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

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Simulator: FLEXSIM simulation software is a true object oriented simulation software program for building models that can help to visualize flow processes in order to optimize throughput and minimize operating expenses. A flow process is defined as a set of operations or process steps performed on an item (in FLEXSIM an item is referred to as a flowitem). If you can define your process in a graphical sketch or a flowchart, you can build a simulation model with FLEXSIM. FLEXSIM provides users with a format to visualize, model, and simulate flow processes using drag and drop objects in a 3D environment. In addition, an in-depth statistical analysis of process performance, bottlenecks, and throughput is available.

Model: The emergency department is modelled, where four kinds of causalities are admitted. Their way trough Causality Ward, X-ray and Plaster Room depends on the severity of their wounds. The overall model is described graphically by stations and queues, instantiated objects from a class library (figure 2).

On creation the patients are divided into four flowitemtypes, representing the four different kinds of patients. Depending on this, the patient makes his way trough the system. Every time a patient exits a treatment point the number of the port he has to take the next time is assigned. This routing is defined by the following definitions (in source object):

```
fsnode* item = parnode(1);
fsnode* current = ownerobject(c);

fsnode* involved = item;

addlabel(involved,"xray");
addlabel(involved,"bearbeitung");
addlabel(involved,"durchgang");

setlabelnum(involved,"bearbeitung",time());
setlabelnum(involved,"durchgang",1);

setitemtype(involved,
 bernoulli(35,1,bernoulli(20,2,bernoulli(5,3,4)))
);

if(eq(getitemtype(involved),1)) {coloraqua(involved); };
if(eq(getitemtype(involved),2)) {colorlime(involved); };
if(eq(getitemtype(involved),3)) {colorpink(involved); };
if(eq(getitemtype(involved),4)) {colorgreen(involved); };
```

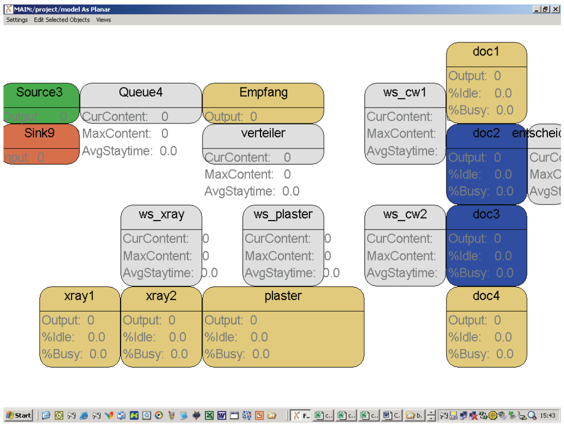

Figure 2: Model Layout

Task a: Simulation – Average Treatment Times. Depending on the patient type treatment time takes between 115 and 257 minutes (details see table 1).

Task b: Doctors' Exchange Strategy. As soon as the queue before casualty ward 2 contains more than 20 patients the more experienced doctor takes over. This is done by assigning new values to the label containing the parameters for calculating the cycle time. This strategy yields an increase of treatment times for all types of patients, also for overall treatment time (details see table 1).

Task c: Priority Ranking. The doctor's exchange strategy is not used in this task. Each patient who enters a casualty ward is assigned a label, telling how often he has already been there. The queues before the treatment points are sorted by this label value ascending. Depending on this a priority ranking is established. This shows a significant decrease in treatment time for patients of type 1 and 3, an increase for the others (details see table 1).

	mean [min] task a	stdev [min] task a	mean [min] task b	stdev [min] task b	mean [min] task c	stdev [min] task c
Patient T. 1	229	56	259	95	174	90
Patient T. 2	126	57	141	77	194	84
Patient T. 3	256	41	242	79	190	103
Patient T. 4	115	54	136	70	149	70
Overall	160	78	181	99	165	82

Table 1: Results for all strategies

C2 Classification: Object- / Process-oriented Modelling

Simulator: Enterprise Dynamics V.4.5