NSF Workshop on Simulation Optimization

Robert H. Smith School of Business
(Department of Decision, Operations & Information Technologies),
University of Maryland, College Park

Douglas Morrice , The University of Texas at Austin

THE UNIVERSITY OF TEXAS AT AUSTIN
McCOMBS SCHOOL OF BUSINESS

Research Topics of Interest

- Optimization Over Multiple Performance Measures
- Optimization Over a Dynamically Changing Performance Measure
- Optimization Heuristics Involving Simulation

Multiple Performance Measures

- **Focus: Multiple Objective Ranking and Selection (MORS) problem**
- **Approaches:**
  - Multiple Attribute Utility Theory (Butler et al, 2001)
  - Constraint-based R&S (Andradóttir and Kim 2010, Batur and Kim, 2010)
  - Multi-objective Computing Budget Allocation using the concept of Pareto optimality (Lee et al. 2004, 2010, Lee et al. 2007)
  - Data Envelopment Analysis (Chen et al., 2010)
  - Others?
- **What are the pros and cons of each approach? How do they perform?**

Dynamically Changing Performance Measure

- Focus: Ranking and Selection with a performance measure that is a function of some other variable such as time.
- My current work: Morrice et al. (2008, 2009)
- What related work is being done on this topic? I am familiar with Frazier et al. (2009)

Optimization Heuristics

- What is the state of the art for using optimization heuristics that involve simulation (e.g., Tabu Search, Simulated Annealing, other)?
- What opportunities are there to advance existing methods or develop new methods?
- What are the large-scale real examples to which these methods have been applied? We have a ready application to the problem described in Loveland et al (2007) and Monkman et al. (2008).

References

- Andradottir, S. and S.-H. Kim (2010). Fully Sequential Procedures for Comparing Constrained Systems via Simulation, To appear in *Naval Research Logistics.*
- Batur, D and S.-H. Kim (2010). Finding Feasible Systems in the Presence of Constrains on Multiple Performance Measures. To appear in *ACM Transactions on Modeling and Computer Simulation*.
- J. Butler, D. J. Morrice, and P. W. Mullarkey (2001). A multiple attribute utility theory approach to ranking and selection. *Management Science, 47(6)*, 800–816.
- C-H. Chen, Y. Gong, R. B. M. de Koster, J. A. E. E. van Nunen (2010). A DEA-based evaluative framework for order picking systems. To appear in *Journal of POM*.
- P. Frazier, W. B. Powell, H. P. Simao (2009). Simulation Model Calibration with Correlated Knowledge-gradients. In *Proceedings of the 2009 Winter Simulation Conference,* ed. M. D. Rossetti, R. R. Hill, B. Johansson, A. Dunkin and R. G. Ingalls ,339-351. Institute of Electrical and Electronics Engineers, Piscataway, New Jersey.
- L. H. Lee, E. P. Chew, S. Y. Teng, and D. Goldsman, (2004). Optimal computing budget allocation for multi-objective simulation models. In *Proceedings of the 2004 Winter Simulation Conference*. IEEE Press, Piscataway, NJ, pp. 586-594.
- L. H. Lee, E. P. Chew, S. Y. Teng, and D. Goldsman (2010). Finding the Pareto set for multi-objective simulation models. To appear in *IIE Transactions*.
- L. H. Lee, E. P. Chew, S. Y. Teng, (2007). Finding the Pareto set for multi-objective simulation models by minimization of expected opportunity cost. In *Proceedings of the 2007 Winter Simulation Conference*. IEEE Press, Piscataway, NJ, pp. 513-521.
- J. L. Loveland, S. K. Monkman, D. J. Morrice, (2007). Dell uses new production scheduling heuristics to accommodate increased product variety. *Interfaces*, 37(3), 209-219.
- S. K. Monkman, D. J. Morrice, J. F. Bard (2008). A production scheduling heuristic for an electronics manufacturer with sequence dependent set-up costs. *European Journal of Operational Research*, 187 (3), 1100–1114.
- Morrice, D. J., M. W. Brantley, C. H. Chen (2008). An Efficient Ranking and Selection Procedure for a Linear Transient Mean Performance Measure. In *Proceedings of the 2008 Winter Simulation Conference,* ed. S. J. Mason, R. R. Hill, L. Mönch, O. Rose, T. Jefferson, and J. W. Fowler, 290-296. Institute of Electrical and Electronics Engineers, Piscataway, New Jersey.
- Morrice, D. J., M. W. Brantley, C. H. Chen (2009). A Transient Means Ranking and Selection Procedure with Sequential Sampling Constraints. In *Proceedings of the 2009 Winter Simulation Conference,* ed. M. D. Rossetti, R. R. Hill, B. Johansson, A. Dunkin and R. G. Ingalls ,590-600. Institute of Electrical and Electronics Engineers, Piscataway, New Jersey.