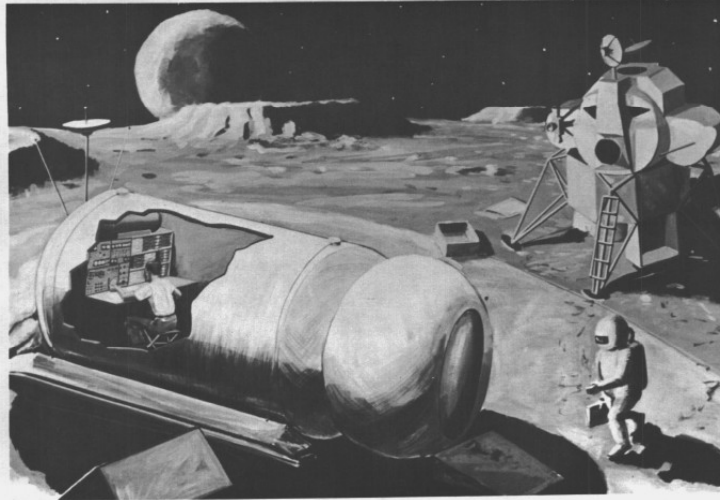# The RSS I
Course Challenge

RSS Lecture 12
Wednesday, 17 March 2010
Prof. Seth Teller, Dr. Una-May O'Reilly

Overview

- RSS I "grand challenge" scenario, subtasks

- What you are provided

- Schedule through end of term

- Graded challenge milestones

- Question & answer session

Build a Shelter on Mars

Goodyear STEM (Stay-Time Extension Module) concept, 1979

Build a Shelter on Mars

- Robot parachutes into a remote, crudely-mapped environment such as Mars
- Materials, fiducials delivered as well; robot must prepare space for later-arriving humans
- Some materials delivered accurately to planned locations; other materials go awry
- Robot must move around to explore and familiarize itself with its new space
- After capturing a rough map, the robot selects a spot for constructing a shelter
- Robot then collects materials, transports them to the shelter site, and builds shelter

Challenge sub-tasks

- **Plan and Navigate**:
  - Form motion plans around mapped, unmapped obstacles
  - Navigate from known start location to construction site
  - Optional: motion planning from unknown start location
- **Identify Construction Site**:
  - Define site location a priori, or have robot choose it online
- **Find Objects**:
  - Detect objects of known types at known locations
  - Detect objects at unknown locations, identify object types
- **Gather and (Optionally) Store Objects**:
  - Collect blocks on, under, or in robot body
- **Transport Objects:**
  - Convey blocks to selected construction site
- **Construction**:
  - Create a simple structure of your choice (e.g. group, row, open wall, closed wall, multi-story wall) at construction site
- **Optional:**
  - Any technical aspect of the challenge that you wish to focus on

What you are provided

- Hardware and Tool Access
  - Standard RSS microbot, sensors, etc.
  - Delrin, Lexan, sheet metal, plywood etc.
  - Any other parts needed from RSS, EECS stock
  - $50 budget for outside components (use MIT's tax-free number, save receipts)
  - Access to shop, waterjet cutter, 3D printer, …
  - **Absolutely no** cardboard or duct tape (decorative or cosmetic cardboard is OK)
- An approximate map of challenge area
- Fiducial locations, color coding
- Rules / constraints

What you are provided

- Hardware and Tool access
- An approximate map of challenge area
  - Polyline perimeter of operation area
  - Mapped and unmapped obstacles
  - Mapped and unmapped blocks
- Fiducial locations, color coding
- Rules / constraints

What you are provided

- Hardware
- An approximate map of challenge area
- Fiducial locations, color coding
  - Two vertically-stacked colored balls
  - Use any blob detector from visual servo lab
- Rules / constraints

What you are provided

- Hardware
- An approximate map of challenge area
- Fiducial locations, color coding
- Rules / constraints
  - Team must be ready to run when your turn
  - Bot must be staged, left to run for 10 minutes
  - Bot can't make destructive/irreversible changes
  - Walls will not move (much) if bot hits them

Challenge Schedule 2010

- **This Friday:**
  - CI-M lecture on expectations for team-written challenge proposal
- **Friday 2 April:**
  - Team-written draft challenge proposals due
- **Monday 5 April, Wednesday 7 April**
  - Challenge design briefings to staff (dry runs in lab)
- **Friday 9 April**
  - CI-M feedback on draft challenge proposals returned by today
- **Monday 12 April:**
  - Work on course challenge implementation begins
- **Monday 12 April, Wednesday 14 April**:
  - Challenge design briefings to staff (in lab)
- **Wednesday 21 April**:
  - Revised team-written challenge proposals due
- **M 26 Apr, W 28 Apr, M 3 May, W 5 May:**
  - Graded Challenge milestones (in lab)
- **Monday 10 May**:
  - Timed challenge dry runs
- **Wednesday 12 May**:
  - Final timed and judged challenge runs

Graded Challenge Milestones

- **As specified in team-written Challenge proposal**
  - Will be graded by staff
- **Monday 26 Apr:**
  - Graded challenge milestones (in lab)
- **Wednesday 28 Apr:**
  - Graded challenge milestones (in lab)
- **Monday 3 May:**
  - Graded challenge milestones (in lab)
- **Wednesday 5 May:**
  - Graded challenge milestones (in lab)
- **Monday 10 May**:
  - Timed challenge dry runs
- **Wednesday 12 May**:
  - Final timed and judged challenge runs

Team huddle

- Come up with several questions
- We'll discuss until end of today's meeting
- Submit remainder to rss-help
  - We'll post responses to wiki (Challenge FAQ)