Developing a DEVS-JAVA model to simulate and pre-test changes to emergency department care delivery in a safe and efficient manner

Type: Type 1
Nipuna Senanayake, Shrikant Pawar

CSC 8350: Advanced Software Engineering
Department of Computer Science, Georgia State University
Spring, 2018

Problem Statement (or Background):

An emergency department (ED), also known as accident & emergency department (A&E), provides acute care for patients who attend hospital without prior appointment. The EDs of most hospitals customarily operate 24 hours a day, 7 days a week and overcrowding of patients in EDs is an increasing problem in countries around the world. ED overcrowding has been shown to have many adverse consequences such as increased medical errors, decreased quality of care and subsequently poor patient outcomes, increased workload, ambulance diversions, increased patient dissatisfaction, prolonged patient waiting times and increased cost of care. [1] There are different types of computer simulations techniques utilized to address these types of issues in the field of medicine and health. Some of such tools include discrete event simulation (DES), system dynamics (SD) and agent-based simulations (ABS). DES is identified to be one of the best method to address this problem due to its capability of replicate the behavior of complex healthcare systems over time. DEVS stands for Discrete Event System Specification which is a time extended Finite State machine. [2] We believe it will be even more suitable method of modeling for this problem due to the fact that ED system is more sensitive for constraints and limitations imposed by time.

In our project, we will be modeling the system in ED using DEVS-JAVA to explore the possibility of using the developed model to simulate changes of services conditions and understand the outputs so that the ED can provide a better service to its patients.

Modeling and simulation goals (for Type 1):

To address these concerns, our specific objectives are to conduct patient flow simulation through ED in terms of key assumptions, systems requirements, and input and output data, and to assess the usefulness of this simulation method for service redesign and evaluating the likely impact of changes related to the delivery of emergency care. We can compare our simulation model with current
ED flow data from known existing database, which will report on differences in conclusions about ED performance with our simulation model and existing ER practice to solve the problem of ED overcrowding. We will be implementing our simulation model in DEVSJAVA.

References