Guide to the
Human Systems Integration Division
Virtual Environment Documentation and Equipment, 1986-1993
Collection Number AFS8078

NASA Ames History Office
NASA Ames Research Center

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Descriptive Summary

Title: Human Systems Integration Division Virtual Environment Documentation and Equipment, 1986-1993

Collection Number: AFS8078

Creator: Human Systems Integration Division

Dates:
Inclusive: 1986-1993
Bulk: 1987-1988

Extent: Volume: 3.70 cubic feet

Repository:
NASA Ames History Office
Moffett Field, California 94035

Abstract: This collection includes a Virtual Visual Environment Display (VIVED) and Virtual Interactive Environment Workstation (VIEW) head-mounted display, system chassis with cords, circuit cards, and system documentation on the Human Systems Integration Division's virtual environment research and development.

Administrative Information

Access: Collection is open for research.

Publication Rights: Copyright does not apply to United States government records. For non-governmental material, researcher must contact the original creator.

Preferred Citation:
Expanded:
NASA Ames History Office, NASA Ames Research Center. Moffett Field, California. AFS8078, Human Systems Integration Division Virtual Environment Documentation and Equipment, 1987-1993, [Container number] : [Folder number]. [Identification of item]. [Date, if available].

Abbreviated:
NASA ARC. AFS8078, [Container number] : [Folder number]. [Identification of item]. [Date, if available].

Acquisition Information: Materials transferred to the History Office by Dr. Stephen R. Ellis on February 6, 2008 and February 13, 2008.

Administrative History

The Human Systems Integration Division (Code TH) has been part of the NASA Ames Research Center for over 30 years and is currently one of the four divisions under the Office of Exploration Technology (Code T). From 1960 to 1977 the division was known as the Biotechnology Division (Code LT) under the Office of Director of Life Sciences (Code L). It was renamed to Man-Vehicle Systems Research Division (Code LM) in 1977. In 1984 the division was reassigned to the Director of Aerospace Systems (Code F) and renamed the Aerospace Human Factors Research Division (Code FL). The name changed in 1995 to Flight Management and Human Factors Division (Code AF) when it was moved to the Office of Director of Aeronautics (Code A). In 1998 the division was reassigned again to the Office of Director of Information Systems (Code I) and renamed to the Human Factors and Technology Division (Code IH). The division was reassigned to its current directorate in 2006 and changed to its present name, Human Systems Integration Division (Code TH).

Human Systems Integration is an umbrella term that encompasses several areas of human factors research, including human performance, technology design, and human-computer interaction. The mission of the Human Systems Integration Division is to advance "human-centered design and operations of complex aerospace systems through analysis, experimentation, and modeling of human performance and human-automation interaction to make dramatic improvements in safety, efficiency, and mission success" (NASA Ames Research Center Human Systems Integration Division, July 2010). Current strategic goals include: advancing understanding of how humans process information, make decisions, and work in partnership with human and machine systems; enhancing aviation safety and performance with help from human-centered automation and interfaces; and extending human capabilities in space through advancement of knowledge about human performance during space missions; and developing tools, technologies, and countermeasures for safe and successful space ventures.

Currently, the division is composed of two technical competencies: human systems integration technology and human performance requirements and standards. The first focuses on areas such as advanced controls and displays; cockpit/flight deck design and development; human-computer interaction for planning and mission operations; and safety analysis, monitoring, and reporting systems. The second focuses on perceptual and cognitive modeling and metrics; physiological processes and countermeasures; and training, procedures, and team coordination.

Throughout the division's 30 years of existence, different branches have engaged in advanced human-centered aerospace research projects, such as the NASA Aviation Safety and Reporting System, Army/NASA Aircrew/Aircraft Integration Program, and virtual interactive environment technologies. The division's research into virtual environment tools and applications began in the mid 1980s and has evolved with changing technologies and research needs.

Virtual environments are computer-simulated, three-dimensional spaces enhanced by special processing to stimulate both visual and non-visual senses of the body (e.g., hearing, touch) to convince users that they are immersed in a synthetic space. Early virtual environment systems at Ames employed four key components: a human user/operator, sensors, effectors,

and a simulation computer. Sensors detected a user's body movements while effectors, such as a stereo head-mounted display, stimulated the user's senses. A simulation computer established the linkage between the sensors and effectors to produce experiences similar to those in a physical environment (Ellis, 1994).

Two early virtual environment research and development projects pursued by the Human Systems Integration Division were the Virtual Visual Environment Display (VIVED) and Virtual Interactive Environment Workstation (VIEW). The VIVED system was a head-mounted, wide-angle, stereoscopic display system controlled by its operator's position, voice, and gestures. Once a user donned the head set, the user could explore a 360-degree virtually synthesized environment and interact with its basic components. The VIVED system was a minimal system, considered to be the first low-cost, head-mounted display virtual environment system to demonstrate that cheap immersive systems were possible.

