Astrobee Guest Science

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Outline

• Astrobee Overview
• Astrobee Interface
• Astrobee Development Tools
Astrobee Overview

• A total of 3 units on board ISS
• Docking station for recharge and wired comm.
• Built in perching arm using payload interface
• 6 total cameras for various purposes, including one cellphone class HD camera.
• Main purposes:
  • Host guest science payload (GSP payloads)
  • Serve as mobile camera for ISS situational awareness
  • Serve as mobile sensor platform for
• First GSP Payloads
  • REALM RFID reader
  • Zero Robotics High School and Middle School competitions
Interface - Processors

• Three main internal processors
  • High-Level Processor (HLP)
    • Snapdragon 805 Quad-Core SOM
    • Mostly reserved for GSP payload use
    • Runs touch screen and
  • Mid-Level Processor (MLP)
    • Snapdragon 805 Quad-Core SOM
    • Lower rate, higher computation processes
    • Runs most of the core robot software
    • Handles decision making and data communication
  • Low-Level Processor (LLP)
    • Wandboard dual
    • High rate control loop and sensor sampling
    • Pseudo-real time
Interface - Attachment

- Available volume:
  - 12.32 cm by 15.24 cm by 10.16 cm
  - Keep outs provided via CAD model
  - Payloads may extend beyond the exterior of robot
  - Payloads within payload volume use built-in bumpers for impact protection

- Alignment pins
- No-tool quick-release levers attachment system
- Four #8-32 bolt pattern for each GSP payload bay
Interface - Electrical

• Connector:
  • Astrobee side: Glenair M83513/03-E03N
  • Payload side: Glenair M83513/04-E03N

• Power:
  • 14.4 V 3A unregulated

• Data:
  • USB to HLP and MLP
Interface - Propulsion

• Two (2) propulsion modules
• Able to instantaneously thrust in any direction and torque about any axis
• Acceleration dependent on weight of GSP payload, but designed to be up to:
  • 10 cm/s² linear
  • 30 deg/s² angular
• Maximum thrust: 600mN
Interface - Human

- Touch Screen
- RGB signal lights
- Laser pointer
- Speaker
- Microphone
• GSP payloads communicate to Astrobee via the Guest Science Android ROS bridge
• A JAR library will facilitate GSP payload software.
• GSP payloads subscribe to any Astrobee message.
• Advanced users may access lower level functionality.
Interface - Ground

- Easy operator interface
- Custom data message for GSP Payload
- Start, stop and send custom commands to GSP payload
Development - Simulator

- Runs actual flight software
- Simulate sensor inputs
- Runs actual GSP Payload code
Development – Payload Tester

• Main purpose to test payload port functionality and demonstrate GSP payload development path.

• External processor capable of running Linux and Core Flight Software.

• Trade study underway to select alternative attachment options, including seat track.