

1. Record Nr.	UNINA9910828854503321
Titolo	Virtual reality : scientific and technological challenges // Nathaniel I. Durlach and Anne S. Mavor, editors
Pubbl/distr/stampa	Washington, D.C., : National Academy Press, 1995
ISBN	0-309-17682-4 1-280-21113-X 9786610211135 0-309-58725-5 0-585-02302-6
Edizione	[1st ed.]
Descrizione fisica	xi, 542 p. : ill
Altri autori (Persone)	DurlachNathaniel I MavorAnne S
Disciplina	006
Soggetti	Human-computer interaction Virtual reality
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	"Committee on Virtual Reality Research and Development, Commission on Behavioral and Social Sciences and Education, Commission on Physical Sciences, Mathematics, and Applications, National Research Council."
Nota di bibliografia	Includes bibliographical references (p. 444-515) and index.
Nota di contenuto	Virtual REALITY -- Copyright -- Contents -- Preface -- Executive Summary -- RECOMMENDATIONS -- Applications -- Psychological Considerations -- Technology -- Human-Machine Interfaces -- Computer Hardware and Software -- Telerobotics -- Networks -- Evaluation -- Government Policy and Infrastructure -- I OVERVIEW -- II Research And Technology -- 1 Some Psychological Considerations -- RESOLUTION, ILLUSIONS, AND INFORMATION TRANSFER -- MANUAL CONTROL, TRACKING, AND HUMAN OPERATOR MODELS -- Subsystem Decomposition of the Human Operator -- Sensory Substitution -- THE SUBJECTIVE SENSE OF TELEPRESENCE -- ALTERATIONS OF SENSORIMOTOR LOOPS -- DISCOMFORT -- LEARNING AND PROBLEM SOLVING -- MOTIVATION -- ATTITUDE, OPINION FORMATION, AND PERSONALITY EFFECTS -- RESEARCH NEEDS -- 2 The Visual Channel -- STATUS OF THE RELEVANT HUMAN RESEARCH -- SE-Relevant Aspects

of Visual System Organization -- Sensory Constraints for Displays --
The Third Dimension -- Augmented-Reality Systems -- Sensory
Adaptation to Visual Distortion -- STATUS OF THE TECHNOLOGY --
Components and Technologies -- Display Surfaces and Optics --
Autostereoscopic Displays -- Integrated Systems -- Head-Mounted
Displays -- Off-Head Displays -- Advantages and Disadvantages of
Head-Mounted and Off-Head Displays -- RESEARCH NEEDS -- 3 The
Auditory Channel -- STATUS OF THE RELEVANT HUMAN RESEARCH --
Resolution and Information Transfer Rates -- Auditory Displays --
Spatial Perception -- Auditory Scene Analysis -- Adaptation to
Unnatural Perceptual Cues -- STATUS OF THE TECHNOLOGY --
Headphone Displays -- Room-Acoustics Modeling -- Off-Head, Hear-
Through, and Augmented-Reality Displays -- Computer Generation of
Nonspeech Audio -- Synthesis Techniques -- Synthesis Technology --
RESEARCH NEEDS -- Perceptual Issues -- Technology -- 4 Haptic
Interfaces -- STATUS OF THE RELEVANT HUMAN RESEARCH.
