

89

Third Annual Workshop on Automation and Robotics

FINAL PROGRAM

**Houston, Texas
NASA Johnson Space Center
Gilruth Recreation Center**

July 25-27, 1989

Keynote Speaker:

James B. Odom
former Associate Administrator for Space Station/NASA

Invited Talks:

Knowledge-Based Systems: Research Challenges in Space
Dr. Randal Davis/MIT

Hypermedia: Bridging from Information to Knowledge
Dr. Chris Dede/University of Houston

**Workshop
Objectives:**

- To establish communications between individuals and organizations involved in similar research and technology
- To bring together project/program managers in open exchange through presentation of technical papers and panel discussions
- To document in the proceedings a snap-shot of USAF/NASA efforts in automation and robotics

Sponsored By:

**The National Aeronautics and Space Administration
and The United States Air Force**

Co-Sponsored By:

University of Houston-Clear Lake

PRESENTERS SCHEDULE - SOAR '89 (continued)

Paper 2: SATELLITE SERVICING
C. Woolley, J. Moore, NASA/Johnson Space Center

Paper 3: THE JPL TELEROBOTIC TESTBED: A SYSTEM ARCHITECTURE FOR SATELLITE SERVICING
Dr. J. Matejovic, NASA/Jet Propulsion Laboratory

H-4 STRATEGIC BEHAVIOR AND WORKLOAD

NASA Co-Chair: Sandra Hart, NASA/Ames Research Center

USAF Co-Chair: Dr. Michael Vidulich, AAMRL/HEG, Wright-Patterson AFB, OH

Paper 1: PERFORMANCE-BASED WORKLOAD ASSESSMENT: ALLOCATION STRATEGY AND ADDED TASK SENSITIVITY
Dr. M. Vidulich, AAMRL/HEG, Wright-Patterson AFB, OH

Paper 2: THE WORKLOAD OF SUSTAINED ATTENTION
Dr. P. Hancock, University of Southern California; J. Warm, W. Dember, J. Gluckman, T. Galinsky, J. Thremann, A. Becker, University of Cincinnati

Paper 3: REAL-TIME MEASUREMENT OF MENTAL WORKLOAD USING PSYCHOPHYSIOLOGICAL MEASURES
Dr. A. Kramer, University of Illinois

Paper 4: VERBAL AND NONVERBAL PROTOCOL ANALYSES FOR STUDIES IN CREW COMMUNICATIONS AND WORKLOAD
Dr. P. Sanderson, University of Illinois

Paper 5: USEFULNESS OF HEART MEASURES IN FLIGHT SIMULATION
Dr. R. Harris, Sr., J. Comstock, Jr., NASA/Langley Research Center; G. Bonadies, Planning Research Corporation, Inc.

E-4 SPACECRAFT INTERACTION EFFECTS

Chair: D. Ferguson, NASA/Lewis Research Center

Paper 1: SPACE ENVIRONMENTS AND THEIR EFFECTS ON SPACE AUTOMATION AND ROBOTICS
H. Garrett, Jet Propulsion Laboratory

Paper 2: ENVIRONMENTAL CAUSED SPACECRAFT ANOMALIES IN ORBIT
J. Allen, D. Wilkenson, H. Kroehe, National Geophysical Data Center, NOAA

Paper 3: DISCHARGE TRANSIENT COUPLING IN LARGE SPACE POWER SYSTEMS
N. Stevens, R. Stillwell, TRW, California

Paper 4: PLASMA INTERACTIONS AND EFFECTS FOR LARGE SYSTEMS
D. Snyder, NASA/Lewis Research Center

Wednesday, July 26, 1989

1:30 p.m. - 3:00 p.m.

I-5 HIERARCHICAL CONTROL AND AUTONOMY

Chair: Maj. Carl Lizza, WRDC/KTS, Wright-Patterson AFB, OH

Paper 1: PILOT'S ASSOCIATE
G. Edwards, ISX Corp.

Paper 2: COOPERATING INTELLIGENT AGENTS
S. Rosenchein, Teles Research; M. Zweben, NASA/Ames Research Center

Paper 3: A TASK CONTROL ARCHITECTURE FOR AUTONOMOUS ROBOTS
R. Simmons, Carnegie-Mellon University

Paper 4: AUTOMATED CONTROL OF HIERARCHICAL SYSTEMS USING VALUE-DRIVEN METHODS
T. Burke, G. Pugh, Decision-Science Applications, Inc.