The Virtual Interactive Environment Workstation (VIEW) was later derived from the VIVED system and was the principal integrated system within which VIVED was used. The goals of the VIEW experiments were the same as VIVED with regard to studying operator interaction within a multisensory, interactive synthetic environment. The VIEW experiments had two goals. The first goal was to build a facility for use by researchers of the Human Systems Integration Division. The second goal was to explore and extend the capabilities of the Workstation beyond what was considered necessary for the initial research facility. The VIEW research project had two primary target applications, which were teleoperation and dataspace. The primary objectives of these applications were interactive graphics scenarios to provide focal points for facility integration; to provide representation, reconfigurable examples of facility use for researchers; and also to provide an integrated, reliable showcase for research and technology developments. The VIEW system had multiple sub-systems consisting of a head-mounted display, data gloves, speech input/output, auditory display, graphic system, and trackers.

Sources Consulted

Ellis, Stephen R. "What Are Virtual Environments?" IEEE: *Computer Graphics & Applications*, 14:1 (1994) 17-22.

National Aeronautics and Space Administration (2009). *Ames Exploration Technology Directorate*. Retrieved July 20, 2010 from http://infotech.arc.nasa.gov/index.php

National Aeronautics and Space Administration (2009). *Human Systems Integration Division*. Retrieved July 20, 2010 from http://human-factors.arc.nasa.gov/

NASA Ames History Office, NASA Ames Research Center. Moffett Field, California. AFS1070.8A, Ames Astrogram Collection. 1960-2008.

NASA Ames History Office, NASA Ames Research Center. Moffett Field, California. AFS1030.39A, Archives Reference Collection. Telephone Directories. 1963-2003.

For More Information

Bibliography compiled by Stephen R. Ellis
http://human-factors.arc.nasa.gov/organization/personnel_view.php?personnel_id=22

Scope and Content

This collection (3.70 cubic feet) contains artifacts and textual records related to the Virtual Visual Environment Display (VIVED) and Virtual Interactive Environment Workstation (VIEW) experiments conducted by the Human Systems Integration Division from the late 1980s to the early 1990s. The materials are dated from 1986 to 1993. Artifacts include a system chassis with corresponding parts and a head-mounted display designed for the VIVED system. Textual records include system documentation for VIVED, and a VIEW document index.

The VIVED and VIEW documentation in this collection corresponds to virtual environment research conducted by the Human Systems Integration Division at Ames Research Center from the mid 1980s to the early 1990s. The primary objective of this research was to develop a multipurpose, multimodal, operator interface to make natural interaction with complex operational tasks possible and to enhance operator situational awareness of large-scale integrated systems.

The two volumes of system documentation in this collection serve as a technical guide for maintaining and upgrading VIVED systems. The documentation provides more than casual information about VIVED and its operational systems to those who have related technical or application interests. The first volume provides information about the display system electronics and is organized into sections based on system functions. The second volume contains a compilation of fabrication drawings for the components of the headgear used during the era. Together the two volumes help explain how to build and recreate a VIVED virtual environment system. The VIEW documentation within this collection consists of a VIEW Document Index with a system design review, system requirements, project goals, project management plans, development plans, sub-system descriptions, and a UNIX programmer's manual.

Sources Consulted

Fisher, Scott. S., McGreevy, Michael W., Humphries, James, & Robinett, Warren. "Virtual Environment Display Sytem" in 1986 Workshop on Interactive 3D Graphics (Chapel Hill: Department of Computer Science, University of North Carolina, 1986), 13.

System of Arrangement

The collection is arranged by format.

Indexing Terms

The following terms may be used to index this collection.

<u>Corporate Name</u>
Ames Research Center
Sterling Federal Systems, Inc.

<u>Personal Name</u>
Humphries, James
Ellis, Stephen R.
Fisher, Scott S.
McGreevy, Michael Wallace
Robinett, Warren

<u>Subjects</u>
Environment Simulation
Human-Computer Interface
Human Factors Engineering
Virtual Environments
Virtual Reality
Virtual Interactive Environment (VIEW)
Virtual Visual Environment Display (VIVED)

Related Collections

Artifacts Collection, Equipment Series: Left Hand Virtual Reality Dataglove by VPL
Research (ART1387.360)

Container List

Box	Folder	Name
1	1	Virtual Visual Environment Display (VIVED) System Documentation Correspondence, 1993
	2	Virtual Visual Environment Display (VIVED) System Documentation, 1987 (Folder 1 of 2)
	3	Virtual Visual Environment Display (VIVED) System Documentation, 1987 (Folder 2 of 2)
	4	Virtual Interactive Environment Workstation (VIEW) Document Index, 1987- 1989 (Folder 1 of 3)
	5	Virtual Interactive Environment Workstation (VIEW) Document Index, 1987- 1989 (Folder 2 of 3)
	6	Virtual Interactive Environment Workstation (VIEW) Document Index, 1987- 1989 (Folder 3 of 3)
2		Virtual Visual Environment Display (VIVED) System Chassis, parts 1-3: Image Display Circuit Card Module (ART8078.1-1, 1 piece), Display Interface Circuit Card Module (ART8078.1-2, 1 piece), Power and Audio/Visual Display Cords (ART8078.1-3, 2 pieces)
3		Virtual Visual Environment Display (VIVED) System Chassis, part 4: Electronics Box (ART8078.1-4, 4 pieces)
4		Virtual Visual Environment Display (VIVED) System Head-Mounted Display (ART8078.2, 4 pieces)