Scheduling of a Cyber-Physical System Simulation

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Simulation

Theoretical framework

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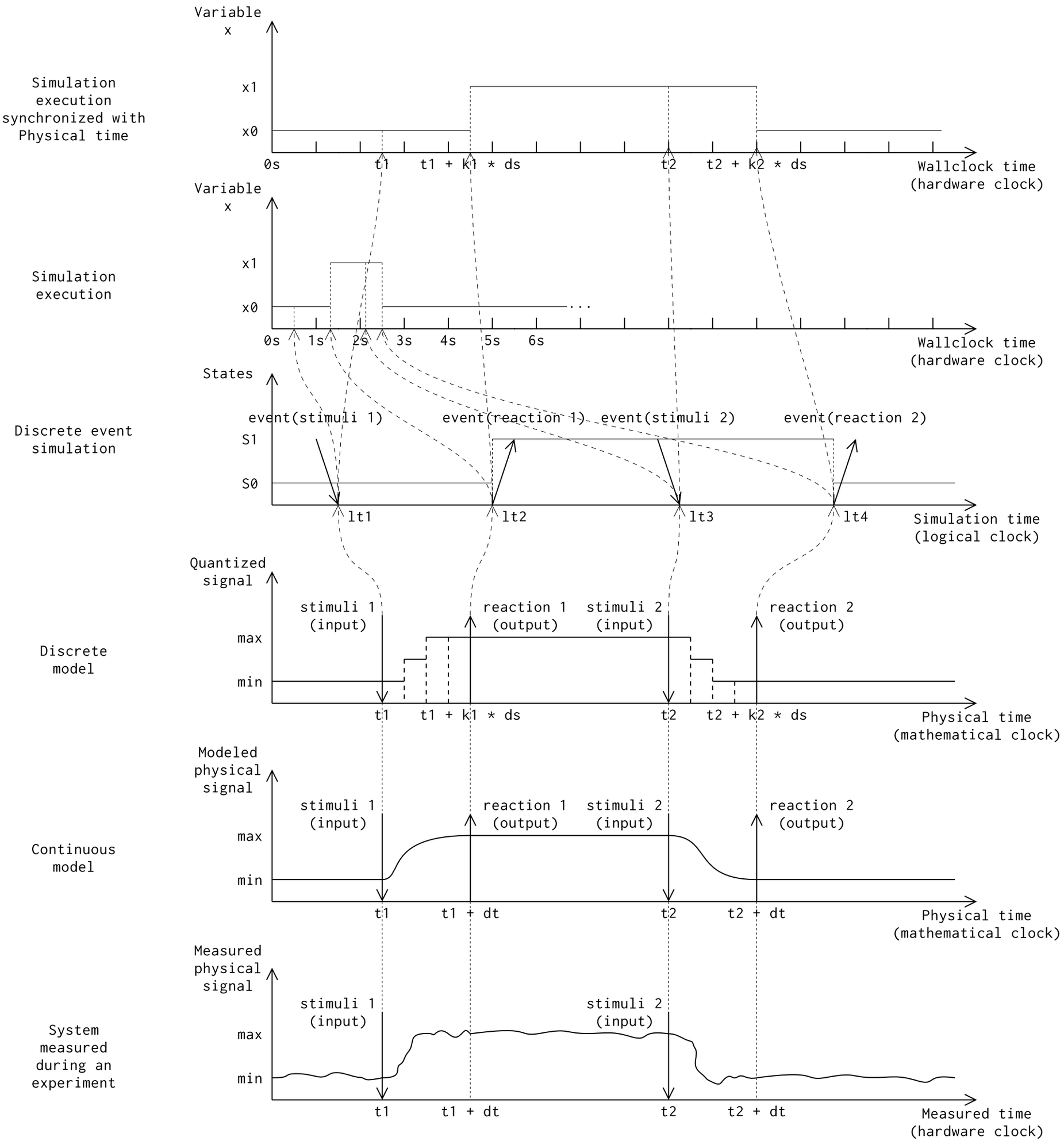
