

Matthew Lee Bolton

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Education

Ph.D. Systems Engineering, University of Virginia, Charlottesville. Degree program started January 2006. Advisor: Dr. Ellen Bass.

Master of Science, Systems Engineering, University of Virginia, Charlottesville. January 2006. Advisor: Dr. Ellen Bass. Thesis: An investigation of the effects of texture and field of view on spatial awareness in synthetic vision head-down displays.

Bachelor of Science, Computer Science, University of Virginia, Charlottesville. May 2003.

Research Experience

Graduate Research Assistant, Department of Systems and Information Engineering, University of Virginia, Charlottesville, 08/2003 – present

- Investigated the use of formal modeling techniques to evaluate human computer interfaces for automated systems and predict complex system failure.
- Developed a framework for conducting human centered systems evaluation and applied it to a cockpit alerting system.
- Applied a novel measure of spatial awareness to synthetic vision systems in order to: 1) Identify the terrain texture and field of view that best facilitated spatial awareness in synthetic vision displays, 2) Compare the new measure with conventional measures of spatial awareness, and 3) Identify potential biasing factors in spatial perception in synthetic vision displays.
- Developed a suite of software tools for designing and performing experiments on synthetic vision system displays utilizing videos of simulations.
- Designed and developed the Cognitive Systems Engineering Education Software package, an integrated toolset designed to facilitate curricula related to human judgment and decision-making performance modeling and evaluation by providing students with the means to generate and analyze performance data using multiple methods.
- Evaluated the validity of Stevens' Power Law using an agent based simulation.
- Delivered guest lecture for SYS 623 – Introduction to Cognitive Engineering.
- Delivered guest lecture for SYS 727 – Quantitative Models of Human Performance.
- Delivered guest lecture for SYS 681 – Problems with Stevens' Power Law
- Co-advised a graduate student in the Systems and Information Engineering Master's of Engineering program with Dr. Ellen Bass.
- Co-advised Dr. Ellen Bass's 2005-2006 undergraduate capstone team.
- Assisted students in the development of experimental apparatus.
- Assisted faculty in the preparation of research proposals.

Research Assistant, Center for Applied Biomechanics, University of Virginia, Charlottesville, 05/2000 – 08/2003

- Designed, implemented, and maintained software to automate the institution's data processing, data analysis, video analysis, and report generation processes.
- Processed and analyzed test data.
- Designed and maintained reference databases.
- Designed and maintained the facility's website.
- Designed and maintained the website for the International Research Council on the Biomechanics of Impact.

Publications

Journal Articles

Bolton, M. L. & Bass, E. J. (2008). Using relative position and temporal judgments to identify biases in spatial awareness for Synthetic Vision Systems. *International Journal of Aviation Psychology*, 18(2), 183-206.

Bolton, M. L. & Bass, E. J. (In Press). Comparing judgment and subjective based measures of spatial awareness. *Applied Ergonomic*.

Bolton, M. L., Bass, E. J., & Comstock, J. R. (2007). Spatial awareness in synthetic vision systems: Using spatial and temporal judgments to evaluate texture and field of view. *Human Factors*, 49, 961-974.

Journal Articles – in preparation

Bolton, M. L. (2008). An evaluation of Stevens' power law: Deriving a power law function from ordinal data generated by a random process. Manuscript in preparation.

Bolton, M. L., Bass, E. J., & Gökür, S. (2008). A framework to support human centered systems evaluation of alerting systems. Manuscript in preparation.

Peer Reviewed Conference Publications

Bolton, M. L. & Bass, E. J. (2005). Cognitive Systems Engineering Educational Software (CSEES): Educational software addressing quantitative models of performance. *2005 IEEE International Conference on Systems, Man, and Cybernetics*. October 10-12, 2005, Hawaii.

Bolton, M. L. & Bass, E. J. (2007). Spatial awareness: Comparing judgment-based and subjective measures. *2007 IEEE International Conference on Systems, Man, and Cybernetics*. October 7-10, 2007, Montreal.

