# CPS Software

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## Software and Tools

### CPS Tools and Design Studios

Tool(s), models, and mature research prototypes are made available on the CPS-VO portal in the CPS Tools and Design Studios group. These tools and design studios facilitate modeling, verifications, simulation, analaysis, and other categories of tools that are of prime interest to the community. A Verification Tools Library documents several of the most mature verification tools available to the CPS community.

### PhysiCloud

PhysiCloud is a software framework that targets mobile, low-power computing systems. It aims to provide a platform-as-a-service layer so that users may develop control applications on mobile cyber-physical systems, such as networked robotic systems. PhysiCloud is under active development as part of the HyPower project.

### MatLab-to-PhysiCloud

Educating undergraduate students in cyber-physical systems is challenging due to its dependence on diverse science and engineering domains. Undergraduate educators need tools that abstract away the low level details, so that control algorithms can be tested and deployed in the lab. Developed as part of the HyPower project, the Matlab/Octave based platform communicates with PhysiCloud. The tool lets students program a PhysiCloud-enabled cyber-physical system in Matlab/Octave, which boosts their time interacting with the systems and deployed algorithms.

### The CyPhy Beginner's Kit

As the prevalence and sophistication of cyber-physical systems increases, so does the need for an emerging workforce with a sufficient cross-disciplinary education. The attached reference material accompanies a paper accepted at the 2013 Workshop on Embedded Systems Education. This paper titled *The AVM Internship Program: a short course in cyber-physical systems design* presents the researchers experiences with introduction of such topics to a varied group of mostly undergraduate students by way of a summer internship program at Vanderbilt University. See also: https://forge.isis.vanderbilt.edu/gme/

### Pessoa

Pessoa is a software toolbox, developed at UCLA's CyPhyLab, for the synthesis of correct-by-design embedded control software. It is based on the recent notion of approximate bisimulation that allows one to replace differential equations, describing a physical system, by an equivalent finite-state machine. Controller design problems can then be solved by using efficient synthesis algorithms operating over the equivalent finite-state machine models. The resulting controllers are also finite-state, are guaranteed to enforce the control specifications on the original physical system, and can be readily transformed into bug-free code for any desired digital platform.