Life in the Atacama Field Journal
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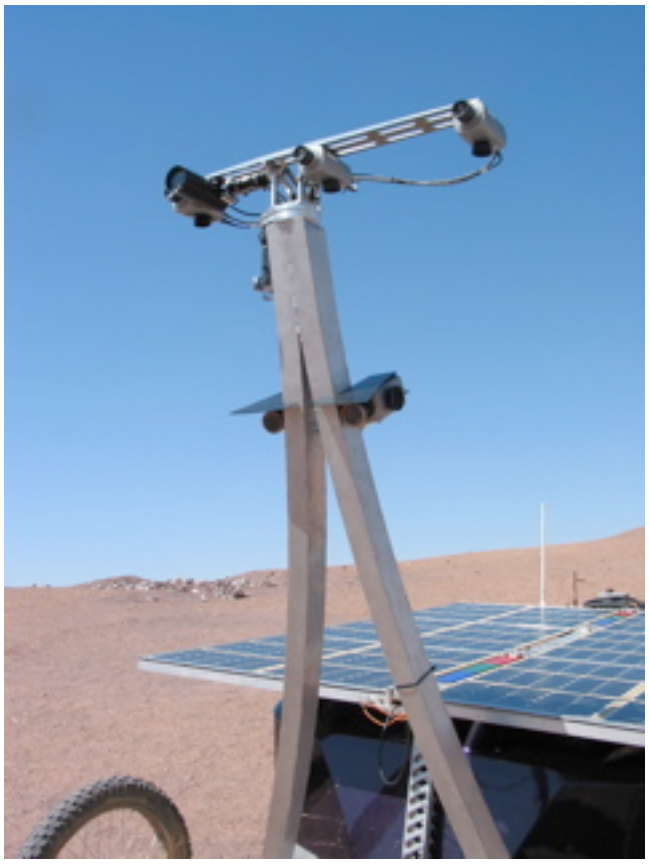
Salar Grande, Chile

Agenda
• Calibrate cameras
• Initialize ground-truth localization system
• Assemble Lithium-Polymer batteries

Status and Progress
• Calibrated cameras. Zoë has 9 camera onboard, if you count the Fluorescence Imager and the Sun Tracker. Today we worked on image quality and calibration of the Stereo Panoramic Imager (SPI) and checked the navigation cameras and workspace cameras. The SPI is comprised of three of color CCD cameras atop a pan-tilt platform. It can view 360° (370° actually) around the robot and from -90° to 60° elevation, allowing it to take in a panoramic view. Because the camera mast leans forward, the SPI cameras can actually see the ground looking straight down.



We focused the cameras and then collected images of a calibration target. These calibration images allow us to compute both the extrinsic geometry of the cameras (where they are pointed relative to

each other) and the intrinsic parameters of each camera related to its optics and CCD. With known calibration we can then use the images from pairs of cameras to estimate the distance to points viewed by both cameras and to reconstruct the geometry of the scene. The middle camera pair with either outer camera provide a narrow 30cm baseline for near-field geometry and the outer cameras have a 60cm baseline that provide better resolution when looking at features far away.

• Initialized ground-truth localization system. Zoë carries a Global Positioning System (GPS) receiver onboard to provide an independent estimate of it's position. GPS provides global estimates of position to within about 10 meters using the constellation of GPS satellites and we augment this using the OmniStar satellite for differential corrections to get to better than 1 meters of accuracy. Today we successfully initialized this system (which requires the OmniStar satellite to send a special initialization signal to Zoë's receiver.) On planets other than the Earth there is not GPS system, so it is important that planetary rovers are able to estimate their own position as they drive around. Zoë does this using internal sensors, but in order to measure the accuracy of this internal estimate, we also record the GPS estimate as the correct value to compare against.

• Assembled Lithium-Polymer batteries. Zoë's solar panels convert solar energy to electrical power to drive, operate its instruments, and power its computers. Any excess energy is stored in batteries so that Zoë has extra energy for peak demand like climbing steep slopes or near dawn and dusk when the solar energy declines. We have both standard lead acid batteries with 600Whr capacity and Lithium-Polymer batteries with 3000 Whr capacity when fully charged. The Lithium-Polymer batteries (2) are each assembled from 20 modules of 6 cells. (Each cell looks like a foil instant soup packet.) They all are plugged in series to for the 72 volt power system. This experimental battery has been hand-assembled and individual cell voltages balanced before it can be installed inside Zoë. That's all done and the batteries are working well, giving Zoë 5 times energy storage capacity of lead-acid battery and power to run for hours after dusk.

Upcoming

• Finalize landing site D

• Run autonomous traverse

Weather

Morning: Clear, 13C, light breezes 5 KPH, 50% RH

Afternoon: Clear (but fog on the hills), light breeze, 10 KPH, 26C, 30% RH

Night: Clear and starry, still, cold 9C, 60% RH

Quote of the Day

"Bang" [Quiet horror]