THE UNIVERSITY of ADELAIDE

School of Mathematical and Computer Sciences
COMP SCI 3006 - Software Engineering & Project

Lunar Rover Operation Manual

Lunar Rover Mapping Robot

Revision 1

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Prepared by UG06

Philip Fai-Yuen Sung
a1211805

Zhongfan Zhang
a1670764

Brent Aaron Poland
a1647000

Charles Jonathon Zyzniewski
a1609619

Christopher Luke Lyndon
a1694039

Sioli Tiafau O'Connell
a1690418

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1 Setup

1.1 Requirements

Java Runtime Environment 1.7 running on Windows or MacOSX

1.2 Installation

Download and install Java Runtime Environment 1.7 then open the SEP-Lunar-Rover.exe for Windows or SEP-Lunar-Rover.app for OSX . No actual installation is required as the application is made to be stand alone.

1.3 Connecting to Lunar Rover

Connect the Lunar Rover and the computer to a dedicated network to relieve network latency and reduce the chance of packet loss. See the user manual for the Lego Mindstorm EV3 for instructions to connect it to the network.

2 GUI Overview

The next section aims to build understanding of the use of the Graphical User Interface(GUI). By the end of this section the reader would assume to have a solid understanding what would be expected operations of the GUI.

2.1 Main window

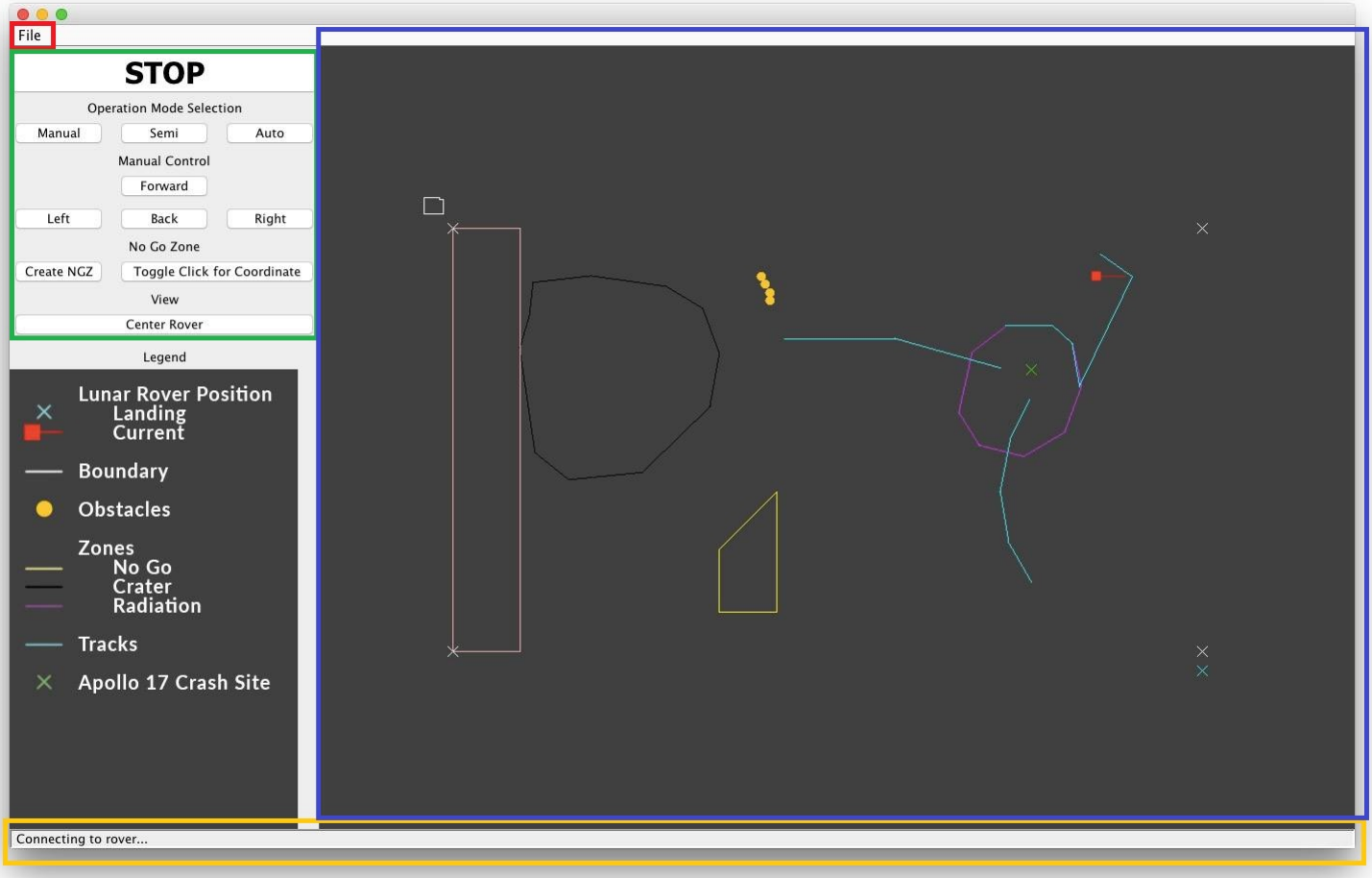

Figure 1: Lunar Rover Graphical User Interface

For the following section the GUI will be broken down into four sections and outlined by a colour coded box for clarity.

- File Menu - RED
- Main Control Panel - GREEN
- Status Bar - YELLOW
- Map Panel - BLUE

2.2 File menu

To align with expected standards, the file menu is located in the top-left corner of the system window.

Figure 2: File Menu

Open Menu Option

The Open option is used to load a pre-existing map file of legal XML data as outlined in the Document Type Definition(See the Software Design Document for further explanation). On click, the operator is able to see a file chooser system to allow them to more easily navigate to any saved data files.

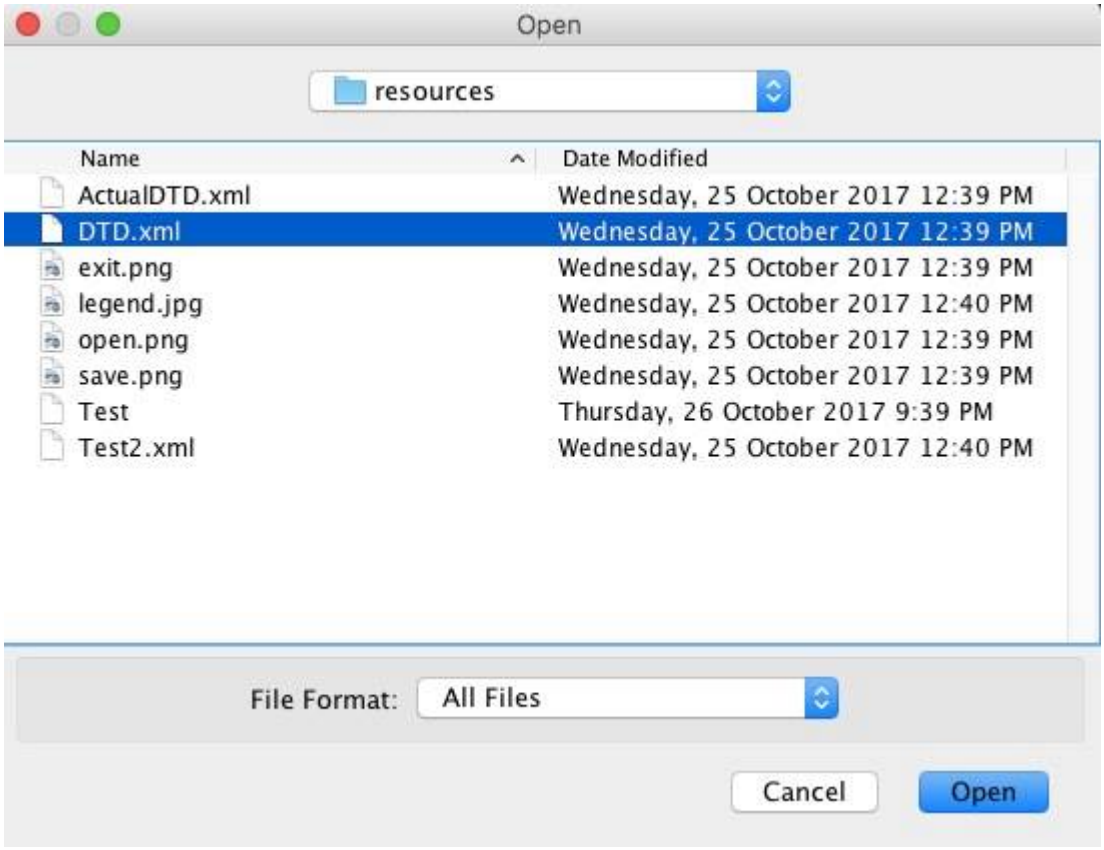

Figure 3: File Chooser - Open Menu Option

To load a file, the Lunar Rover operator would navigate through their system directories until they have located the file they wish to import. Subsequently they will click to highlight the file and click the open button to load the data into the system.

