Status:

1. For the STARMAC quadrotor helicopter control system we can generate

platform-specific code from models, and run a time-triggered distributed

controller in a hardware-in-the-loop configuration to detect design and

software generation errors. We have a prototype integration of the CMU

statistical model checking tools with our STARMAC model to analyze the

robustness of our design to fault conditions. We also have a preliminary

analysis of the delay effects of different data links with respect to the

passivity assumptions in a simplified version of the quadrotor design.

2. We created a prototype software test generation framework, which is

being applied to a multicore implementation of the Cesna fixed-wing

backstepping controller (in progress). This prototype was run as a class

research project, with students working to implement the controller on the

Cell processor architecture executing a local time-triggered scheduler.

3. Experimented with model-based constructive control design

approaches, including a custom modeling language for building and simulating

simple passive digital controllers, and a prototype symbolic controller

generation tool for nonlinear port-Hamiltonian control designs.

Publications:

Conferences/Workshops

N. Kottenstette, J. Porter, G. Karsai, and J. Sztipanovits. Discrete-Time

IDA-Passivity Based Control of Coupled Tank Processes Subject to Actuator

Saturation. Submitted to 3rd International Symposium on Resilient Control

Systems (ISRCS '10) 2010.

J. Porter, G. Hemingway, C. vanBusKirk, N. Kottenstette, G. Karsai, J.

Sztipanovits. Online Dynamic Stability Verification Using Sector Search.

submitted to the ACM International Conference on Embedded Software (EMSoft)

2010.

G. Hemingway, J. Porter, N. Kottenstette, H. Nine, C. vanBuskirk, G. Karsai,

and J. Sztipanovits. Automated Synthesis of Time-Triggered

Architecture-based TrueTime Models for Platform Effects Simulation and

Analysis. Accepted for Rapid Systems Prototyping (RSP), 2010.

N. Kottenstette, J. Porter. Digital Passive Attitude and Altitude Control

Schemes for Quadrotor Aircraft. IEEE 7th Intl. Conference on Control and

Automation (ICCA 2009). Christchurch, New Zealand, Dec. 2009.

J. Porter, G. Karsai, and J. Sztipanovits. Towards a time-triggered schedule

calculation tool to support model-based embedded software design. In Proc.

of ACM Intl. Conf. on Embedded Soft. (EMSOFT '09), Grenoble, France, Oct

2009.

E. Eyisi, J. Porter, J. Hall, N. Kottenstette, X. Koutsoukos, and

J.Sztipanovits. PaNeCS: A Modeling Language for Passivity-based Design of

Networked Control Systems. In 2nd Workshop on the Architecting and

Constructing of Embedded Systems - Model-Based (ACES-MB). Denver, Colorado.

Oct. 2009.

Journals

J. Porter, G. Hemingway, H. Nine, N. Kottenstette, C. vanBusKirk, G. Karsai,

and J. Sztipanovits. On Semantically Consistent Tool Integration in

Model-Based Cyber-Physical Systems Design. ACM Trans.

in Embedded Comp. Sys. - Special Issue on the Synthesis of Cyber-Physical

Systems (SCPS), submitted(Feb), 2010.

Presentations / Meetings:

1. J. Porter (ISIS). ARTIST Design Summer School in Europe 2009.

Grenoble, France. Sep. 2009.

2. S. Neema (ISIS). Demonstration of Hardware-in-the-loop flight

control test architecture at Formal Methods 2009 Tool Exhibition.

Eindhoven, Netherlands. Nov. 2009.

3. J. Reineke (UCB), "Caches in WCET Analysis". January 26, 2010. MURI

Webex.

4. P. Zuliani (CMU), "Bayesian Statistical Model Checking". March 11,

2010. MURI Webex.

5. Collaboration meeting at ISIS with Paolo Zuliani (CMU). May 17-19,

2010.