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EDUCATION

B.S., Mathematics, Michigan Technological University, 1973
M.S., Mathematics, Michigan Technological University, 1975
M.S., Applied Mathematics, Michigan State University, 1978
Ph.D., Engineering, Wright State University, June 2014

SUMMARY OF EXPERIENCE

Dr. Middleton is currently serving full time on the graduate faculty in the Biomedical, Industrial, and Human Factors Engineering Department at Wright State University, having previously served as an adjunct since 2015.

His teaching experience began with full time appointments in mathematics at Michigan Technological University and Columbia-Greene Community College in Hudson, New York. Over the last half century, he has served as a graduate teaching assistant at Michigan State University and in part-time/adjunct appointments at Bard College in Annadale-on-Hudson, New York, and in Dayton Ohio at Sinclair Community College, the University of Dayton, and in the College of Science & Mathematics and the College of Engineering & Computer Science here at Wright State. The courses he taught ran the gamut from adult and remedial education to a range of typical undergraduate courses in mathematics and computer science.

Dr. Middleton has a combined life-long love of teaching with a career as a Senior Operations Research Analyst working as an independent consultant to the government and civilian firms. He has 40 years' experience developing, implementing, and applying mathematical models and simulations for a wide variety of military and civilian studies and analyses while also teaching mathematics and computer science at the college and university level as mentioned above.

For the past few years, he has been responsible primarily for graduate level courses at Wright State, but at present he is deeply involved in two curriculum development efforts. The first of these addresses Wright State's practices in distance learning where Dr. Middleton is exploring how to better integrate instructor-student and peer-to-peer interaction with an asynchronous distance learning paradigm.

The second involves a campus-wide effort to support incoming freshman students through a wide variety of best practices student for self-assessment and acclimation to the university environment. Dr. Middleton's involvement concerns that portion of the seminar focused on incoming engineering students, and is designed to optimize each student's journey here at Wright State, one culminating in a professional career upon graduation. The transition to university education can be challenging even for well-prepared students: a new environment, increased personal responsibility both socially and academically, and greater rigor in subject matter requirements. These challenges are exacerbated by varying levels of academic preparedness, the rapid pace of new technology and scientific discovery, and unique new concerns relating the Covid

pandemic's disruption of the development of social and academic coping skills required to survive in a university environment.

To help meet these challenges, Dr. Middleton is applying his experience as a practicing industrial engineer with the extensive teaching experience referred to earlier. He has developed a personal pedagogy that integrates classroom application of the Socratic method, techniques in remedial education and alleviation of math anxiety, and traditional adult education. His goal is to promote a classroom experience of understanding through interaction, inquiry, exploration, and critical thinking.

Dr. Middleton completed his Ph.D. in Industrial Engineering at Wright State with a dissertation entitled: Imperfect Situation Analysis: Representing the Role of Error and Uncertainty in Modeling, Simulation & Analysis. For most of the 21st century his research focus has been on the use of intelligent agent technologies and the incorporation of situation awareness, decision-making under uncertainty, and other cognitive aspects of individual behaviors into Monte Carlo simulations individual and unit performance. This research incorporates methods from multiple objective decision analysis (MODA) and multi-attribute value and utility theory (MAUT) to support representation of decision-making in models and simulations. Dr. Middleton has used such simulations for the analysis of complex adaptive systems characterized by emergent behavior, and applied data farming / data mining to look for patterns in apparently random phenomena.

Dr. Middleton is a recognized expert in Modeling, Simulation, and Analysis (MS&S), with most of his research performed in various capacities for the U.S. Department of Defense (DoD). He has worked on a number of international initiatives with regard to U.S. DoD MS&A, including serving the DoD Deputy Under Secretary for Army OR (DUSA-OR) mission on behalf of US-German High-Resolution Modeling of the Soldier, decades long participation in collaboration between the U.S. Army Natick Soldier Systems and the Dutch TNO, or Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (the Netherlands Organisation for Applied Scientific Research), and otherwise supporting the US Army's role in a long-standing international organization concerned with cooperation on defense science and technology matters– the **Technical Cooperation Program** (TTCP) whose membership comprises Australia, Canada, New Zealand, the United Kingdom (UK) and the United States (US).

From 1980 to 1983 Dr. Middleton worked for the University of Dayton Research Institute (UDRI), supporting Avionics Analysis for the U.S. Air Force Research Laboratories (AFRL) at Wright Patterson AFB, Energy Recovery Analysis for the Montgomery County Environmental Engineer, simulating the emergency evacuation of aircraft in post-crash fire situations.

