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Title – Rigorous Programming of Predictable Embedded Systems

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Cyber-physical systems (CPS) combine computations, networks, and physical processes. The concept of time is an inherent property of such systems; missed deadlines for hard real-time applications, such as avionics and control systems in automobiles, can result in devastating, life-threatening consequences. In contrast to desktop or web-based applications, timing for CPS is a correctness criterion, not a quality factor. Today's software and hardware platforms are designed to optimize for average-case performance, not to be timing predictable--a necessary requirement for establishing correctness guarantees for hard real-time applications. In this talk, we present the RIPPES project, a collaboration between UC Berkeley, Inria Grenoble, and the University of Auckland. The objective of the project is to explore high-level programming languages and formalisms that are predictable when designing complex CPS. In particular, we develop new high-level languages for compiling to precision-timed (PRET) machines--a new era of processors with predictable timing. In the project, we also investigate extensions to synchronous data-flow (SDF) that are more adaptive and flexible.

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