An OO Approach to ARGESIM Comparison "C6 - Emergency Department" using AnyLogic

D. Riezler, F. Breitenecker, TU Wien
e9926277@student.tuwien.ac.at

Simulator: AnyLogic is a Java-based, object oriented simulation tool for continuous, discrete and hybrid applications, based on UML notation and active objects.

Model: The simulated emergency department comprises different facilities, which are all represented as connected Active Object Classes.
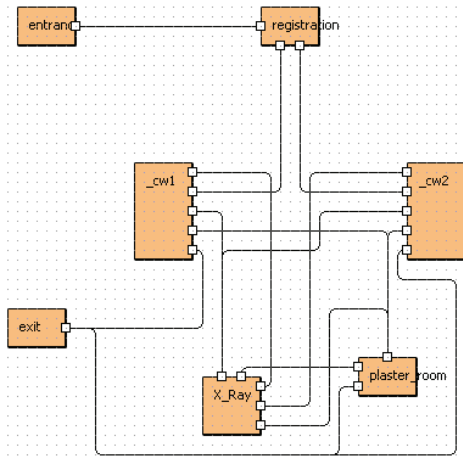

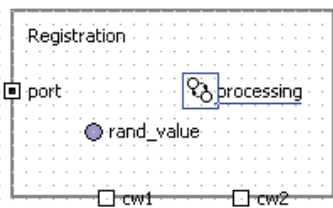Figure 1: Model layout of the emergency department

Figure 2: Internal view of the Registration Object

Each Active Object Class can include ports for communication, intern variables and a state-chart which describes the behaviour of sending/receiving messages used to represent the patient flow.

The Entrance object creates new (exponential distributed) patient-messages with different properties, determining the type of patient, a timestamp and the needed treatment. The messages are queued and forwarded by the other objects, according to the comparison specifications. At the Exit object, all patient-messages are counted and the mean treatment times are calculated.
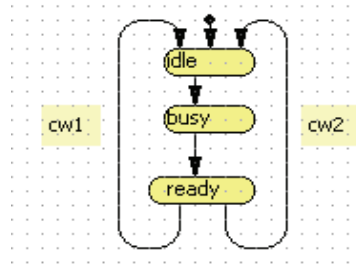

Figure 3: Statechart modelling of the Registration Object

Task a: Simulation – Average Treatment Time. Simulation (experimentation) in AnyLogic is usually menu-driven, statistical results can be gathered during the run. For the basic strategy in this task, the average treatment times vary between 114 and 253 minutes, depending on the patient type (see Table).

Task b: Doctors' Exchange Strategy. The exchange is simply modelled by changing attributes of the objects representing the casualty wards. As soon as more than 20 patients are waiting in the queue of casual ward 2, one doctor is replaced by a more experienced doctor from casual ward 1. The replaced doctor from casual ward 2 now works at casual ward 1, but his treatment time is increased by 20%. All this leads to an increase of treatment time for all patients (see Table).

Task c: Priority Ranking. In this task patients of type 1 and 3 who are entering a treatment point the second time rank higher in priority than all other patients (implemented by additional attributes). This reduces not only the mean treatment time for patients of type 1 and 3, but also the overall treatment time for all patients is also improved (see table).

	Task a	Task b	Task c
Mean treatment time	170	194	156
Mean treatment time patient type 1	242	261	148
Mean treatment time patient type 2	131	143	180
Mean treatment time patient type 3	253	271	157
Mean treatment time patient type 4	114	132	151
Standard deviation of time per patient	89	101	70
Overall treatment time	402	429	354

C4 Classification: Object-oriented Process Approach

Simulator: AnyLogic 4.5

COMPARSIONS

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