The Human Haptic System -- Input-Output Variables of Haptic
Interactions -- Sensing and Control of Interface Variables -- Limb
Position and Motion -- Net Forces of Contact -- Perception of Contact
Conditions and Object Properties -- Summary -- Tactile Sensory
System -- Kinesthetic Sensory System -- Motor System -- Active Touch
Involving All Three Systems -- STATUS OF THE TECHNOLOGY --
Terminology and Variables of Haptic Interfaces -- Classification of
Haptic Interfaces -- Current Technology -- Hardware -- Software --
Summary of Current Technology and Future Possibilities -- RESEARCH
NEEDS -- Human Haptics -- Biomechanical Investigations --
Psychophysical Investigations -- Technology Development -- Hardware
-- Software -- Matching Performance of Humans and Haptic Devices --
Comfort (Ergonomics) -- Methods of Stimulation -- Evaluation of
Haptic Interfaces -- 5 Position Tracking and Mapping -- HAND
TRACKING -- EYE TRACKING -- HEAD TRACKING -- BODY MAPPING
AND TRACKING -- Mechanical Trackers -- Goniometers -- Ground-
Based Linkages -- Magnetic Trackers -- Optical Sensing -- Passive
Stereo Vision Systems -- Marker Systems -- Structured Light Systems
-- Laser Radar -- Laser Interferometers -- Acoustic Trackers -- Inertial
Tracking -- Eye Tracking -- RESEARCH NEEDS -- 6 Whole-Body Motion,
Motion Sickness, and Locomotion Interfaces -- STATUS OF THE
RELEVANT HUMAN RESEARCH -- Sensorimotor Stability During Self-
Motion -- Head Movements -- Arm Movements -- Locomotion -- Body
Orientation -- Illusions of Self-Motion -- Motion Sickness -- WHOLE-
BODY MOTION AND LOCOMOTION INTERFACES -- Inertial Displays --
Full Inertial Displays -- Partial Inertial Displays -- Variable Gravity
Displays -- Locomotion Displays -- Treadmill-Type Displays -- Haptic
Interfaces for Individual Feet -- Noninertial Displays -- Visual Displays
-- Auditory Displays -- Vestibular Displays.
Proprioceptive/Kinesthetic Displays -- RESEARCH NEEDS -- 7 Speech,
Physiology, and Other Interface Components -- SPEECH RECOGNITION
AND SYNTHESIS -- Speech Recognition -- State of the Art in Speech
Recognition -- Speech Synthesis -- PHYSIOLOGICAL RESPONSES --
Autonomic Nervous System Responses -- Brain Activity -- Cognitive
Function -- Functional and Structural Information -- Brain-Actuated
Control -- OTHER INTERFACE COMPONENTS -- 8 Computer Hardware
and Software for the Generation of Virtual Environments -- HARDWARE
FOR COMPUTER GRAPHICS -- Notable Graphics Workstations and
Graphics Hardware -- Graphics Architectures for VE Rendering --
Computation and Data Management Issues in Visual Scene Generation
-- An Example: The Virtual Wind Tunnel -- Strategies for Meeting
Requirements -- Graphics Capabilities in PC-Based VE Systems --

SOFTWARE FOR THE GENERATION OF THREE-DIMENSIONAL VIRTUAL ENVIRONMENTS -- Interaction Software -- Existing Technologies -- Design Approaches and Issues to be Addressed -- Visual Scene Navigation Software -- Survey of Currently Developed Navigation Software -- Survey of Hierarchical Data Structure Techniques for Polygon Flow Minimization -- Application-Specific Solutions -- World Modeling -- Geometric Modeling: Construction and Acquisition -- Dynamic Model Matching and Augmented Reality -- Physical Simulation for Visual Displays -- Autonomous Agents -- Populating the World: NPSNET as an Example -- Hypermedia Integration -- HARDWARE AND SOFTWARE ISSUES TO BE ADDRESSED -- RESEARCH NEEDS -- Hardware -- Software -- Interaction Software -- Visual Scene Navigation Software -- Modeling -- TECHNICAL APPENDIX -- Graphics Architectures for VE Rendering -- Silicon Graphics from the IRIS-1400 to the RealityEngine 2 -- Onyx RealityEngine2 -- Evans & Sutherland Freedom 3000. Graphics Hardware from the University of