Between 1983 and 1990 Dr. Middleton worked under contract to AFRL at Wright Patterson on issues pertaining to nuclear, biological, and chemical (NBC) defense, balancing operational capability and risk with respect to the estimation of human performance in NBC environments. Ahigh point of this experience was his participation in Exercise Saly Chase, a Chemical Defense Command Post Exercise held at Hahn Air Base in Germany. Hahn AB was a frontline NATO facility for over 40 years during the Cold War and was the home of the USAF 50th Fighter Wing. Dr. Middleton's job during the exercise was to dynamically simulate the results of a chemical attack of the air base, representing the results of chemical agents on personnel, equipment, and supplies as a function of the base's response to the attack.

From 1990 to 2004, Dr. Middleton supported MS&A of small unit infantry operations, exploring the gamut of soldier "illities": survivability, lethality, mobility, sustainability, as well as command and control issues. He is one of the principal authors of the US Army's Integrated Unit Simulation

System (IUSS), developed by Simulation Technologies, Inc, under contract to the US Army Research Development and Engineering Command (RDECOM) Natick Soldier Center (NSC). From its inception, Dr. Middleton's research in connection with this effort centered on the individual dismounted combatant, recognizing the need for integrated representation of the relationships between human psycho-physiological states, the operational environment, and mission performance. He served as the Principal Scientist for the evolution of the IUSS into a new model, the Infantry Warrior Simulation (IWARS), to meet the joint needs of NSC and the US Army Materiel Systems Analysis Activity (AMSAA) for improved representation of decision-making and other aspects of human behavior. IWARS implements simulated entities (individual combatants, units, weapons platforms) as semi-autonomous intelligent agents operating within a virtual battle space. The HBR aspects investigated by Dr. Middleton account for agent behaviors and interactions, as well as other aspects of the battle space, including definition of terrain and interpretation of terrain features, dynamic updates to environmental conditions, and the effects of both conventional and chemical weapons on both the environment and the entities and objects in that environment. His research is reflected in his numerous technical reports and presentations with respect to Warrior Systems MS&A. He has been an invited participant in related workshops and seminars both in the US and abroad, in England, Germany, and the Netherlands.

In 2004 Dr. Middleton returned to the assessment of military chemical and biological defense issues, supporting Kettering University in Flint Michigan and the U.S. Defense Threat Reduction Agency (DTRA), modeling the environmental fate of chemical agents, using agent based simulation to study military operations in environments challenged by chemical and biological threats, and applying that research towards development of decision aids and other crisis management tools. This work concentrated on modeling the stochastic nature of both chemical agent dissemination and human response to chemical agent intoxication.

In 2009 he assisted the U.S. Army TRADOC Analysis Center (TRAC)-Monterey, exploring ways in which to support analysis of both the performance and potential of Land Warrior (LW) and Ground Soldier Systems (GSS) as they evolve to become part of the Future Combat Systems (FCS). The immediate objective was modeling small unit SA in force-on-force models.

More recently Dr. Middleton has performed analyses of the protection afforded by different configurations of body armor challenged by a variety threat munitions, using another tool he helped develop for the U.S. Army Natick Soldier Center, the Integrated Casualty Assessment Model (ICEM).

Dr. Middleton recently completed serving as a consultant for a Small Business Innovative Research (SBIR) effort entitled Dynamic Representation for Evaluating the Effect of Moderators and Stress on Performance (DREEMS). This research is a follow-on to successful Phase I and Phase II awards of the SBIR. DREEMS explores the cognitive and physiological effects of fatigue and stressors on a Warfighter's performance by mapping different types of fatigue, stressors, and moderators into an ontology that incorporates a cause-and-effect methodology. The goal is to provide reasoning algorithms that link changes in Warfighter moderator states to changes in performance.

Dr. Middleton's SBIR participation was concurrent with his teaching duties at Wright State. where has been responsible for two of the five core courses core courses for the Ph.D. in Engineering: Systems Engineering and Design of Experiments and has also revamped and updated the university's offerings in Data Mining and Simulation Based Queueing Theory. He is currently also developing a new course on multi-modal simulation-based analysis, integrating the application of systems dynamics models, discrete event simulation, and agent-based modeling.

Publications and Presentations:

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Weyhrauch, Peter W., Danczyk, Jennifer. Ritter, Frank E, Middleton, Victor E., Dynamic *Representation for Evaluating the Effect of Moderators and Stress on Performance (DREEMS), Phase 1 Final Report No. R1503730*; 10 Feb. 2017; prepared by Charles River Analytics, Boston MA; for U.S. Army Soldiers Systems Center- Natick, Natick MA

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Middleton, V. E. (2013) *Distortion of Mental Maps as an Exemplar of Imperfect Situation Awareness.* Simulation Conference (WSC), 2013 Winter, Washington D. C.

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