

System Engineering: Optimizing Creation of Conversational Virtual Human Avatars

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ABSTRACT

Many defense organizations report pressure to replace or augment scarce, expensive and schedule-constrained personnel who are needed to provide responses or to give advice. One method that has demonstrable capability and has found utility is the use of conversational, computer-directed avatars which can respond smoothly to a carefully fashioned list of germane questions. These avatars can be either animated or live (via a large number of video clips). Early research and development has focused on “hand crafting” question lists, paraphrases, recording scripts, utterances, transcriptions, video editing, validation, testing, and updating. The administrative burden of all of this has begun to overshadow the scientific and technical research effort. As this virtual human capability moves into acceptance and common implementation, the skills of system engineering are seen as facilitators for optimizing the production process. This paper addresses early experience with subjecting an on-going project to system engineering analyses in order to make the adoption of these avatars more practical and economical. The authors discuss the use of the V-Model and other system engineering tools in a way that should enable other researchers to understand what can be expected of such an approach to computer-generated virtual humans. These management tools and techniques provide a real opportunity to make manifest in the DoD the early successes demonstrated in research settings. Optimizing just the transcription phase would save significant amounts of implementation time. The paper then lays out both early results and suggests future paths for research and use.

ABOUT THE AUTHORS

Daniel P. Burns 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 served as the as the Military Associate Dean and as acting Dean of the Graduate School of Engineering and Applied Sciences at NPS. His research interests center on analyses of both human and resource utilization in defense efforts. Currently he is participating in the creation of a new program for Air Force Officers who seek postgraduate degrees. Captain Burns received a BS degree from the U.S. Naval Academy and an MS from the Naval Postgraduate School. He is currently finishing his dissertation for a Ph.D. from Portland State University.

Dan M. Davis is a consultant for the University of Southern California, focusing on large-scale distributed DoD simulations. Pre-retirement, for a decade he was the Director of USC’s JESPP project for JFCOM. As the Assistant Director of the Center for Advanced Computing Research at Caltech, he managed Synthetic Forces Express, bringing HPC to DoD simulations. Prior experience includes serving as a Director at the Maui High Performance Computing Center and as a Software Engineer at the Jet Propulsion Laboratory and Martin Marietta. He has served as 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. He saw duty in Vietnam as a USMC Cryptologist and retired as a Commander, Cryptologic Specialty, U.S.N.R. He received B.A. and J.D. degrees from the University of Colorado in Boulder.

Julianne M. Nordhagen is an Ensign in the U.S. Navy and is attached to the NROTC unit at the University of Southern California, where she is assigned to collaborate on research at the Institute of Creative Technologies (ICT). As an Industrial and Systems Engineering (ISE) undergraduate, Julianne cultivated the analytical and technical skills required for this project, including optimizing the performance of large scale systems and applying computational methods for scheduling and forecasting. She has professional experience using integrated planning software like SAP and NetSuite ERP. She was selected to be one of the mentors for ICT’s Mentor PAL project for the Office of Naval Research. Next April, she will begin her Naval Aviator training at the Naval Air Technical Training Center in Pensacola Florida. Ensign Nordhagen earned an ISE B.S. degree from the University of Southern California.