North Carolina, Chapel Hill: PixelPlanes 4, 5, and PixelFlow -- 9 Telerobotics -- INTRODUCTION -- Relation to Robotics -- Relation to Virtual Environments -- REMOTE MANIPULATORS -- Kinematics -- General Positioning Capabilities -- Redundancies -- Workspace -- Serial Versus Parallel Mechanism -- Kinematic Solvability -- Actuation -- Macrorobots -- Micromotion Actuators -- End Effectors -- Sensors -- Joint Motion Sensors -- Joint Torque Sensors -- Wrist Force/Torque Sensors -- Tactile Sensors -- Proximity Sensors -- REMOTE VEHICLES -- Systems -- Class 1 Systems: Power and Data Tethered -- Class 2 Systems: Data Tethered -- Class 3 Systems: Nontethered Telemetry -- Class 4 Systems: Nontethered, No Telemetry -- Technologies and Directions -- Sensor Systems -- Platforms -- High-Level Robotic Control -- Human-Machine Interface -- LOW-LEVEL CONTROL OF TELEOPERATORS -- Position-Based Teleoperation -- Coupled Control of Manipulators for Force-Feedback Teleoperation -- Modeling -- Delay -- Robustness -- Scaling -- Performance Evaluation -- SUPERVISORY CONTROL -- Generic Paradigm for Supervisory Control -- Status of Research in Supervisory Control -- Computer-Based Planning of Telerobot Actions -- Teaching the Telerobot What to Do -- Computer Assistance in Monitoring -- Intervening and Learning -- Predictor Displays to Cope with Time Delay -- Visual and Haptic Aids -- Performance Measurement, Learning, and Modeling -- REAL-TIME COMPUTING -- Requirements -- Levels of Control -- Low-Level Control -- Intermediate Level Control -- High-Level Control -- Latency Versus Update Period -- System Architecture -- Processors and Computing Platforms -- Parallel Processing and Communications -- Operating Systems and Development Environments -- RESEARCH NEEDS -- Handling Communication Delays -- Accurate, Real-Time Simulations. Real-Time Computing -- Better Robot Hardware -- Multiaxis, High-Resolution Tactile Sensors -- Robust Proximity Sensors -- Multiaxis Force Sensors -- High-Performance Joints -- Improved Telerobotic Controllers -- 10 Networking and Communications -- STATUS OF THE TECHNOLOGY -- Wide-Area Networks -- Local-Area Networks -- Issues to be Addressed -- COMMUNICATIONS SOFTWARE -- RESEARCH NEEDS -- Hardware -- Software -- 11 Evaluation of Synthetic Environment Systems -- GENERAL ISSUES IN SYSTEM EVALUATION -- SPECIAL ISSUES IN SE EVALUATION -- Evaluation of System Characteristics -- Observation and Measurement of Human Behavior in SEs -- III Applications -- 12 Specific Applications of SE Systems -- DESIGN, MANUFACTURING, AND MARKETING -- Rationale -- Specific Manufacturing Applications -- Building Prototypes Electronically -- Electronic Configuration and Management of Production Lines --

Exemplar Industries -- Textiles -- Aerospace -- MEDICINE AND HEALTH CARE -- Rationale -- Specific Medical Applications -- Preservice and Continuing Medical Education -- Teaching Anatomy -- Surgical Training -- Accreditation -- Surgical Planning -- Telemedicine -- Telesurgery -- Rehabilitation -- Issues to be Addressed -- TELEOPERATION FOR HAZARDOUS OPERATIONS -- Rationale -- Survey of Major Applications -- Toxic Environments -- Space Operations -- Teleoperated Heavy Machinery -- Off-the-Ground Environments -- Firefighting and Security -- Bulk Transportation Environments -- Ocean Environments -- Infrastructure and Research Needs -- TRAINING -- Rationale -- The Future -- Specific Applications -- Training Transfer -- Issues to be Addressed -- Research Needs -- EDUCATION -- Rationale -- Specific Applications -- Simulated Field Trips and Telepresence -- Spatial Relations -- Playrooms to Build Things -- Micro Worlds -- Simulations -- Issues to be Addressed -- Desirability. Effectiveness and Feasibility.
