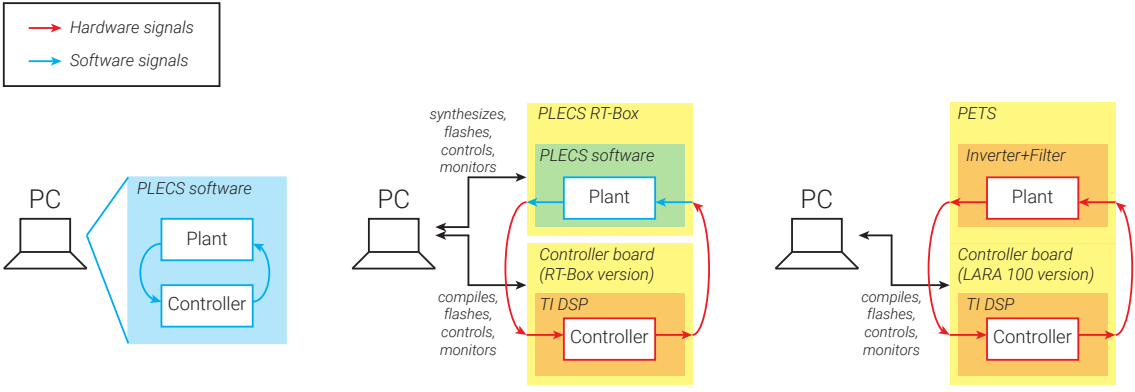
PETS HIL

About PETS HIL

- Replica of PETS
- Same GPIOs, same controller, same communication channels, etc.



CONTROLLER DESIGN PROCESS



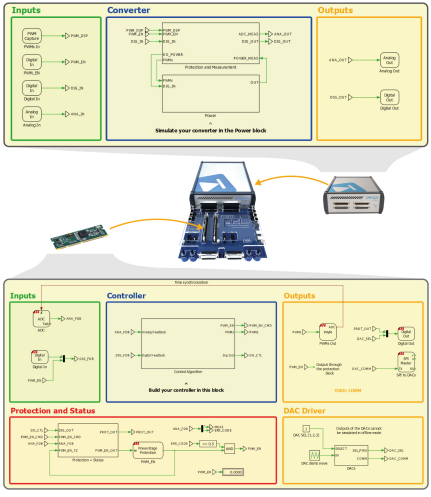
1. Offline simulation

2. HIL simulation

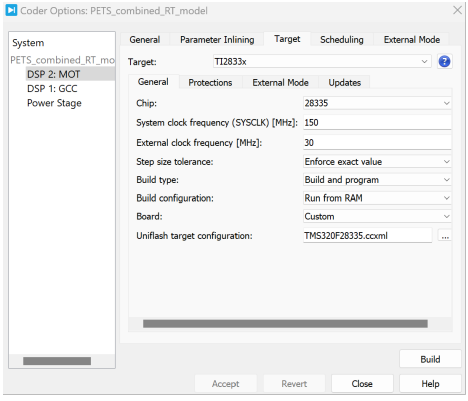
3. Experiments

EXAMPLE

PLECS interface



Code generation for TI DSP



PETS HIL MODEL

Files:

- DSP_GCC_init.m
- DSP_MOT_init.m
- PETS_PLECS_init.m
- RTBOX_init.m
- RTBOX_init.m
- TMS320F28335.ccxml
- PETS_combined_RT_model.plecs

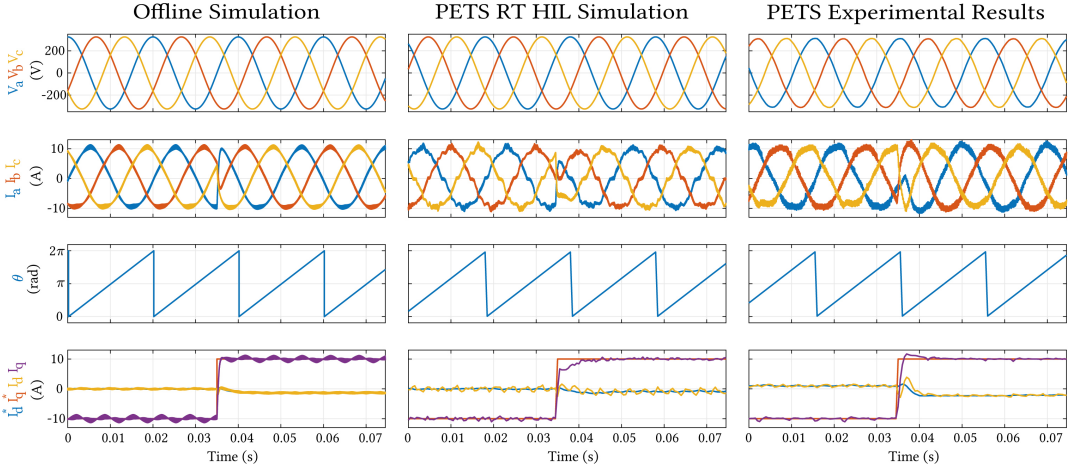
```
% ===    Converter Parameters     ===
Ldc = 33e-3;% H
Rdc = 382e-3;% Ohm
Lac = 3.5e-3;% H
Rac = 1;% Ohm
Cac = 6.8e-6;% F
Cdc = 705e-6;% F
Csupply = 56e-6;% F
Rbr = 240;% Ohm
Rch = 44;% Ohm

% ===    CONTROL DEFINITIONS    ===
% Braking chopper control
Vth_up^^I= 630;
Vth_down = 600;

% Current control - magnitude optimum
T_delay_current = 1.5*Ts;
Tn_current = Ldc/Rdc;
Ti_current = 2 * 1 * 1/Rdc * T_delay_current;

kp_current = Tn_current/Ti_current;
ki_current = 1/Ti_current;
kbc_current = ki_current/kp_current;
```

WHAT TO EXPECT



SETTING THE SOFTWARE ENVIRONMENT

Requirements

- Latest version of PLECS
- Correct version of RT-BOX (provided on Moodle)
- Latest version of TI C2000 code generator

links

- In order to install PLECS (standalone), go here and follow the instructions: https://www.plexim.com/download/standalone
- In order to install both PLECS RT-Box and TI C2000 code generator, go here and follow the instructions: https://www.plexim.com/download/tsp_c2000