

HybridUML Profile for UML 2.0

Kirsten Berkenkötter Stefan Bisanz
Ulrich Hannemann Jan Peleska

University of Bremen

- } Introduction
- } Motivation
- } CHARON at a Glance
- } HybridUML Profile
- } Future Work

Introduction

- } hybrid systems
 - discrete observables
 - time-continuous observables

- } widespread application area
 - physical models
 - development of control systems (sensors, actuators)

- } formalisms
 - Hybrid Automata (Henzinger)
 - CHARON (Alur et. al.)

- } Introduction
- } **Motivation**
- } CHARON at a Glance
- } HybridUML Profile
- } Future Work

Motivation

- } no formalism ↪ no formal reasoning
- } no sufficient support for real-time in UML 2.0
- } no support for hybrid constructs

- } formalism needed for
 - unambiguous meaning
 - formal reasoning (model checking, proofs)
 - simulation

Motivation

- } well known standard
- } various CASE tools
- } profile support in UML 2.0

- } CHARON syntax is similar to UML ↪ easy adoption
- } formal semantics
- } hybrid state machines
- } both structural and behavioral hierarchical modeling

- } Introduction
- } Motivation
- } CHARON at a Glance
- } HybridUML Profile
- } Future Work

CHARON at a Glance

- } structural modeling: agents
- } behavioral modeling: modes (hybrid statecharts)
- } communication by shared variables
- } discrete and continuous steps for hybrid modeling
 - time passing: change of continuous variables
 - transition taken: change of discrete variables

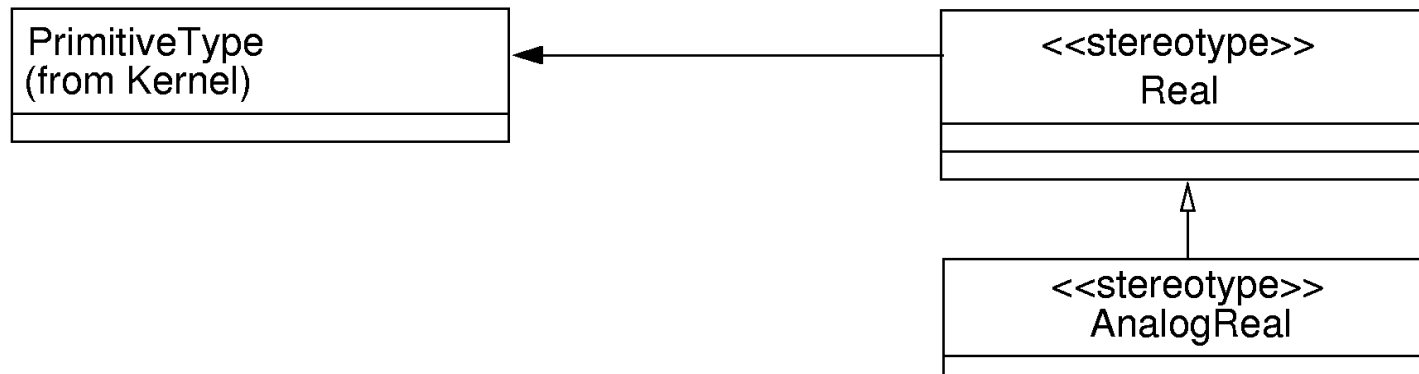
CHARON at a Glance

- } interrupts/exceptions by group transitions with history functionality
- } various possibilities in toolkit
 - graphical user interface
 - type checker
 - simulation

- } Introduction
- } Motivation
- } CHARON at a Glance
- } HybridUML Profile
- } Future Work

