Real-time Self-driving Car Experience: M&S and Self-driving Standards Synergy

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ABSTRACT: *The extensibility of the methodologies, insights and standards of the Modeling and Simulation community have a lot to offer to the burgeoning "self-driving automobile"(SDA) efforts and, concomitantly, a lot to learn from the emerging body of data collected by the SDA users. Currently, the two communities, while fully aware of the others, are falling prey to the well documented "siloing" tradition of academic departments. The may be seen as slowing progress in both communities and, even worse, the very real prospect of a catastrophic cataclysm in one or both disciplines. New technologies are emerging to quantify and record data from many sources, as well as analytic techniques to rapidly recognize and analyze petabytes of information daily. This paper briefly surveys the current status of both efforts, indentifies the intersection of interests, and suggests the existence of data of common interests. The need for standards for the interchange of critical data has long been recognized in the M & S community. The authors suggest ways in which these lessons learned may say time, effort and lives in the SDA community's drive to early adoption. They record the historical events that sometimes set advancing technologies back decades, if not causing a permanent abandonment of otherwise promising technologies. The authors adduce both recorded records and personal experience in both M&S and SDA implementations and uses. They use that experience to proffer several views of possible futures for uses of M&S in SDA's and vice-versa. They introduce some coordinating techniques from the Systems Engineering (SE) discipline as a viable vehicle for improving both community efforts. SE strives to ensure consistency and coverage across the salient disciplines to better understand and evolve these disparate concepts. Future actions and research are envisioned for the communities at-large to consider autonomous robotics and valid simulations on the battlefield.*

Self-driving Automobiles
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Figures of Merit

Author Biographies

MARK C. DAVIS, PH.D. is the Chief Technical Officer at Wood Duck Research, Inc, and is semi retired after careers in the US Navy and as a computer design engineer for both IBM and Lenovo. Rising to the level of Distinguished Engineer at Lenovo, he was responsible for the design of laptop computer cross-disciplinary technology, including PC architecture, embedded systems, open source and virtualization. Previous work was with IBM in the areas of software development and architecture involving security, storage and virtualization. Dr. Davis has been granted well over fifty patents that were filed during his service at both companies. He is a graduate of the Duke University NROTC program and was commissioned as an Ensign, attended nuclear power school, and served as a Submarine Officer for twelve years, including one duty tour as a classroom instructor. He left the active duty as a Lieutenant Commander to pursue a PhD. Mark holds a BSEE degree from Duke University and a PhD in Computer Science from the University of North Carolina, Chapel Hill, where his advisor was Professor Fredrick P. Books.

DANIEL P. BURNS, CAPT, USN (Ret.) is a lifelong Systems Engineer, first with the Active Duty Navy, then SAIC, and small business. He served as Naval Chair and Professor of Practice in Systems Engineering at the Naval Postgraduate School (NPS).Captain Burns also was appointed as the as the Military Associate Dean and as acting Dean of the Graduate School of Engineering and Sciences at NPS. His research interests center on analyses of both human and resource utilization in defense efforts. He successfully facilitated the creation of a new program for Air Force Officers who seek post-graduate degrees. He is currently engaged in a project at the US Air Force Base, Los Angeles. Captain Burns received a BS degree from the U.S. Naval Academy, an MS from the Naval Postgraduate School and an MS from Southern Methodist University. He is currently working with Portland State University on a Ph.D in Systems Engineering.

JENNIFER H. NOLAN, PH..D. is the President of Catholic Polytechnic University and Professor of Psychology in their College of Arts and Sciences. Her earlier work specialized in memory, dementias, stroke and insulin resistance. She is a brain plasticity specialist and certified Cogmed provider. Previously, she was the C.O.O. and co-founder of a stroke and brain injury rehabilitation center. Dr. Nolan has taught university courses at the University of California Irvine, Loyola Marymount University, and Glendale Community College. She has conducted local and nationwide clinical trials, and published in both scientific journals and popular magazines. She received a BA in Psychology from Loyola Marymount University, Los Angeles and a Ph.D. in Neuro-Psychology from the Dept. of Cognitive Science at the University of California, Irvine.

DAN M. DAVIS is a Research Associate Professor at Catholic Polytechnic University (CPU) and is also active as a consultant at the Institute for Creative Technologies, University of Southern California (USC). He is currently focusing on large-scale DoD simulations and virtual human implementations. Prior to retirement, he was the Director of the JESPP project at USC for more than a decade. As the Assistant Director of Advanced Computing Research at Caltech, he ran Synthetic Forces Express, bringing HPC to DoD simulations. He has also served as a Director at the Maui High Performance Computing Center and in computer research roles at the Jet Propulsion Laboratory and Martin Marietta. He was the Chairman of the Coalition of Academic Supercomputing Centers and has taught at the undergraduate and graduate levels. As early as 1971, Dan was writing programs in FORTRAN on one of Seymour Cray's CDC 6500's. While in the Marine Corps, he saw duty in Vietnam as a Cryptologist and retired in 2002 as a Commander, U.S.N. He received B.A. and J.D. degrees from the University of Colorado in Boulder.

JUDITH L. JACOBUS is retired from conducting speech therapy as a Speech and Language Specialist for more than two decades. Her experiences were in public schools settings in Orange County. California. She also previously taught for 12 years as a classroom teacher in multi-cultural communities there. Judith currently volunteers her professional skills for a local police department, so has extensive experience with dysfunctional adults and children in a variety of both every-day and traumatic situations. Her participation in amateur theatrics has more fully familiarized her with the characteristics of human behavior as they are projected via verbal, facial and body-language cues. This experience has also exposed her to the skill and art of the selection of appropriate persons for specific on-screen roles. Judith holds a lifetime Special Education Credential in Speech and Hearing Therapy, K-12 from the State of California. She earned a B. A. Degree in Speech Communications from the California State University Long Beach and an M. A. Degree in Teaching and Teacher Leadership from the Grand Canyon University in Glendale, Arizona.