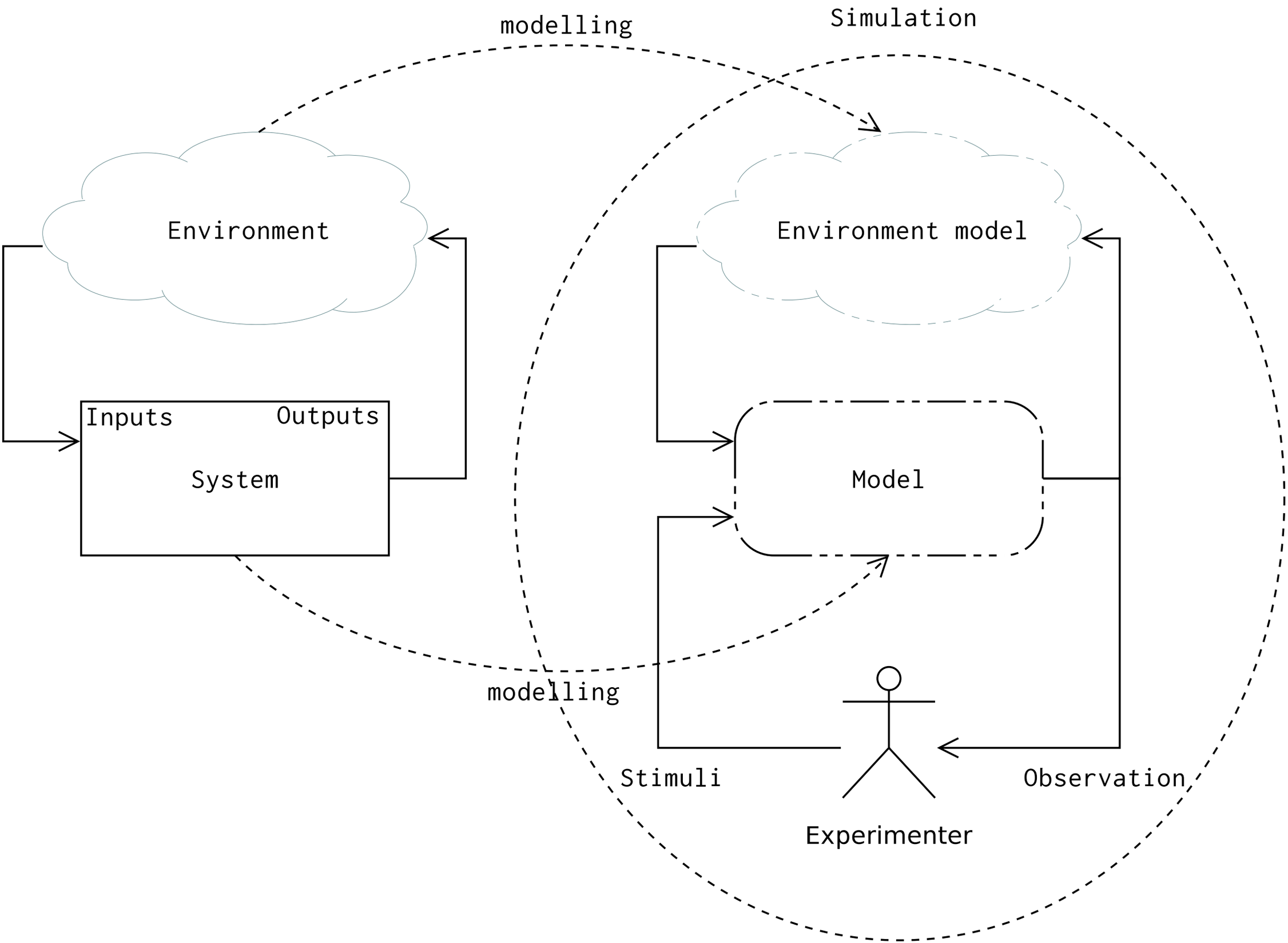
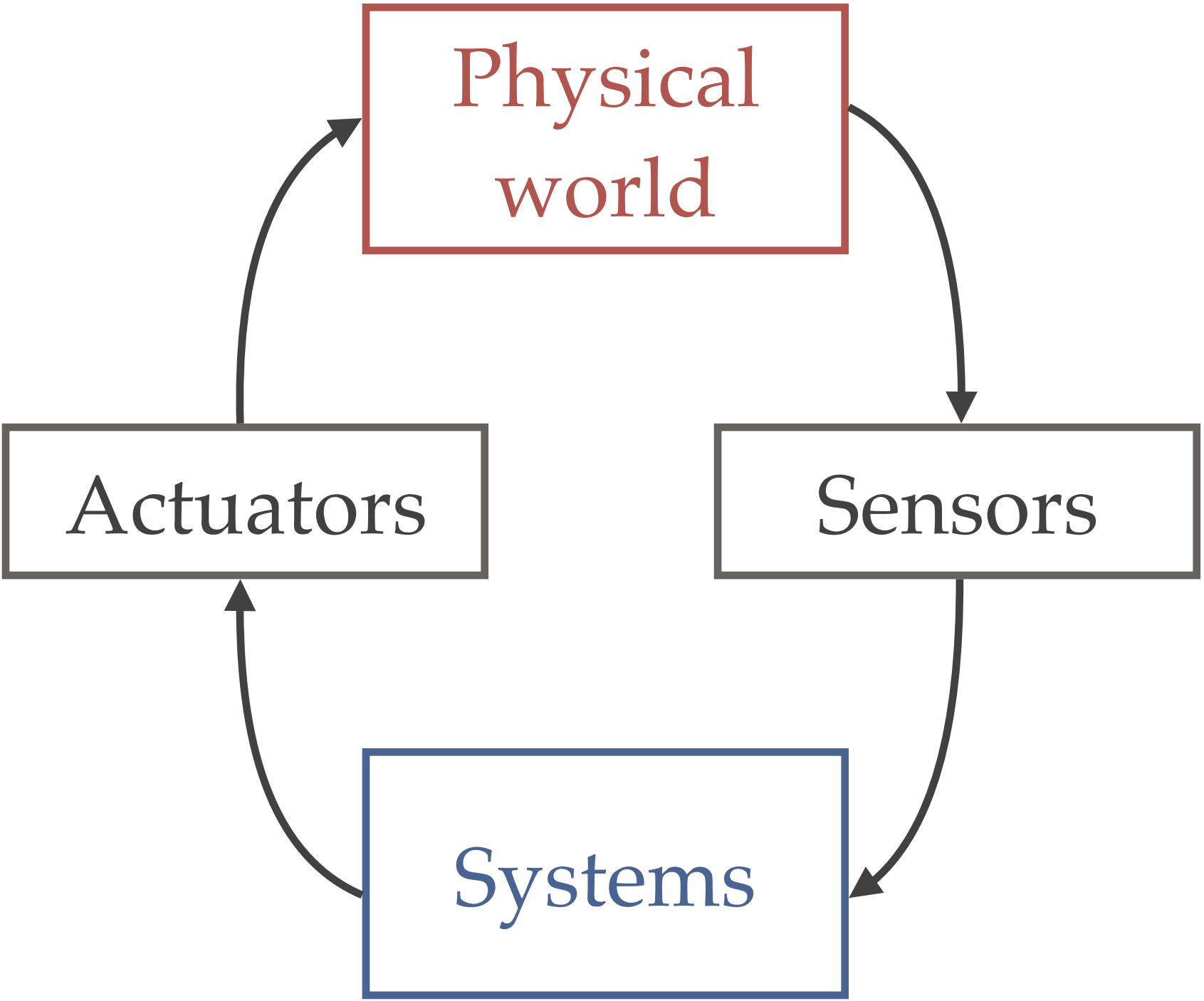
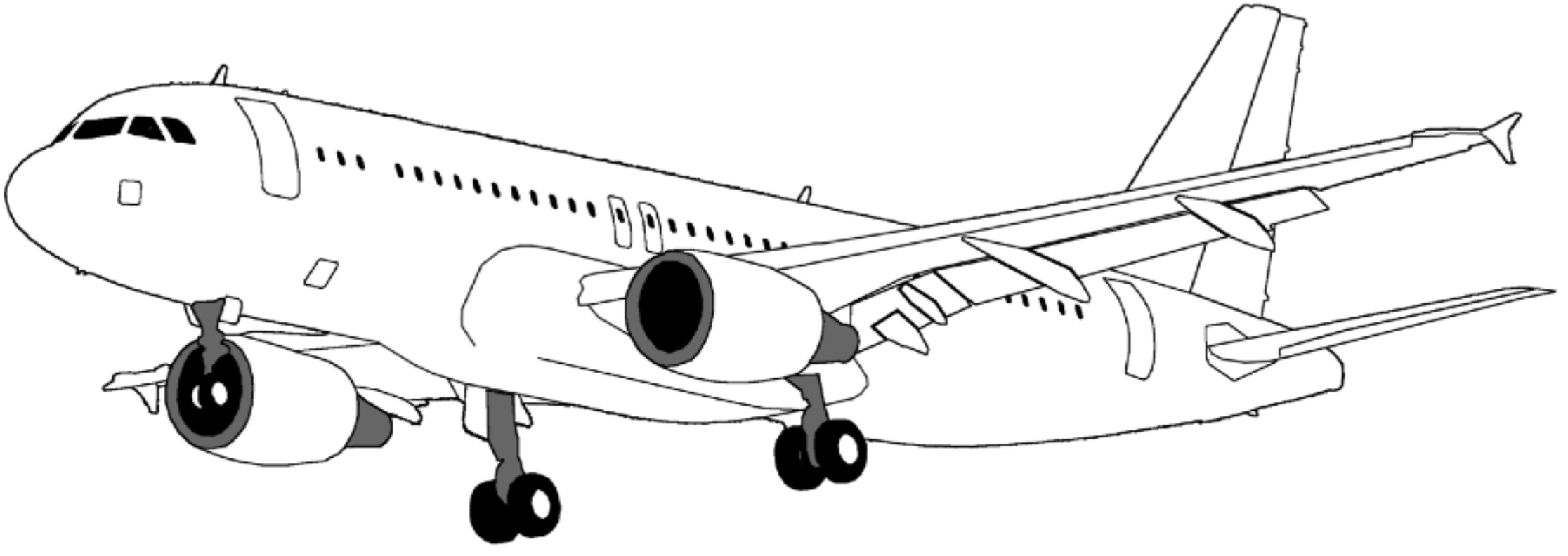

