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1995

A National Research Agenda for Virtual Reality: Report by the National Research Council Committee on VR R&D

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https://hdl.handle.net/10945/38289

A National Research Agenda for Virtual Reality: Report by the National Research Council Committee on VR R&D

Chair
Randy Pausch, University of Virginia

Panelists
Walter Aviles, Massachusetts Institute of Technology
Nathaniel Durlach, Massachusetts Institute of Technology
Warren Robinett, Virtual Reality Games, Inc
Michael Zyda, Naval Postgraduate School

In 1992, at the request of a consortium of federal agencies, the National Research Council established a committee to "recommend a national research and development agenda in the area of virtual reality" to set U.S. government R&D funding priorities for virtual reality (VR) for the next decade. The committee spent two years studying the current state of VR, speculating on where likely breakthroughs might happen, and deciding where funding could have the greatest impact. The result is a 500-page report that will have tremendous effect on what does and does not get funded in Virtual Reality research by agencies such as ARPA, the Air Force Office of Scientific Research, the Army Research Laboratory, Armstrong Laboratory, the Army Natrick RD&E Center, NASA, NSF, NSA, and Sandia National Lab.

The committee's report tries to "describe the current state of research and technology that is relevant to the development of synthetic environment systems, provide a summary of the application domains in which such systems are likely to make major contributions, and outline a series of recommendations that we believe are crucial to rational and systematic development of the synthetic environment field."

The purpose of this panel is to report the (often surprising) recommendations in the committee's report. Few researchers will have time to read this very influential document, but this forum will disseminate the basic highlights, and attempt to explain some of the more fractious points that the committee dealt with. For example, the report recommends "no aggressive federal involvement in computer hardware development in the [virtual reality] area at this time."

Based on last year's SIGGRAPH, Virtual Reality is one of the hottest areas for the computer graphics community, and funding is clearly needed from the federal government. Industrial sources are not viewed as having sufficiently long-term strategies to advance the field in many necessary areas. Therefore, the funding priorities and strategies discussed in this report may have a direct impact on the future directions of the SIGGRAPH community.

The report itself is Virtual Reality, Scientific and Technological Challenges, copyright 1995 National Academy of Sciences; ISBN 0-309-05135-5, Nathaniel I. Durlach and Anne S. Mavor, editors.

The purpose of the panel is to disseminate the report, the various panelists will be covering the following areas of the report and its recommendations:

Durlach: explanation of the committee's charge, government policy implications, and a high-level overview of the anticipated impact.

Pausch: description of the recommendations regarding the need for psychologists and evaluation criteria, and the recommendations in the area of education.

Aviles: discussion of recommendations regarding teleoperation and haptic/force feedback.

Robinett: discussion of human-machine interface recommendations, augmented reality, and sensory extension via VR.

Zyda: discussion of networking and hardware recommendations.

PANELISTS

Randy Pausch, University of Virginia (panel organizer) is an Associate Professor of Computer Science at the University of Virginia. He received a B.S. in Computer Science from Brown University in 1982 and a Ph.D. in Computer Science from Carnegie Mellon in 1988. He is a National Science Foundation Presidential Young Investigator and a Lilly Foundation Teaching Fellow. He currently leads the University of Virginia User Interface Group, which is developing the Alice VR system. His primary interests are human-computer interaction and undergraduate education.

Nathaniel Durlach, MIT, (chair of the NRC committee) is a senior scientist in the Department of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology and has been co-director of the Sensory Communication Group in the Research Laboratory of Electronics there for over 20 years. He has also been a visiting scientist in the Biomedical Engineering Department of Boston University for five years. He received an M.A. degree from Columbia University in mathematics and an M.A. degree from Harvard University in psychology and biology. He is the author (or coauthor) of numerous book chapters and refereed articles in such journals as Perception and Psychophysics and the Journal of the Acoustical Society of America; he continues to review articles, proposals, and research programs in the field of pschophysics; and he has recently been selected to receive the silver medal award for outstanding work in psychoacoustics by the Acoustical Society of America. Recently, his research interests have focused on teleoperator and virtual environment systems, with special emphasis on the human-machine interfaces used in such systems. He is cofounder and director of the MIT Virtual Environment and Teleoperator Research Consortium, as well as cofounder and managing editor of the new MIT Press journal Presence: Teleoperators and Virtual Environments.

Walter Aviles, MIT, has over a decade of experience in the design and development of advanced human/machine interfaces and robotic systems. His technical-emphasis areas include real-time control and integration architectures for distributed robotic

and sensor systems and multi-modal, spatially-oriented, interactive human /machine interfaces. He is one of the founding members of the Virtual Environment and Teleoperator Research Consortium (VETREC) and is an Associate Editor of the MIT Press journal Presence. Currently a Ph.D. candidate at MIT, Walter is responsible for the day to day management of the Virtual Environment Technology for Training Research Testbed. His current research involves exploring the efficacy of multi-modal user interfaces (MMUIs) in training applications After graduating from Stanford University in 1982, Walter spent the next 11 years at the Naval Ocean Systems Center (NOSC), a US Navy research and development laboratory.

Warren Robinett, Virtual Reality Games, Inc., is a designer of interactive computer graphics software and hardware and president and founder of Virtual Reality Games, Inc., a developer of virtual reality video games for the home market. In 1978, he designed the Atari video game Adventure, the first graphical adventure game. In 1980, he was cofounder and chief software engineer at The Learning Company, a publisher of educational software. There he designed Rocky's Boots, a computer game that teaches digital logic design to 11-year-old children. Rocky's Boots won software of the year awards from three magazines in 1983. In 1986 Robinett worked as a research scientist at the NASA-Ames Research Center, where he designed the software for the Virtual Environment Workstation, NASA's pioneering virtual reality project. From 1989 to 1992 at the University of North Carolina, he directed the virtual reality and nanomanipulator projects. He is an associate editor for the journal Presence.

Michael Zyda, Naval Postgraduate School, is a professor in the Department of Computer Science at the Naval Postgraduate School. He is also the academic associate and associate chair for academic affairs in that department. His main focus in research is in the area of computer graphics, specifically the development of large-scale, networked, three-dimensional virtual environments and visual simulation systems. He is the senior editor for virtual environments for the quarterly Presence; for that journal, he has coedited special issues on Pacific Rim virtual reality and telepresence.