Bolton, M. L. (2008). Modeling human perception: Is Stevens' power law an emergent feature? *2008 IEEE International Conference on Systems, Man, and Cybernetics*. October 12-15, 2008, Singapore.

Bolton, M. L., Bass, E. J., & Comstock, J. R. (2006). Using relative position and temporal judgments to assess the effects of texture and field of view on spatial awareness in synthetic vision systems displays. *The 50th Annual Meeting of the Human Factors and Ergonomics Society*. October 16-20, 2006, San Francisco, CA.

Bolton, M. L., Bass, E. J., & Comstock, J. R. (2006). Using videos of simulations to support the analysis of spatial awareness in synthetic vision displays. *2006 IEEE International Conference on Systems, Man, and Cybernetics*. October 8-11, Taipei, Taiwan.

Gökür, S., Bolton, M. L., & Bass, E. J. (2004). Adding a motor control component to the Operator Function Model Expert System to investigate air traffic management concepts using simulation. *2004 IEEE International Conference on Systems, Man, and Cybernetics*. October 10-13 2004, The Hague, the Netherlands.

Other Conference Publications

Bolton, M. L. & Bass, E. J. (2007). Spatial awareness biases in synthetic vision systems displays. *14th International Symposium on Aviation Psychology*. April 23-26, 2005, Dayton, OH.

Bolton, M. L., Bass, E. J., & Comstock, J. R. (2006). A toolset to support the development of spatial and temporal judgment experiments for synthetic vision systems. *2006 IEEE Systems and Information Engineering Design Symposium*. April 28, 2006, Charlottesville, VA.

Bolton, M. L., Bass, E. J., Siminiceanu, R. I. (2008). Using formal methods to predict human error and system failures. *2008 Applied Human Factors and Ergonomics International Conference*, July 14-17, 2008, Las Vegas, NV.

Bolton, M. L., Hagan, T., Kustu, D., LaChance, L., Li, S., & Bass, E. J. (2006). Assessment and enhancement of synthetic vision systems experimentation software. *2006 IEEE Systems and Information Engineering Design Symposium*. April 28, 2006, Charlottesville, VA.

Abstracts

Bolton, M. L., & Bass, E. J. (2008). Formal modeling of erroneous human behavior and its implications for model checking. *The Sixth NASA Langley Formal Methods Workshop*. April 30 - May 2, 2008, Newport News, VA.

Book Chapters

Bolton, M. L., Klein, K. A., & Göknur, S. C. (2006). Navigation. In Strunk, E. A. & Knight, J. C. (Eds.), *Digital Avionics: A Computing Perspective* (pp. 15-26). IEEE Inc.

Göknur, S. C., Klein, K. A., & Bolton, M. L. (2006). Flight Management Systems. In Strunk, E. A. & Knight, J. C. (Eds.), *Digital Avionics: A Computing Perspective* (pp. 53-61). IEEE Inc.

Klein, K. A., Göknur, S. C., & Bolton, M. L. (2006). Autopilot Flight Director Systems. In Strunk, E. A. & Knight, J. C. (Eds.), *Digital Avionics: A Computing Perspective* (pp. 45-52). IEEE Inc.

Technical Reports

Bass, E. J., Göknur, S. C., Klein, K. A. & Bolton, M. L. (2003). *Evaluating measures of human-automation interaction in pilot self-separation tasks*. Final Report under NASA grant NAG1-02113. Charlottesville, VA: University of Virginia.

Bolton, M. L. & Bass, E.J. (2006). *An investigation of the effects of texture and field of view on spatial awareness in synthetic vision head-down displays*. Final Report under Synthetic Vision Systems - Rising Star Fellowship (M. Bolton), UVA-03-01, Sub-Award Number: 4817-UV. Charlottesville, VA: University of Virginia.

Presentations

Bolton, M. L. (2005). Tools for supporting spatial and temporal judgment experiments for synthetic vision systems. Presented at the National Institute of Aerospace, September 23, Hampton, Virginia.

Bolton, M. L. (2006). An investigation of the effects of texture and field of view on spatial awareness in synthetic vision head-down displays. Presented to Washington Metro ARCS, April 25, Charlottesville, Virginia.