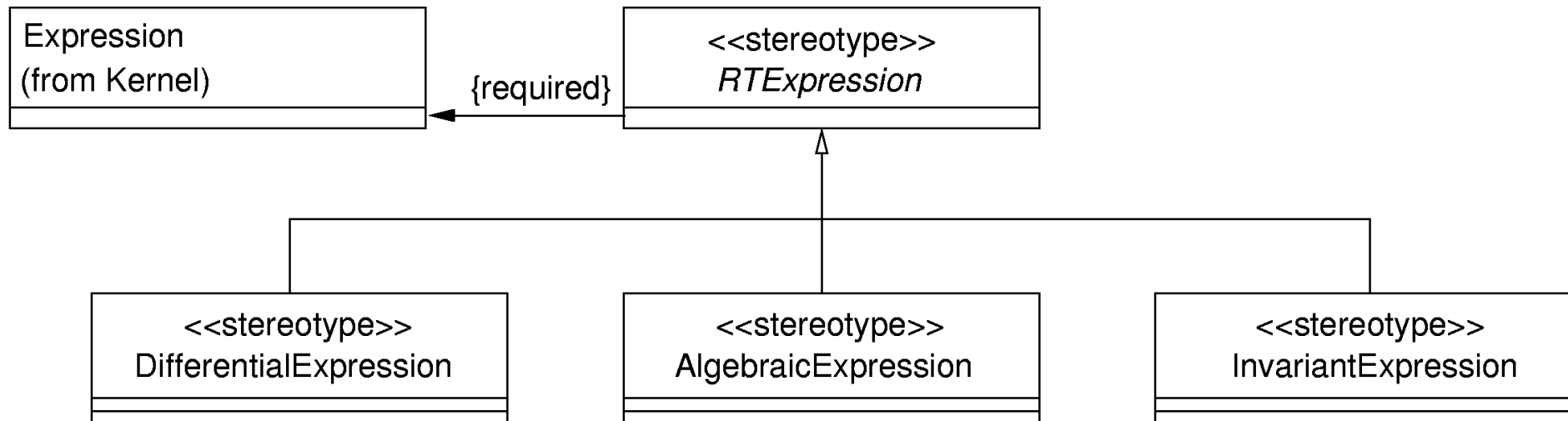
HybridUML Profile

} new datatypes: Real and AnalogReal



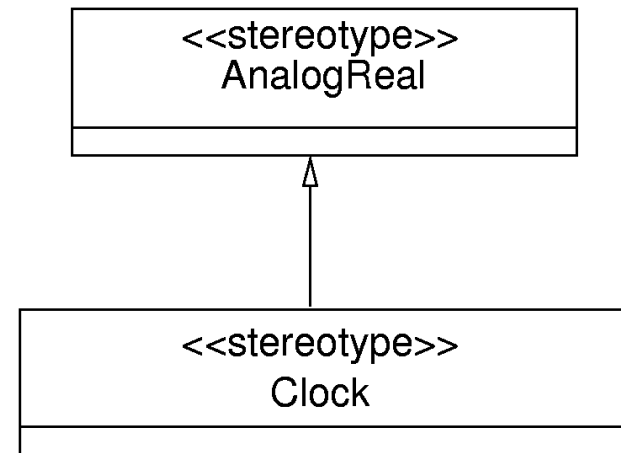
HybridUML Profile

} real-time expressions and constraints