Save As Menu Option

The Save as option can be used to save the map of the current session in XML format. The following window will appear when clicked.

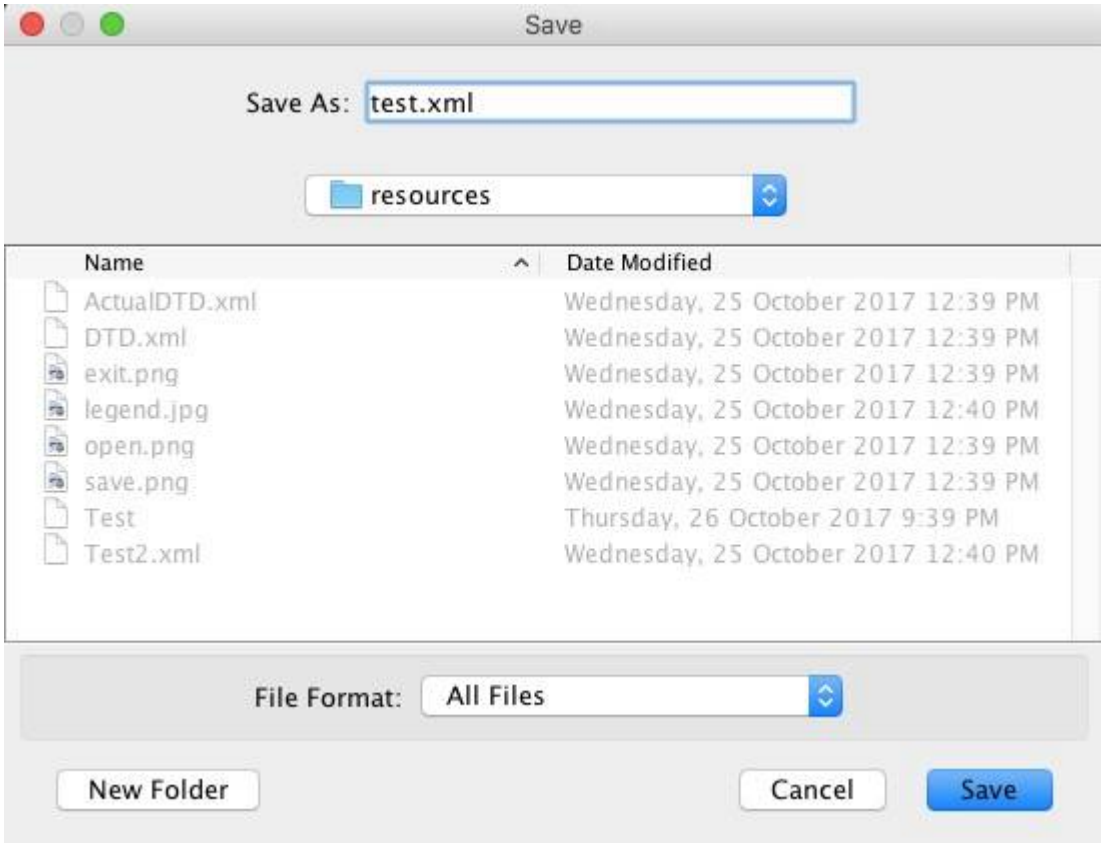

Figure 4: File Chooser - Save As Menu Option

The default directory that all map files are saved to is the /resources directory within the main directory of the program. The saved file name can be changed by typing a new name in the "Save As" box at the top of the window. The file will be saved after pressing the Save button at the bottom right of the window.

The Quit option terminates the program and closes all windows related to the program. Please note that all progress that is not saved will be lost.

2.3 Keyboard shortcuts

Key combination	Function
Ctrl + o	Open
Ctrl + s	Save As
Ctrl + q	Exit

3 Operator Input

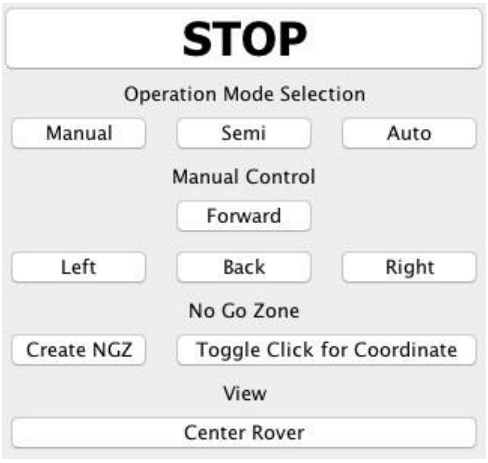

Figure 5: Main control panel

The buttons are divided into four sections - Operation Mode Selection, Manual Control, No Go Zone and View. Manual control, No Go Zone and View buttons are disabled when the Lunar Rover is in semi-automatic or automatic mode. The STOP and Operation Mode Selection buttons are always available.

