An Active-Objects Approach to ARGESIM Comparison C10 Dining Philosophers II with AnyLogic

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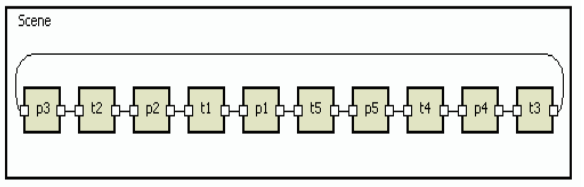
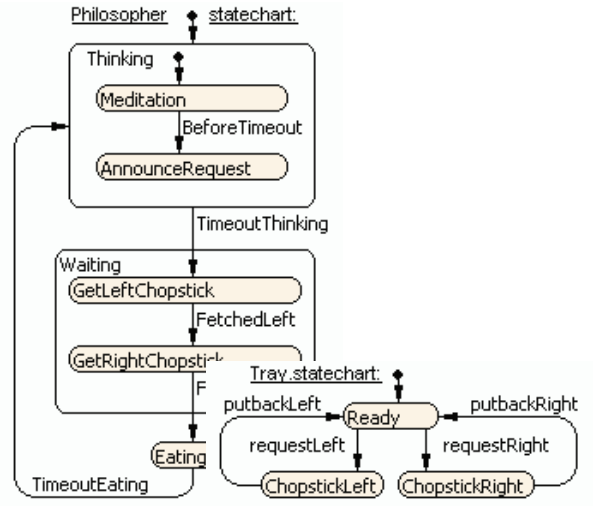
Simulator: AnyLogic 4.0 (http://www.xjtek.com) is a general purpose simulation environment for discrete, continuous and hybrid systems generating cross-platform standalone Java models. However, simultaneous tasks are handled unpredictable and no priorisation mechanism is available.

Model: The scene of the dining philosophers is implemented via ActiveObjects of type `Philosopher` (p) and `Tray` (t) as given in the following pictures:





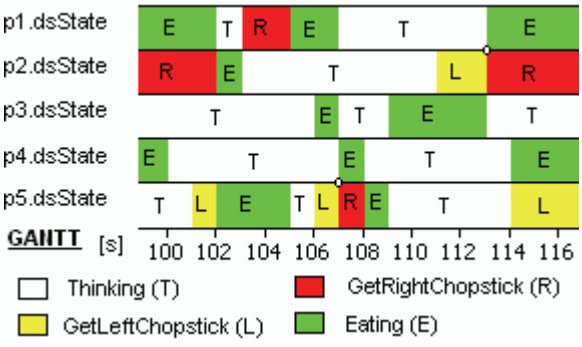
Between two philosophers a tray is responsible for transferring the chopstick. To overcome the unpredictable firing of simultaneous transitions the transition `requestLeft` is disabled (via `AnnounceRequest`) 0.1 seconds before a request (`GetLeftChopstick`) from the priorised right port of the tray arrives.

Task a: Single run – utilization results: Chopstick utilization of a single run is as follows:

[%]	C1	C2	C3	C4	C5	avg
Util	91,97	91,95	91,91	91,96	91,95	91,95

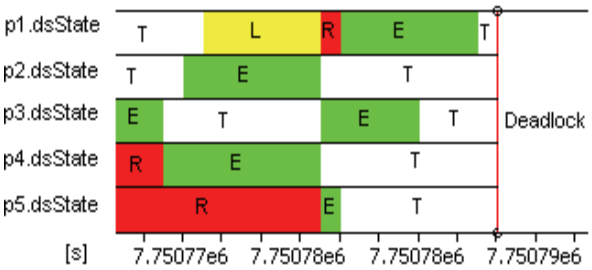
The average times of thinking, waiting and eating periods (± standard deviation) are given next:

[s]	Thinking	Waiting	Eating
P1	5.50±2.87	11.45±8.07	5.50±2.87
P2	5.51±2.87	11.44±8.06	5.50±2.87
P3	5.50±2.87	11.43±8.07	5.50±2.87
P4	5.50±2.87	11.46±8.07	5.49±2.87
P5	5.50±2.87	11.45±8.07	5.50±2.87
avg	5.50±2.87	11.44±8.07	5.50±2.87



Task b: Simultaneous Access: The right handling of simultaneous requests can be seen on the GANTT-chart above. At the time 107, the philosopher p4 gets the chopstick to the left of his bowl even though philosopher p5 requires the chopstick simultaneously. The same occurs at the time 113 between the philosopher p1 and p2.

The following GANTT-chart shows the situation of a deadlock where all philosophers have picked up their left chopstick at the same time



Task c: Multiple runs – deadlock observation: AnyLogic detects a deadlock due to an empty event list on that situation. The minimum and maximum termination time evaluated on 50 simulation runs is 60979 s or 1.237E7 s, resp.

C10 Classification: Active – Objects Approach
Simulator: AnyLogic 4.5