HybridUML Profile

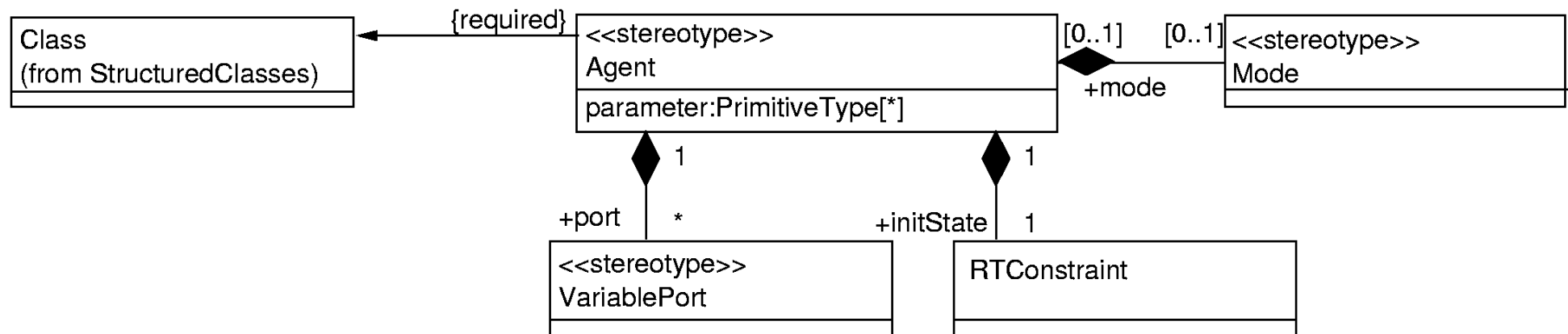
} clocks



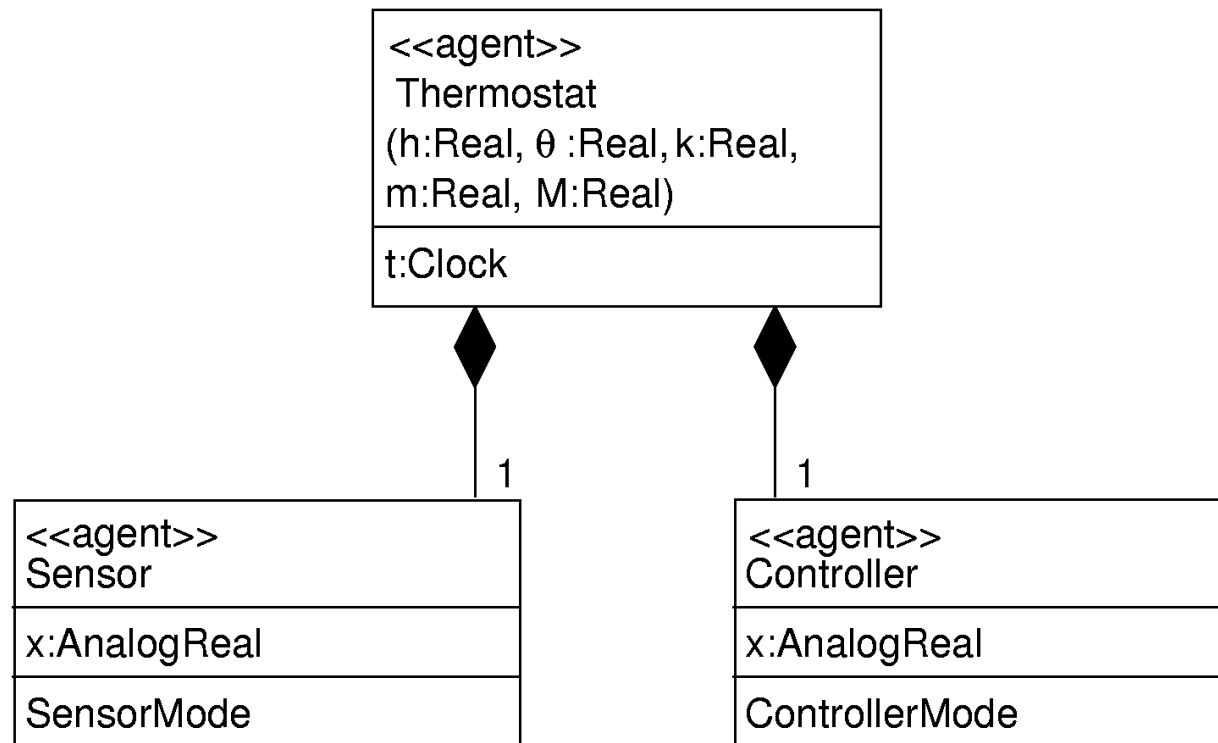
} variable ports and variable connectors for communication by shared variables