Paper 5: PLANNING EXECUTION MONITORING FOR A PLANETARY ROVER
D. Miller, R. Firby, NASA/Jet Propulsion Laboratory

R-5 END EFFECTORS/MANIPULATORS I

Chair: Dr. Timothy F. Cleghorn, NASA/Johnson Space Center

Paper 1: ANTHROPOMORPHIC MANIPULATORS AT JPL
A. Becjzy, NASA/Jet Propulsion Laboratory

Paper 2: SMART HANDS FOR THE EVA RETRIEVER
C. Hess, L. Li, NASA/Johnson Space Center

Paper 3: KINEMATICALLY REDUNDANT ARM FORMULATIONS FOR COORDINATED MULTIPLE ARM IMPLEMENTATIONS
R. Bailey, L. Quiocho, Lincoln; Dr. T. Cleghorn, NASA/Johnson Space Center

Paper 4: NUMERICAL APPROACH OF COLLISION AVOIDANCE AND OPTIMAL CONTROL ON ROBOTIC MANIPULATORS
J. Wang, M. W. Kellogg, Houston

H-5 HUMAN FACTORS ENGINEERING AND ROBOTICS

NASA Co-Chairs: Dr. Steven R. Ellis, NASA/Ames Research Center
Dr. Thomas Malone, Carlow Associates, Inc.

Paper 1: VISUALIZATION AND CONTROL OF DYNAMICS 3D DATA
Dr. S. Ellis, NASA/Ames Research Center

Paper 2: REMOTE OPERATION OF AN ORBITAL MANEUVERING VEHICLE IN SIMULATED DOCKING MANEUVERS
A. Brody, Sterling Software, NASA/Ames Research Center

Paper 3: HUMAN-LIKE DESIGN FOR TELEROBOTICS: USEFUL METAPHOR OR RED HERRING?
Prof. L. Stark, University of California, Berkeley

Paper 4: ASSESSMENT OF CONTROL STABILITY FOR A DEXTROUS TELEOPERATOR WITH TIME DELAY
J. McConnell, Grumman Space Systems

Paper 5: HUMAN FACTORS ISSUES IN TELEROBOTIC SYSTEMS FOR SPACE STATION FREEDOM SERVICING
Dr. T. Malone, Carlow Associates, Inc.

E-5 SPACECRAFT INTERACTION EFFECTS

Chair: D. Ferguson, NASA/Lewis Research Center

Paper 1: CONSIDERATIONS FOR SPACE STATION POWER SYSTEM EMI
G. Murphy, H. Garrett, NASA/Jet Propulsion Laboratory

Paper 2: SOLAR ARRAY ARCING IN PLASMAS
D. Ferguson, NASA/Lewis Research Center

Paper 3: PHOTOVOLTAIC ARRAY SPACE POWER PLUS DIAGNOSTICS EXPERIMENT
D. Guidice, Geophysics Laboratory, Hanscom AFB, MA

Paper 4: ORBITAL DEBRIS AND METEOROID EFFECTS ON SPACECRAFT SYSTEMS
E. Christiansen, NASA/Johnson Space Center

Wednesday, July 26, 1989

3:30 p.m. - 5:00 p.m.

I-6 MACHINE LEARNING

Chair: James Villareal, NASA/Johnson Space Center

Paper 1: ADVANCED NETWORK ARCHITECTURES
Dr. J. Barhen, NASA/Jet Propulsion Laboratory

Paper 2: SUNSPOT PREDICTION USING NEURAL NETWORKS
J. Villareal, NASA/Johnson Space Center

Paper 3: BEHAVIORAL NETWORKS AS A MODEL FOR INTELLIGENT AGENTS
N. Siwa, NASA/Langley Research Center

Paper 4: AUTOCLASS II
P. Cheeseman, NASA/Ames Research Center

R-6 TELEROBOTICS AND SUPERVISED AUTONOMY

Chair: Dr. Antal Becjzy, NASA/Jet Propulsion Laboratory

Paper 1: THE APPLICATION OF NASREM TO REMOTE ROBOT CONTROL
M. Walker, A. Dobryden, J. Dionise, R. Giles, B. Harper, Robotics Research Laboratory, University of Michigan

Paper 2: TECHNOLOGY FOR AN INTELLIGENT, FREE-FLYING ROBOT FOR CREW AND EQUIPMENT RETRIEVAL IN SPACE
J. Erickson, G. Reuter, K. Healey, NASA/Johnson Space Center; D. Phinney, Lockheed LESC

Paper 3: THE JPL TELEROBOT OPERATOR CONTROL STATION-OPERATIONAL EXPERIENCES
Dr. E. Kan, NASA/Jet Propulsion Laboratory

