Maximizing Productivity with Wearable Tech

• Improve Efficiency
  • Maximize time on productive tasks
  • Minimize time on support tasks
  • Minimize errors
  • Automate monitoring

• Provide Natural Interfaces
  • Comfortable: on-body, long term
  • Controls: hands, voice, eyes, body
  • Display: visual, auditory, tactile
  • Smart: adaptive and collaborative

• Augment Human Capabilities
  • Monitor and control remote systems
  • Access information on demand
  • Detect danger and respond
Wearable Electronics Application and Research
WEAR Lab

Electronic Design, Manufacture, Test

3D Printing

Usability Testing and Analysis

University Collaboration

Partner: App Design

Partner: 3D Printing
Rapid Develop, Integrate, Test

• **MoBI Software**  
  *Multi-wearable, multi-sensor data hub*
  - Bluetooth Low Energy focus
  - Integrate data from many devices
    - Commercial devices
    - Custom NASA-developed devices
    - Custom partner-developed devices
  - Currently at alpha internal release

• **Chisel Software**  
  *Drag and drop, cross-platform display builder*
  - Rapid design (WYSIWYG), rapid reconfig
  - Platform interoperable
    - Interfaces leverage modern web standards
    - Out of the box integration with int’l standards
  - Integrated user interaction analytics
  - Currently at alpha internal release
Wearable Device Base Board

Common platform with basic features to jumpstart wearable device design

Features

• Bluetooth Low Energy Communication
• Rechargeable Battery Regulation
• On-board Data Storage
• On-board Processing
• Variety of I/O interfaces
• Small form factor
  • Unfolded: 2.35” x 1.0” x 0.125”
  • Folded: 1.25” x 1.0” x 0.625”

Reference Design: Personal CO2 Monitors
Personal CO2 Monitor Rapid Development

- Project Start to Delivery in 12 months
  - Class I-E certification process

- Designed, built, tested, certified, and delivered:
  - Base Board with off-the-shelf CO2 Sensor
  - 3D-printed Clip-on Housing
  - iPad App, user interface and automation
  - Networked Data Server Integration

- Developed custom testing tools

- Conducted multiple rounds of user testing, crew briefings

- Created procedures, ops plans, and training videos
Current Work

• Multi-Sensor Crew Device
  • Unmet **ISS** requirements and monitor other target parameters
    • Lighting, noise hazard indicator, fatigue/sleep monitoring
  • Fully correlated datasets from crew-worn devices to support and enable operations and research

• Sociometric Badge
  • A wearable built for the monitoring of team interaction
    • Originally developed by Michigan State University
  • Take existing system and modify for spaceflight
  • Electronics prototype and shrink form factor to wearable clip-on device

• Leveraging commercial wearable development kits
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