HybridUML Profile

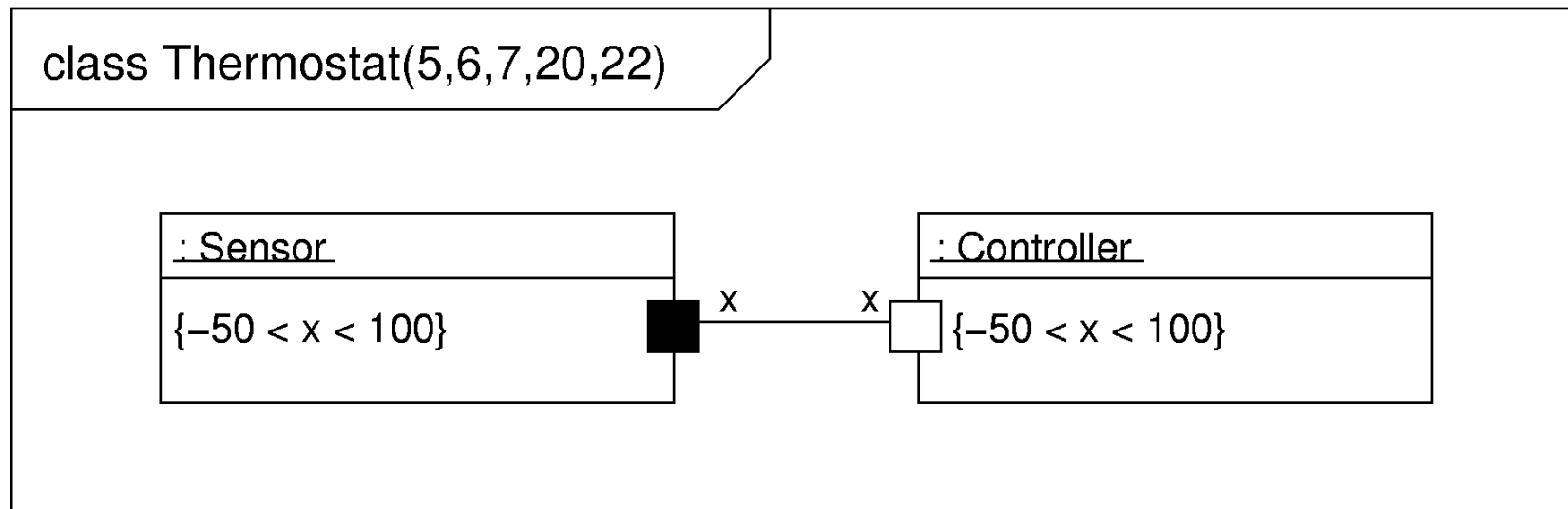
} agents



HybridUML Profile

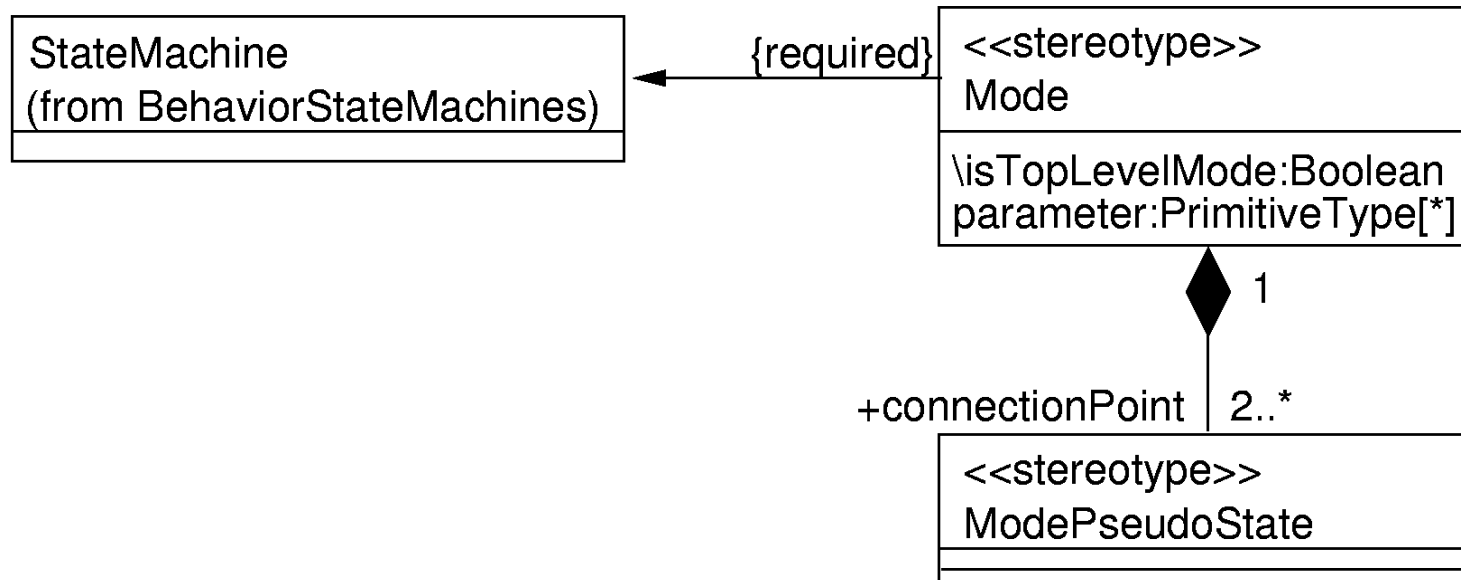


HybridUML Profile

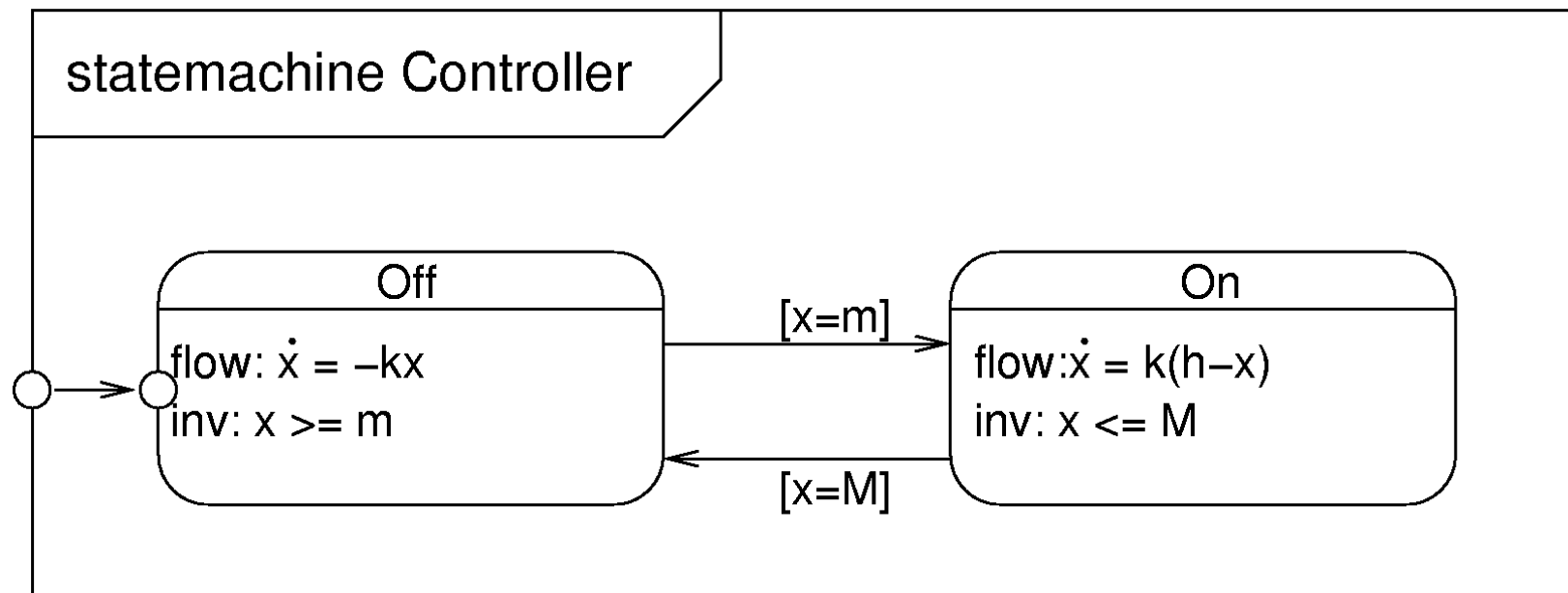


HybridUML Profile

} modes



HybridUML Profile



- } Introduction
- } Motivation
- } CHARON at a Glance
- } HybridUML Profile
- } Future Work

Future Work

- } events/signals for better communication support
- } `real` interrupts without resume
- } usage for test specifications of real-time systems