Simulation execution synchronized with Physical time
Variable x
x1
x0
0s
t1
t1 + k1 * ds
t2
t2 + k2 * ds
Wallclock time (hardware clock)
Simulation execution
Variable x
x1
x0
0s
1s
2s
3s
4s
5s
6s
Wallclock time (hardware clock)
Discrete event simulation
States
event(stimuli 1)
event(reaction 1)
event(stimuli 2)
event(reaction 2)
S1
S0
lt1
lt2
lt3
lt4
Simulation time (logical clock)
Discrete model
Quantized signal
stimuli 1 (input)
reaction 1 (output)
stimuli 2 (input)
reaction 2 (output)
max
min
t1
t1 + k1 * ds
t2
t2 + k2 * ds
Physical time (mathematical clock)
Continuous model
Modeled physical signal
stimuli 1 (input)
reaction 1 (output)
stimuli 2 (input)
reaction 2 (output)
max
min
t1
t1 + dt
t2
t2 + dt
Physical time (mathematical clock)
System measured during an experiment
Measured physical signal
stimuli 1 (input)
stimuli 2 (input)
max
min
t1
t1 + dt
t2
t2 + dt
Measured time (hardware clock)


modelling
Simulation
Environment
Environment model
Inputs
Outputs
System
Model
modelling
Stimuli
Observation
Experimenter


Physical world
Sensors
Systems
Actuators



another and interacting with the physical world via

“A cyber-physical system consists of a collection of

computing devices communicating with one

sensors and actuators in a feedback loop.” [Alu15]

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