Bolton, M. L. (2007). A framework for human centered systems evaluation. Presented to Washington Metro ARCS, April 16, Charlottesville, Virginia.

Bolton, M. L. (2007). Using formal methods and automated analysis to predict human error and system failure. Presented at NASA Langley Research Center, November 16, Hampton, Virginia.

Bolton, M. L. (2007). Using formal methods and automated analysis to predict human error and system failure. Presented at the Medical Informatics Colloquium, September 21, Charlottesville, Virginia.

Bolton, M. L. (2007). Using relative position and temporal judgments to assess spatial awareness for synthetic vision systems displays. Presented at the NASA Langley Research Center, January 16, Hampton, Virginia.

Bolton, M. L. (2008). Using formal methods to predict human error and system failures. Presented at the National Library of Medicine Training Conference, July 9, Bethesda, MD.

Posters

Bolton, M. L. (2008). University of Virginia: Human Factors. Poster session presented at the 52nd Annual meeting of the Human Factors and Ergonomics Society, September 23rd, New York, NY.

Professional Service

IEEE Systems Man and Cybernetics (SMC), student member

- Member of the program committee for the 2007 IEEE International Conference on Systems, Man, and Cybernetics.
- Reviewed manuscripts for IEEE Transaction on Systems, Man, and Cybernetics, Part A.
- Reviewed manuscripts for 2006 IEEE International Conference on Systems, Man, and Cybernetics.
- Helped prepare the proceedings for the 2005 Systems and Information Engineering Design Symposium.

Human Factors and Ergonomics Society (HFES), student member

- Served as webmaster for the Human Performance Modeling Technical Group (2008-Present)
- Served as the president of the University of Virginia's Human Factors and Ergonomics Society's student chapter (2007-Present).
- Served as the webmaster for the University of Virginia's Human Factors and Ergonomics Society's student chapter (2003-2007).
- Served as a session chair at the 2008 HFES annual meeting.
- Organized a weekly research seminar series for the 2006 summer and fall terms.
- Reviewed manuscripts for the 2007 and 2008 HFES annual meetings.
- Served as a judge for the 2004 HFES's Cognitive Engineering and Decision Making Technical Group student paper competition.
- Served as co-editor of the 2004 winter edition of *Cognitia*, newsletter of the Human Factors and Ergonomics Society's Cognitive Engineering and Decision Making Technical Group.

Department of Systems and Information Engineering

- Represented the University of Virginia's Department of Systems and Information Engineering at the "Integration of Advanced Concepts and Vehicles into the Next Generation Air Transportation System" Pre-proposal Conference, August 9, 2007.
- Represented the University of Virginia's Department of Systems and Information Engineering at the 2006 and 2008 HFES annual meeting's lab presentations.
- Represented the University of Virginia's Department of Systems and Information Engineering at the School of Engineering and Applied Science's 2006, 2007, and 2008 Prospective Student Day.
- Represented the University of Virginia's Department of Systems and Information Engineering at the School of Engineering and Applied Science's 2004 and 2005 engineering open houses.
- Represented the University of Virginia's Department of Systems and Information Engineering at the School of Engineering and Applied Science's 2004 Science, Engineering, Communication, Mathematics Enhancement Program open house.

Honors

- Received the Award for Excellence in Scholarship in the Sciences & Engineering, 2008.
- Work discussed in the 2007 University of Virginia President's Report.
- National Library of Medicine trainee fellowship recipient, 2007-2008.
- Recognized as a Student Member with Honors by the Human Factors and Ergonomics Society, 2007.
- ARCS Scholarship recipient, 2006-2007.

- Governor's Fellowship recipient, spring 2007.
- Louis T. Rader Outstanding Masters Student Award recipient, 2006.
- Lead author on the paper that received the best paper award for the Human Computer Interface track at the 2006 Systems and Information Engineering Design Symposium.
- National Institute of Aerospace's Rising Star Fellowship recipient, 2004-2006.
- Dean's List Spring 2002, Spring 2001, Fall 1999 at the University of Virginia.