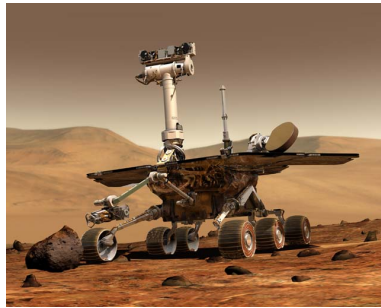


CMSC 360: Intelligent Robotics and Perception

Lab 1: Puppets – Sensing and Acting at a Distance

Due September 16, 2009



Spirit (Mars Rover) and the Rovio robot

Overview

In the first unit of the course we are studying teleoperated robots. For instance, robots that dispose of bombs or explore planets from afar. These robots extend the eyes and hands of the operator (the sensors and effectors), but the bulk of the 'thinking' is left to the operator. You will come up with your own mission for sensing and acting from a distance.

This lab is intended to let you explore some of the issues involved with teleoperation. Furthermore, it will introduce you to a real robot hardware platform – the Rovio. You will use the Rovio to collect some data of interest to you (images, sound, WIFI signal strength), and to effect change from a distance (play a .wav file, or turn on a LED). You are free to choose your particular mission. You might start by thinking of a real-world task you imagine a teleoperated robot undertaking, then simplify it to fit the Rovio's limited capabilities.

One key guideline of this assignment is that you must attempt your mission in **two different locations** separated by at least 100 feet. For instance, in two different buildings on campus, or at the very least in two different rooms in RKC. It will be easiest to use the computers in RKC-107 as your base station (where the Rovio software is already installed, and the remote microphone and speaker are enabled), but you are free to use any computer you wish.

Since we only have three Rovios available, you should work in teams of two or three people. I leave it up to you to form teams for this assignment. If self-assigned teams don't work out, future collaborative assignments will have assigned teams.

Learning Objectives

- Become familiar with a robot hardware platform.
- Use a robot to collect data from a distance.
- Explore some of the issues with teleoperated robot systems.

Lab Report

Submit an electronic copy (PDF) on moodle and bring a hardcopy to class to discuss. Graphs and other visualizations of the data you collect are encouraged!

1. **Mission:** What is your robot's mission? Why is it interesting? Why does it make sense for a robot to be used for this task?
2. **Teleoperation System:** How does your teleoperation system work? If you developed your own, how does your program work? What were your design choices? If you used WowWee's teleoperation system, how does that work? Be sure to address the hardware and software aspects of the system as well its sensing, thinking, and acting dimensions..
3. **Mission 1:** Where was the first mission? What were the results of the first mission?
4. **Mission 2:** Where was the second mission? What were the results of the second mission?
5. **Complications:** What complications arose during your missions? How were the missions similar and different?
6. **Improvements:** How could the teleoperation system be improved? Specifically, how would you address the complications that arose?



Figure 1: The Rovio Web Interface

The Rovio

The Rovio is 802.11-enabled, meaning it can be accessed from most places on Bard’s campus! You should take advantage of this and take Rovio out of RKC (provided you sign it out). The three Rovies are configured to use a dynamic DNS service since they receive their IP addresses via DHCP. The robots require a user/password combination. Keep this information to yourselves, i.e. don’t give this information to anyone that isn’t in CMSC-360.

green	bard-rovio1.dynalias.com
blue	bard-rovio2.dynalias.com
yellow	bard-rovio3.dynalias.com

The Rovio has a built-in webserver that can be queried to obtain information (images, odometry, obstacle detector, battery status) or issue commands (lower camera, go forward, dock). You can interact with it via a web-browser or using curl from the command-line.

```
curl --user 'user:pass' 'http://bard-rovio1.dynalias.com/rev.cgi?Cmd=nav&action=1'
```

The Rovio comes with Windows software for teleoperating the robot which you are free to use, but creating your own teleoperating software (e.g. using Java or Python) is encouraged. More information about the Rovio software can be found on the course website’s resources section and these websites:

www.wowwee.com/en/support/rovio

www.wowwee.com/static/support/rovio/manuals/Rovio_API_Specifications_v1.2.pdf