Identifying Human Performance Shortcomings in Data Comprehension: Advanced Technology Remediation

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ABSTRACT

Both the identification of human performance shortcomings in the comprehension of massive data flows and the development of technical enablers of remedial education and training are presented. During the authors' experience with new capabilities to amass, manage and deliver virtually limitless information, one of the major barriers to optimal use was observed as being the users' inability to assess, comprehend and filter the available data. A common complaint of armed forces the members is that they are given too much information, so that it becomes distracting rather than illuminating. A major component of the data transfer issue is the existence of a sort of friction that degrades the best use of the data. The current defense environment has suggested some supportable contentions: information friction has been ameliorated by technology, albeit the existence of some restrictions imposed by organizational leadership; the access to and interpretation of the extant body of data is driven more by human proclivities than technical constraints; and this issue is particularly critical to the warfighters. The current education system, which was designed for 19th century industrial work-places, is not well suited to developing the appropriate human-machine interface skills. Research will be presented that will support paths to identifying and addressing the military concerns. During current research, the authors have tested a useable avatar technology to provide similar remedial education and training where needed. This virtual human use makes the approach practicable, as it does not require significant new staffing and it is available at any time and any place a network connection can be established. Educational and computer simulation projects at the University of Sothern California would be extensible to address these issues. USC's high performance and quantum computing efforts have demonstrated new approaches to enable this methodology. A system engineered implementation is detailed.

ABOUT THE AUTHORS

Mark C. Davis, Ph.D. is currently 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 an Submarine Officer for twelve years before leaving the service 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, where his advisor was Professor Fredrick P. Books.

Dan M. Davis is active as a consultant at the Institute for Creative Technologies, University of Southern California (USC), focusing on large-scale DoD simulations and avatar uses. Prior to retirement, he was the Director of the JESPP project at USC for a decade. As the Assistant Director of Advanced Computing Research at Caltech, he ran Synthetic Forces Express, bringing HPC to DoD simulations. He also served as a Director at the Maui High Performance Computing Center and 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. He saw duty in Vietnam as a USMC Cryptologist and retired as a Commander, U.S.N. He received B.A. and J.D. degrees from the University of Colorado in Boulder.