



PROJECT REPORT

Submitted by

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Subject : System Model and Simulation

Project title : Hospital Management Simulation

Introduction:

Hospitals are one of the most important links in the healthcare service chain and their quality directly affects people's lives. Operational Research/Management Science (OR/MS) methods can assist many people in the health system who are required to plan and manage hospital resources. One such method is computer simulation. A simulation model is a replica of a real-world system on computer and can be used to evaluate 'what-if?' scenarios before actually implementing changes in the real system. For example, a simulation model of a hospital's radiology department could be used to better understand the impact that a new Magnetic Resonance Imaging scanner might have on the hospital's quality of service.

Problem Statement:

In a multiphasic screening clinic, patients arrive at a rate of one every 5 ± 2 minutes to enter the audiology section. The examination takes 3 ± 1 minutes. Eighty percent of the patients were passed on to the next with no problems. Of the remaining 20%, one-half require simple procedures that take 2 ± 1 minutes and are then sent for re-examination with the same probability of failure. To other half are sent home with medication. Simulate the system for one hour. (Note : patients sent home with medication are not considered “passed”.)

Simulation Method:

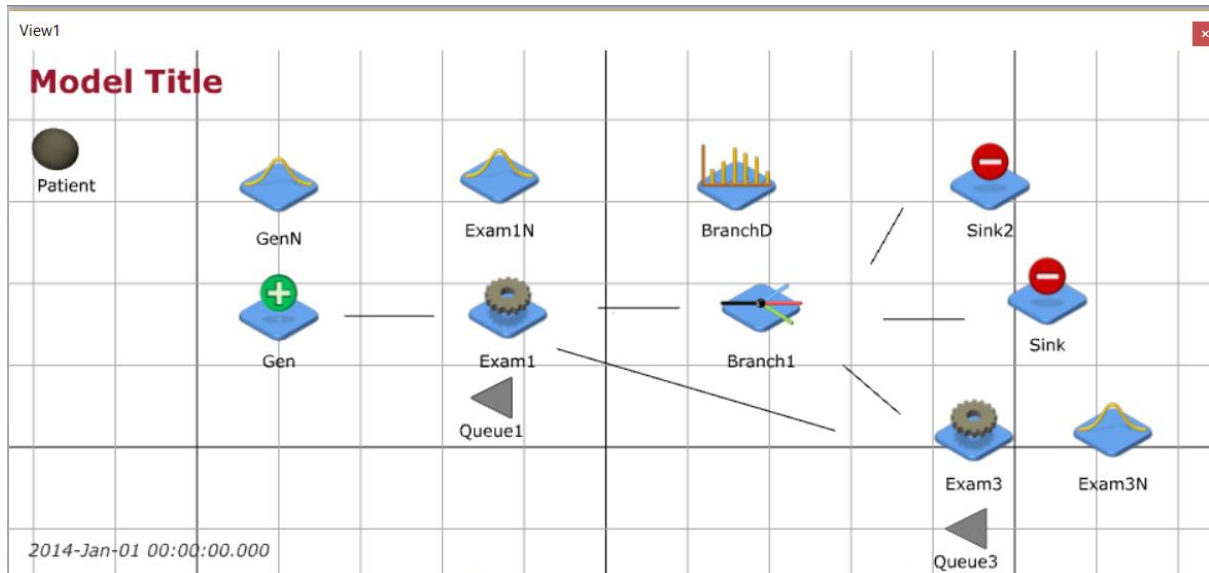
Software used: JaamSim Software.

JaamSim is a free, open-source simulation package written in the Java programming language. A modern graphical user interface is provided that is comparable to commercial software, including drag-and-drop model building, an Input Editor, Output Viewer, and 3D graphics. Users are able to create their own palettes of high-level objects using standard Java and modern programming tools such as Eclipse.

Abstract :

The increasing demand for outpatient services has led to overcrowded clinics, long waiting times for patients, and extended staff working hours in outpatient clinics. Simulation tools have been used to ameliorate deficiencies in the appointment system, resource allocation, and patient flow management that are the root causes of these problems. Integrated studies that considered these three factors together produced better results than attempts to resolve individual causes. While simulation has proved to be an effective problem-solving tool for outpatient clinic management, there is still room for improvement.

