Announcing the Final Examination of Joseph DeKeyrel for the degree of Doctor of Philosophy

Time & Location: March 1, 2011 at 10:00 AM in Engineering II 312L
Title: Improving throughput and predictability of high-volume business processes through embedded modeling

Being faster is good. Being predictable is better. A faithful model of a system, loaded to reflect the system’s current state, can then be used to look into the future and predict performance. Building faithful models of processes with high degrees of uncertainty can be very challenging, especially where this uncertainty exists both in terms of processing times, queuing behavior and re-work rates. Within the context of a multi-tiered workflow system the author builds such a model to endogenously quote due dates.

The target context is readily recast as a generalized Industrial Engineering problem: There is a flexible flow shop in which the stations that a job passes through are known and the jobs in the stations queues at any point are known. All of the other parameters associated with the flow shop, including job processing times per station, and station queuing behavior are uncertain though there is a significant body of past performance data that might be brought to bear. The objective, in this environment, is to meet the delivery date promised when the job is accepted.

To attack the problem the author developed a novel heuristic for decomposing the workflow system’s event logs exposing non-standard queuing behavior, developed a new simulation component to implement that behavior, and assembled a prototypical system to automate the required historical analysis and allow for on-demand due date quoting through the use of embedded discrete event simulation modeling.

The developed software components are flexible enough to allow for both the analysis of past performance in conjunction with the workflow system’s event logs, and on-demand analysis of new jobs entering the system. Using the proportion of jobs completed within the predicted interval as the measure of effectiveness, the author was able to validate the performance of the system over six months of historical data and during an additional 75 day period of live operations with both samples achieving the 90% service level targeted.

Major: Industrial Engineering

Educational Career:
Bachelor's of Mathematics, BS, 1986, Virginia Military Institute
Master's of Systems Architecture and Engineering, MS, 2003, University of Southern California

Committee in Charge:
Dr. Linda Malone, Chair, Industrial Engineering & Management Systems
Dr. Christopher Gieger, Industrial Engineering & Management Systems
Dr. Stephanie Lackey, Institute for Simulation and Training
Dr. Mansooreh Mollaghasemi, Industrial Engineering & Management Systems

Approved for distribution by Dr. Linda Malone, Committee Chair, on February 7, 2011.

The public is welcome to attend.