VirginiaTech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Computer Science Seminar Series, 2010

National Capital Region

Perpetuities in the Analysis of Algorithms for Order Statistics

Speaker: Professor Hosam M. Mahmoud
Department of Statistics
The George Washington University

Friday, November 5, 2010
1:00PM- 2:00PM, NVC 325

Abstract

We analyze algorithms for finding order statistics and show that "perpetuities," which are entities that appear in mathematical finance, play a central role. Two one-sided algorithms for finding order statistics are considered: Quick Select (a variant of Quick Sort) and Radix Select (a variant of Radix Sort). We analyze these algorithms when they work to find an element with a randomly selected rank. This kind of grand average provides a smoothing over all individual distributions for specific fixed order statistics. We show in both cases that the number of swaps (suitably scaled) is a perpetuity. In the case of radix Select we detect a phase change between biased and unbiased data.

The tool for this proof is contraction in the Wasserstein metric space, and identifying the limit as the fixed-point solution of a distributional equation.

Biography

Hosam Mahmoud earned a Ph.D. in Computer Science from the Ohio State University (in 1983). He is an elected member of the *International Statistical Institute*. He currently serves as an Associate Editor of the *Annals of the Institute of Statistical Mathematics* (Japan) and as an Associate Editor of *Methodology and Computing in Applied Probability*. He has research interests in the areas of probabilistic analysis of algorithms, searching and sorting, random structures and algorithms, randomized algorithms and statistical computing

Hosam Mahmoud assumed all the academic ranks at the Department of Statistics, The George Washington University, where he started as an Assistant Professor in 1983 and moved up to become Associate then Full Professor. During his years of tenure he served as department chair (1998-2001). He accepted visiting positions at the Institute of Statistical Mathematics, Tokyo, Japan (2002 and 2004), Princeton University (1998), Institut National de Recherche, France (1997), Centre de Recerca Matematica, Spain (1996) and University of Waterloo, Canada (1990). He authored three books: *Evolution of Random Search Trees*, Wiley (1992), *Sorting: A Distribution Theory*, Wiley (2000) and *Pólya Urn Models*, Chapman-Hall (2008). He also published about 63 peer-refereed papers, many are in premier journals.

Hosam Mahmoud gave invited talks in many countries. His service to the scientific community includes acknowledgments in dozens of research papers, organizing and chairing conferences in the U.S.A (1989, 1997, 2010), Germany (1997), Spain (1999, 2010), Poland, (2000), Japan (2004) and France (2007, 2008), serving as a panel reviewer of *Mathematical Reviews*, refereeing over 15 books and over 140 papers for premier journals.