Simulation:

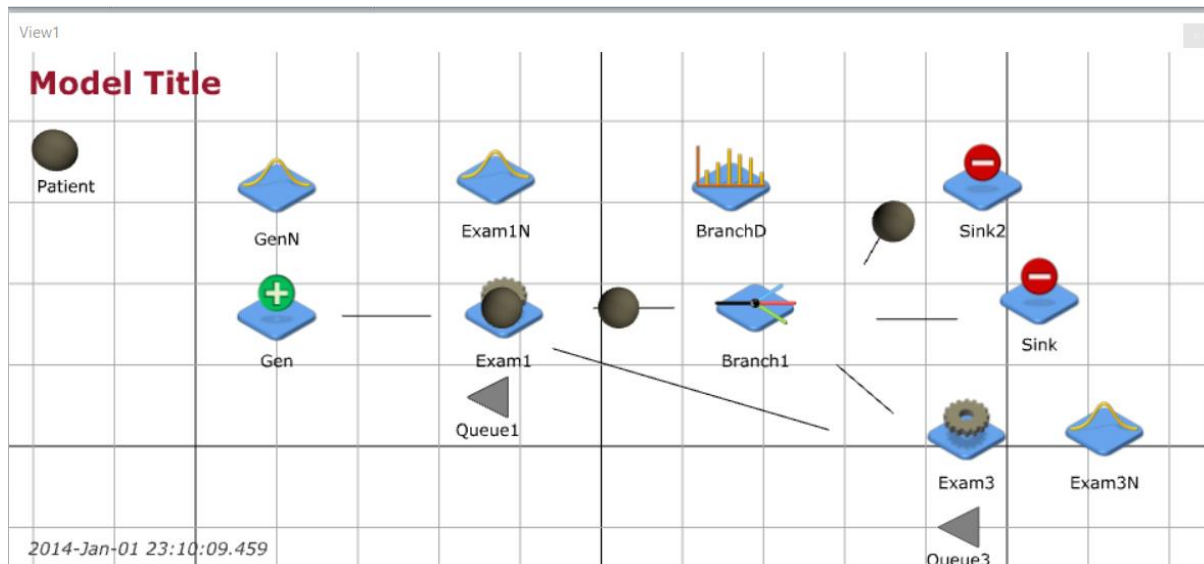


Gen :generates patients.

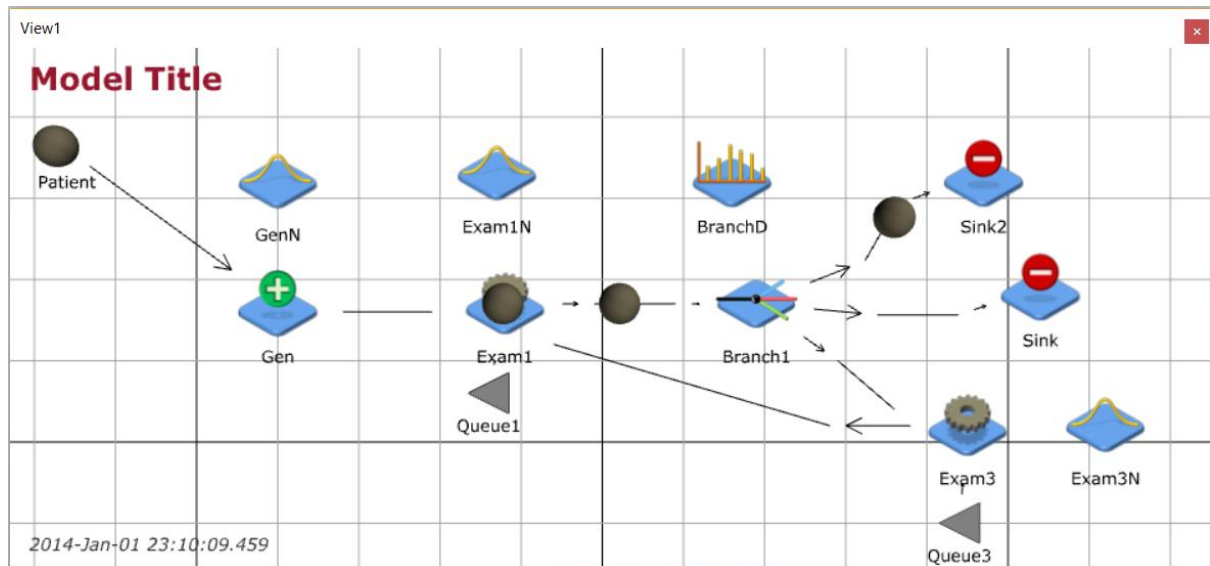
Exam1: First examination of the patient is done here. This has normal distribution.