H-6 INTELLIGENT TUTORING SYSTEMS

NASA Co-Chair: Dr. Michael Shafto, NASA/Ames Research Center

USAF Co-Chair: Dr. Sherrie Gott, Brooks AFB, Texas

Paper 1: TRAINING HIGH-PERFORMANCE TASKS WITH INTELLIGENT TUTORING SYSTEMS
Dr. J. Regian, AFHRL/IDI, Brooks AFB, Texas

Paper 2: AN INTELLIGENT SIMULATION TRAINING SYSTEM
Dr. J. Biegel, University of Central Florida

Paper 3: FUNCTIONAL DESCRIPTION OF A COMMAND AND CONTROL LANGUAGE TUTOR
D. Eike, T. Semster, W. Truskowski, NASA/Goddard Space Flight Center

Paper 4: SUCCESS IN TUTORING ELECTRONIC TROUBLESHOOTING
Dr. E. Parker, AFHRL/MOMJ, Brooks AFB, Texas

I-8 EXPERT SYSTEM VERIFICATION AND VALIDATION PANEL

Chair: Peter A. Kiss/BDM International, Inc.

Panel Members: C. Culbert, NASA/Johnson Space Center; K. Richardson, NASA/Ames Research Center; S. Johnson, NASA/Langley Research Center; R. Stachowitz, Lockheed; K. Bellman, Aerospace Corp.

Thursday, July 27, 1989

10:30 a.m. - noon

I-7 KBS STANDARDS

Chair: Dr. Chuck Hall, Lockheed AI Center, California

Panel: B. Bullock, ISX Corp.; B. Neches, ISI; J. Rockmore, ADS; P. Kiss, BDM International, Inc.; Capt. D. Howell, AFLC, Wright-Patterson AFB; M. Stock, AI Technology, Inc.

Paper 1: A MODEL FOR KNOWLEDGE-BASED SYSTEM'S LIFE CYCLE
P. Kiss, BDM International, Inc.

Paper 2: KBS DEVELOPMENT - A MAINTENANCE PROSPECTIVE
Capt. D. Howell, Wright-Patterson AFB

Paper 3: ARCHITECTURE DESIGN AND IMPLEMENTATION STANDARDS FOR MEDIUM-TO-LARGE SCALE KNOWLEDGE-BASED APPLICATIONS
M. Stock, AI Technology, Inc.

R-7 END EFFECTORS/MANIPULATORS II

Chair: Capt. Ron Julian, AAMRL/BBA, Wright-Patterson AFB, OH

Paper 1: TESTBED EXPERIMENTS FOR VARIOUS TELEROBOTIC SYSTEM CHARACTERISTICS AND CONFIGURATIONS
Dr. N. Duffie, Dr. R. Lorenz, Dr. S. Wiker, Wisconsin Center for Space Automation and Robotics

Paper 2: NEEDS AND USES OF HUMAN ENGINEERING DATA IN THE DESIGN OF A FORCE REFLECTING EXOSKELETON
Capt. M. Jaster, AAMRL/BBA, Wright-Patterson AFB, OH; J. Garin, Martin Marietta

Paper 3: LTM-A DUAL-ARM REDUNDANT TELEROBOTIC SYSTEM
R. Mixon, W. Hankins III, NASA/Langley Research Center

H-7 HUMAN-SYSTEM INTERFACES

NASA Co-Chairs: Dr. Betty Goldsberry, Dr. Tim McKay, Lockheed-ESC

Paper 1: HUMAN INTERACTIONS WITH GRAPHICS: REPRESENTATION AND PROCESS
Dr. D. Gillan, R. Lewis, Lockheed-ESC; M. Rudisill, NASA/Johnson Space Center

Paper 2: THE SPACE STATION USER INTERFACE LANGUAGE: AN OBJECT-ORIENTED LANGUAGE FOR CONTROLLING COMPLEX SYSTEMS
Dr. R. Davis, University of Colorado

Paper 3: LEONARDO AND THE DESIGN OF LARGE DISTRIBUTED SOFTWARE SYSTEMS
K. Fairchild, G. Meredith, MCC

Paper 4: EVALUATION OF OFF-ROAD TERRAIN WITH STATIC STEREO AND MONOSCOPIC DISPLAYS
John Yorchak, Craig S. Hartley, Martin Marietta, Denver Aerospace

I-9 FUZZY LOGIC

Chair: Bob Lea, NASA/Johnson Space Center

Paper 1: OCEAN FEATURE RECOGNITION USING GENETIC ALGORITHMS WITH FUZZY FITNESS FUNCTION (GA/F3)
Dr. B. Buckles, Dr. F. Petry, Tulane University

Paper 2: EXTENSIONS OF ALGEBRAIC IMAGE OPERATORS: AN APPROACH TO MODEL-BASED VISION
B. Lerner, US Naval Academy; Jackson and Tull Chartered Engineers, NASA/Goddard Space Flight Center

Paper 3: FUZZY-C DEVELOPMENT SYSTEM: A COMPLETE OVERVIEW
C. Perkins, J. Teichrow, E. Horstkotte, Togai InfraLogic, Inc.

