Human Centered Design and Development for NASA’s MERBoard

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Overview

• Mission Intro
MER Mission
MER Operations

- Human Science Team with
  - Computer tools
  - Intent, Qualitative Assessment, Judgement,
  - Science Priorities, Resource Management

- Commands to rover reflect intent, group science decisions
MER Human Centered Computing

• Program proposed to JPL as part of four Ames technology insertions for the MER Mission
  – Program goals - mitigate risk of operational errors, improve surface ops productivity and communications
  – Methods - observe, interview, design, prototype, iterate

• HCC definition parallels Norman
  – A development process that starts with users and their needs, rather than with technology. The goal is a system design that serves the user, where the technology fits the task and the complexity is that of the task not of the tool
  – We also added to Norman’s definition
    • A system perspective that includes human - machine and MOS process interactions
MER HCC Program Cont.

• Unique to HCC proposal was that the initial program did not include any specific tools or technologies - only observations, with process and technology recommendations to follow

• The MERBoard is the key technology recommendation to date
MERBoard Overview

MERBoard Collaborative Workspace
--50” plasma display with touchscreen
--4 main applications, API for extensibility
--Browser, Data display tools
--Virtual network computer for real time sharing/control
--Digital whiteboard with drawing tools, MER-specific tools for long term planning
--Pervasive storage space
--Tools for data capture and distribution
--Data storage and retrieval
MERBoard Use
Process - Initial Idea

• Inspiration from IBM Almaden Research Center’s Blueboard, Dan Russell, User Science and Experience Research Group

• Observations of Athena Science Team training in Mars Yard and FIDO Field Tests
1. **pcons** - Personal Icon for “badged in” members. Clicking on them brings up members home page. Dragging to it adds to a session mail message.

2. Login mechanism may be a card reader, logout would be a reswipe of an ID card.

3. Web Browser is setup to briefly display a series of relevant web pages to survey a broad range of information.

4. Whiteboard brings up collaborative drawing space.

5. Personal web page. This contains various links, the shared files link is the session email message.

Blueboard screen courtesy of IBM
FIDO 01 Observations

FIDO 2001 Observations

- Flip charts for planning and communication, decision process
- Not persistent over time, difficult to share and distribute, no ability to composite
- Laptop content difficult to share with the group, projection screens for science workstations only
- Communication issues foreseen for large Mission Operations Support Area for the mission

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MERBoard Prototype

- Initial task driven by mission deadlines
- Mission system critical design review baselines the operational system
- MERBoard was proposed shortly before this review
  - Initial proposal to Mission System (key user)
  - Early demo on 15” touchscreen PC for Science Team PI and Mission System Manager
- Prototype design done by team lead, developer, inputs from ethnographer

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Prototype Demo

- Demo to Athena science team, 1/02, first demo to use 50” touch screen
- A demo has the plus of showing the users a part of the system and making it real - it has the minus of inhibiting imagination, i.e. the user sees what is in front of them as the system, whereas the designers see a vision of what it they envision it to be months later - fidelity of prototype is key here
- Ethnographer recorded user reaction to demo
- Mission system preliminary o.k. to bring to FIDO 02, deploy on the mission

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MERBoard Early Development

• Team and infrastructure built from scratch
• Early decisions
  – Java - driven by cross platform requirements
  – Prototype thrown away
  – Palm Pilot level of simplicity
  – Initial use with 10 - 15 minutes of training
  – Browser for data access
  – VNC
  – Personal Storage Space
  – Digital Whiteboard
  – Meta-tools
Development Phase 1

• Focus on requirements and related technical issues
• Small team, fragmentation issues, focus
• Team re-organization
  – Data analysis Team
  – Design Team
  – Development Team