Branch1: Here the decision is made as to where the patient should be sent. This has discrete distribution.

From Branch1 the patient is either sent home (i.e. sink) or sent for re-examination to Exam3 which are sent back to Exam1.



- Patients are generated at Gen which uses Normal Distribution with mean as 5min and deviation 2 min.
- Patients are sent to Server named as Exam1. Examination at Exam1 again follows a Normal Distribution with mean of 3 min and deviation 1 min.
- Eighty percent of patients are passed to Sink2 as they have no problems.
- Out of the remaining twenty percent, ten percent of them are sent to Exam3 Server which uses Normal Distribution with mean 2 min and standard deviation 1 min, they are sent back for re examination to server Exam1.
- Rest ten percent of them are sent home.
- We handled the probability at the Branch1 which uses Discrete Distribution.
- We run the simulation for one hour.



The flow of the patient can be seen in this.

OUTPUT ANALYSIS

*** Server ***

Exam1 StateTimes[Breakdown]	0.0	h
Exam1 StateTimes[Idle]	0.3374071897222217	h
Exam1 StateTimes[Maintenance]	0.0	h
Exam1 StateTimes[Stopped]	0.0	h
Exam1 StateTimes[Working]	0.6625928102777777	h
Exam1 Utilisation	0.6625928102777777	-
Exam1 Commitment	0.6625928102777778	-
Exam1 Availability	1.0	-
Exam1 Reliability	1.0	-
Exam1 NumberAdded	782.0	-
Exam1 NumberProcessed	781.0	-

The number processed at Exam1 is 781 .

Exam3 StateTimes[Breakdown] 0.0 h

Exam3 StateTimes[Idle] 0.9563257747222221 h

Exam3 StateTimes[Maintenance] 0.0 h

Exam3 StateTimes[Stopped] 0.0 h

Exam3 StateTimes[Working] 0.04367422527777777 h

Exam3 Utilisation 0.04367422527777777 -

Exam3 Commitment 0.04367422527777787 -

Exam3 Availability 1.0 -

Exam3 Reliability 1.0 -

Exam3 NumberAdded73.0 -

Exam3 NumberProcessed 73.0 -

The number at Exam3 is 73. This is 10% of Exam1 . This 10% only will be re-examined.

*** EntitySink ***

Sink StateTimes[None] 1.0 h

Sink NumberAdded81.0 -

Sink NumberProcessed 81.0 -

The number processed is 81 which is 10% of the total .These are sent home with some medication.

