

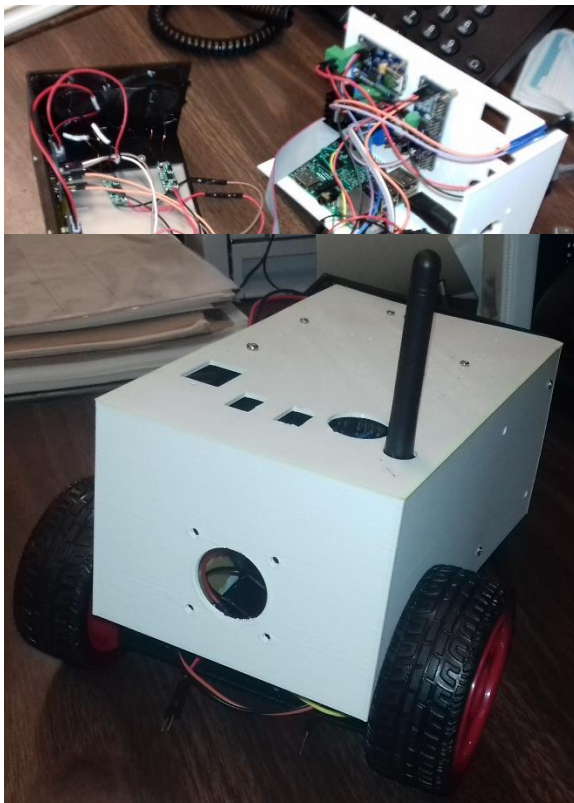
Abstract – Belbas, Nicholas (EC2)

Originally, I was brought into the Design and Analysis Branch in the Crew and Thermal Systems to work on administrative tasks like archiving and scheduling. However, I ended up splitting my time between secretarial tasks and a technical project.

My technical project was originally meant to be a wireless sensor package for the 20ft Spacecraft Thermal Vacuum Chamber in the B7 High Bay. I would be using a miniature wifi development board and a temperature/humidity sensor along with custom 3D modeling to accomplish this. However, after some discussion with my technical mentor, the plan was changed to a mobile autonomous self-charging sensor platform. A mobile platform will allow the sensors to be moved around without depressurizing the chamber. Also, the self-charging aspect of the package allows for almost unlimited time in the chamber. If the on-board battery runs low, the robot can easily be driven to its charging dock and continue to transmit while charging.

The driving base is based around a Raspberry Pi 3 board with a 1²C PMW DC Motor controller and a PWM controller driving two small gear motors. The sensor transmitter itself is a RHT03 temperature and humidity sensor and Cozir CO₂ sensor connected to an ESP8266 Huzzah board. The power distribution system utilizes a pair of 3.7v 3600mah lipo batteries wired to Powerboost 500 boards. Also, the self-charging mechanism utilizes two 12v-max inductive charging coils wired into the same Powerboost boards as the battery.

The Raspberry pi is running Python 3.3 for the driving base and Javascript MJPEG library for transmitting live video from the onboard camera. The sensor package is running Arduino-based C++ and the program capturing the data is running PyQtGraph Python and HTML.



The shell of the robot itself is a 3D printed case that will (work in progress) snap together. The photo to the left shows the two halves separated from each other. The black shell contains the power distribution boards and connectors while the white shell contains the driving base and data systems.

This photo on the left shows the mobile sensor package as a whole. This photo however does not have the sensors poking out the holes in the top or the camera poking out the hole in the front.