Pumas in a Half-Shell: Donashello Robotics Project

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Abstract:

- **What:** An autonomous imitation Mars rover.
- **How:** 3D Printing most of our components and programming
- **Why:** Explore new territory for future astronauts.

Introduction

Donashello is a fully autonomous, imitation Mars rover capable of basic navigation. The robot was tested at the Great Sand Dunes in Alamosa, CO, to gain hands-on experience in robotics.

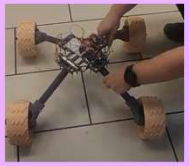
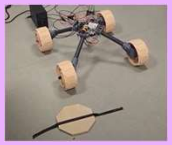
Materials

- ABS 3D Printing filament
- Metal hardware
- Adafruit 9-DOF Chip
- Arduino Due
- BoJack motor shield
- Sharp IR sensors
- PVC pipe legs
- 11.1 V Airsoft lithium-ion battery
- Rubber, Styrofoam, and plastic wheels

Methodology

The chassis and original wheels were 3D printed, all the chips were soldered to their boards, the battery was zip-tied on and the chassis and legs were all assembled by hand. Everything was designed and tested using the scientific method. We specifically tested Donashello repeatedly on grass, tile, carpet, dirt, and sand. Some pictures are shown below.



Results

Our tests unfortunately concluded that our 3D printed wheels were too big, and we were severely under the torque requirements, so we had to switch to the rubber wheels last minute.

We also found that IR sensors would serve our purpose the best, as well as that they are a cone shaped laser pretending to be a line, so we needed to calibrate them individually a certain way.


The Arduino Due ended up not having enough memory for our program so we switched to the Arduino Due.

We used the magnetometer, or compass, from the Adafruit 9-DOF to control our heading.

The program was written in Arduino and went through several versions including a grid-based mapping system that we could not get working in time.

Credit to Angel Padilla

Conclusion

We built a fully autonomous, imitation Mars rover that can navigate terrain like Mars as proven by our tests at the Great Sand Dunes in Alamosa, CO, to gain hands-on experience in robotics.

Recommendations

Going forward we would love to complete our mapping function as well as add a camera so it can send pictures or video back to us and perfect the original 3D printed wheels. And possibly a suspension system.

Acknowledgements

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