Sink2 StateTimes[None] 1.0 h

Sink2 NumberAdded627.0 -

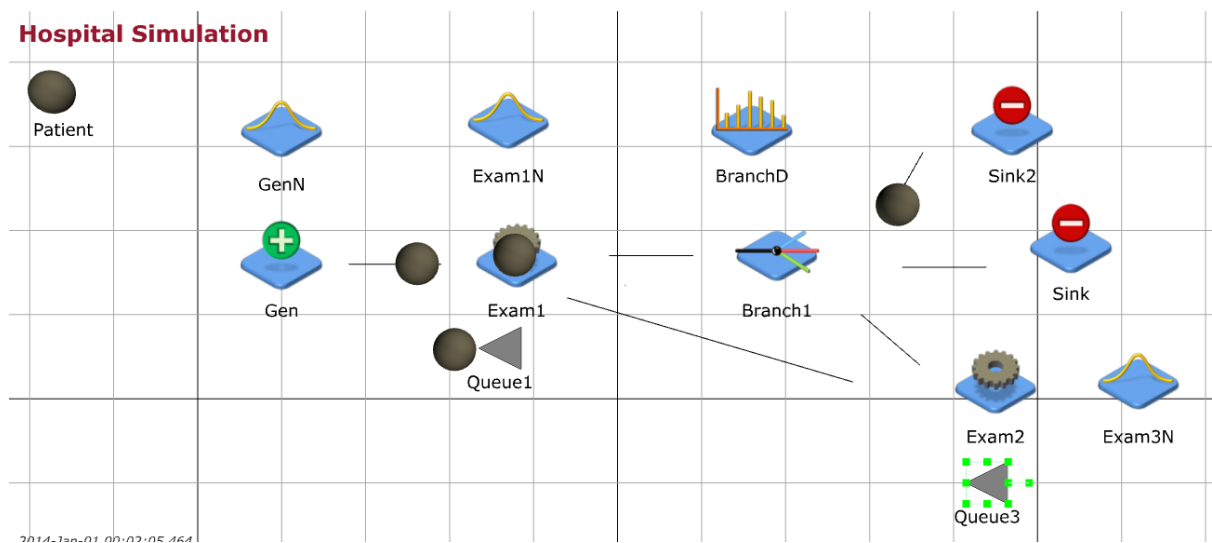
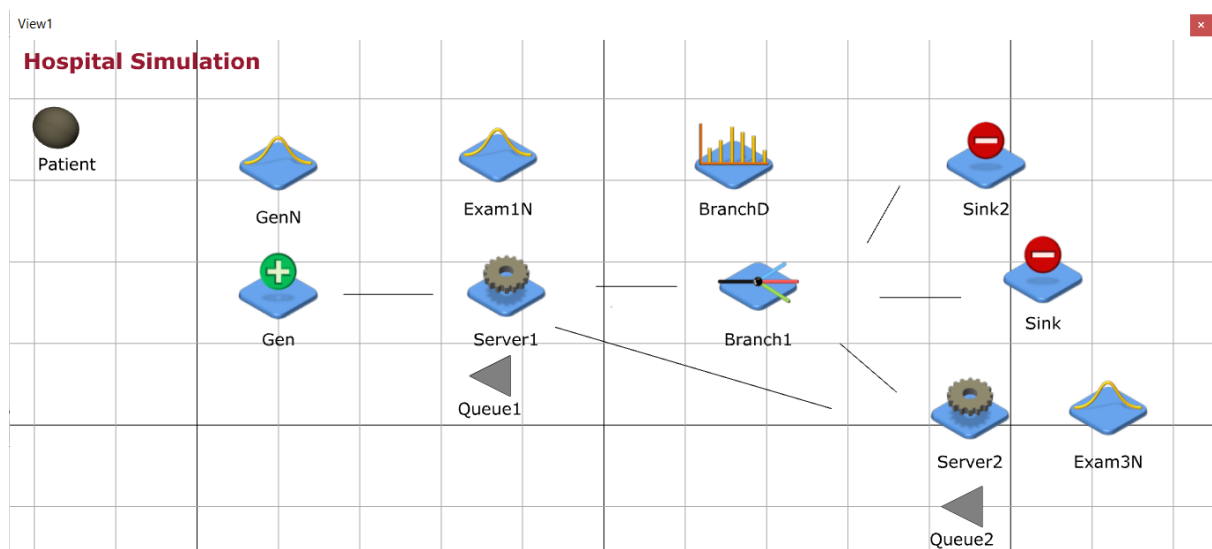
Sink2 NumberProcessed 627.0 -

Sink2 is 627 which is 80% of the total.

*** Queue ***

Queue1	StateTimes[None]	1.0	h
Queue1	NumberAdded	784.0	-
Queue1	NumberProcessed	782.0	-
Queue1	QueueLengthAverage	0.21026307222222185	-
Queue1	QueueLengthStandardDeviation	0.54086669687919	-
Queue1	QueueLengthMinimum	0.0	-
Queue1	QueueLengthMaximum	4.0	-
Queue1	QueueLengthTimes[0]	0.8398903013888891	h
Queue1	QueueLengthTimes[1]	0.12207644333333319	h
Queue1	QueueLengthTimes[2]	0.026881780555555353	h
Queue1	QueueLengthTimes[3]	0.01018283111111121	h
Queue1	QueueLengthTimes[4]	9.686436111110829E-4	h
Queue1	AverageQueueTime	2.6819269416099723E-4	h
Queue1	NumberReneged	0.0	-
Queue3	StateTimes[None]	1.0	h
Queue3	NumberAdded	73.0	-
Queue3	NumberProcessed	73.0	-
Queue3	QueueLengthAverage	6.856111111111178E-4	-
Queue3	QueueLengthStandardDeviation	0.026175199111285456	-
Queue3	QueueLengthMinimum	0.0	-

Queue3	QueueLengthMaximum	1.0	-
Queue3	QueueLengthTimes[0]	0.9993143888888889	h
Queue3	QueueLengthTimes[1]	6.856111111111178E-4	h
Queue3	AverageQueueTime	9.391933028919422E-6	h
Queue3	NumberReneged	0.0	-



Hospital Simulation