COMMITTEE

S O A R • 8 9



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Assistant General Chair
Col. Paul C. Anderson, AFSTC

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Marshall Space Flight Center
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Technology, Inc.

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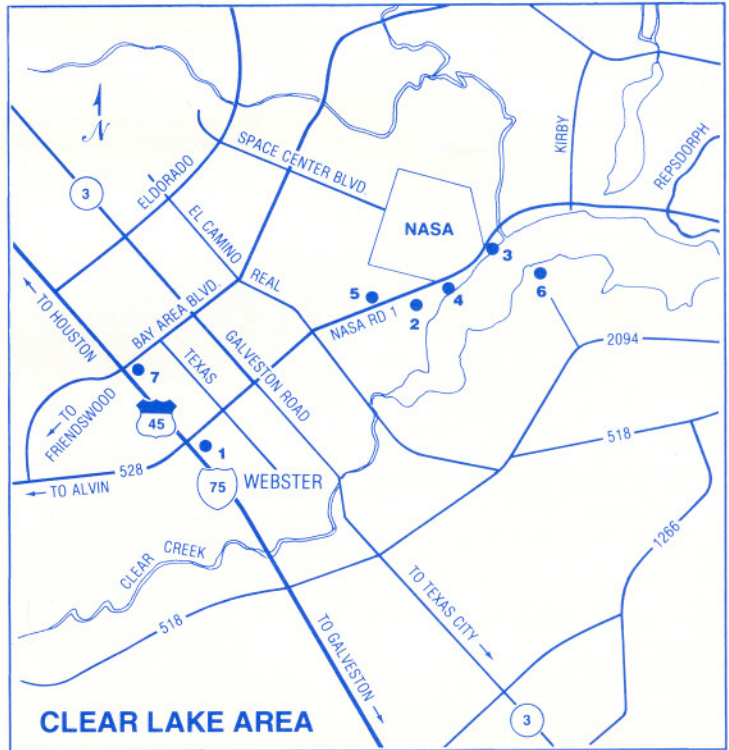
Katherine Moser, UH-Clear Lake

Exhibit Chair

Ellis Henry, NASA/JSC

A hospitality room will be set up in the Gilruth Center for the attendees to relax and socialize. A message center will be set up to leave messages for the attendees. Telephone number: (713) 483-0318

Tuesday 8:00 a.m. - 4:00 p.m.
Wednesday 8:00 a.m. - 4:00 p.m.
Thursday 8:00 a.m. - 12 noon



Accommodations

HOLIDAY INN - NASA (2)
1300 NASA Road 1
Houston, TX 77058
(713) 333-9167
Gov. Rate: \$53.50
Corp. Rate: \$53.50

MOTEL 6 (1)
(formerly Comfort Inn)
1001 West NASA Road 1
Webster, TX 77598
(713) 332-4581
Rate: \$24.95
\$6.00 per extra person
No Gov. Rate

NASA MOTEL (7)
889 West Bay Area
Webster, TX 77598
(713) 338-1526
Gov. Rate: \$30.00
Corp. Rate: \$33.00

AMERICAN HOST (4)
(formerly Quality Inn)
2020 NASA Road 1
Houston, TX 77058
(713) 332-3551
Gov. Rate: \$53.00
Corp. Rate: \$53.00
(includes breakfast)

NASSAU BAY HILTON (3)
3000 NASA Road 1
Houston, TX 77058
(713) 333-9300
Gov. Rate: \$79.00 single
\$89.00 double
Corp. Rate: \$89.00 single
\$99.00 double

**SOUTH SHORE RESORT AND
CONFERENCE CENTER (6)**
2500 S. Shore Blvd.
League City, TX 77573
(713) 334-1000
Gov. Rate: \$70.00
\$10.00 per extra person
Corp. Rate: \$80.00
\$10.00 per extra person

KINGS INN (5)
1301 NASA Road 1
Houston, TX 77058
(713) 488-0220
Gov. Rate: \$55.00 single
\$65.00 double
Corp. Rate: \$59.00 single
(ranges up to \$71.00)

Rates subject to change