3.1 Manual mode

3.1.1 Manual Control

The Manual control section of the panel is used to move the Lunar Rover by clicking and holding down the buttons. The forward, left, back, and right buttons will move the Lunar Rover in the corresponding direction until the button is released.

3.1.2 No Go Zones

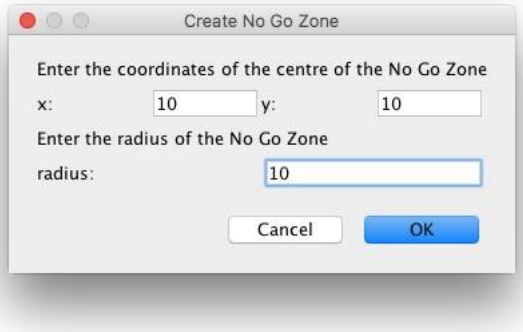

Figure 6: No Go Zone creation dialogue box

To create a No Go Zone, the Lunar Rover operator must enter the x and y coordinates of the center of the desired area and the radius. If the Lunar Rover operator wishes to create a No Go Zone but does not know the coordinates of the area, they can click "Toggle Click for Coordinates", then click on the map and the coordinate will be displayed in a pop-up box as shown in the figure below. ..

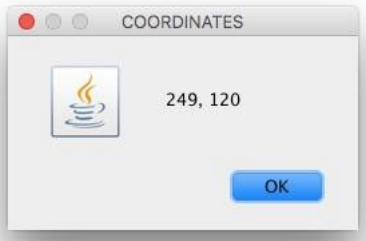

Figure 7: Example click for coordinates output

3.2 Semi-automatic mode

Semi-automatic mode allows the Lunar Rover operator to input a destination coordinate to navigate toward. When the Lunar Rover arrives at the destination it will stop and a message saying "Rover is at destination" will appear. In this mode, only the Operation Mode Selection buttons and the Stop button are available.

3.3 Automatic mode

In automatic mode, the rover will systematically search for Apollo 17 remnants. Once it finds the target, it will record the location of the Apollo remnants and return to its starting location. In this mode, only the Operation Mode Selection buttons and the Stop button are available.

4 Output

4.1 Status bar

4.1.1 Status text structure

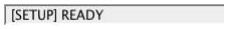

Figure 8: Status bar

All status text can be divided into two parts, the mode that the Lunar Rover is currently in is contained in square brackets and is followed by the status of the rover.
For example, "[AUTO]Moving fowards..." means that the Lunar Rover is in automatic mode and is moving forward. The following tables show all of the possible modes and statuses that the Lunar Rover could be in.

Tag	Mode
[AUTO]	Automatic mode
[SEMI]	Semi-automatic mode
[MANUAL]	Manual mode
[SETUP]	Setting up

4.1.2 Setup status text

Status text	Lunar Rover actions
Connecting to rover	The client is not connected to the rover
Setting up motors	Setting up motor control
Setting up sensors	Setting up sensor control
READY	Setup is complete, the Lunar Rover is ready to take operator input

4.1.3 Manual mode status text

Status text	Lunar Rover actions	Recommended actions
The Lunar Rover is too close to an object and has automatically stopped	The Lunar Rover has detected an object in front of it and it has automatically stopped approximately 10cm in front of the object	Turn the Lunar Rover left or right to avoid any collisions.

4.1.4 Automatic mode status text

Status text	Lunar Rover actions
Moving fowards	The Lunar Rover is moving forward as normal without obstruction
Blocked. Turning and trying a different direction	The Lunar Rover has detected an object in front of it, it will turn 90 degrees to the right.
Reversing	The Lunar Rover is moving backwards

4.1.5 Semi-automatic mode status text

Status text	Lunar Rover actions	Recommended actions
Moving forwards	The Lunar Rover is moving forwards without obstruction	The stop button can stop the Lunar Rover if required
Rover is at destination	The Lunar Rover has arrived at the specified coordinates and will not move until instructed	Any action
Rover stopped due to obstacle	The Lunar Rover has detected an obstacle in front of it and has stopped approximately 10cm away from it.	Use the left or right functions to change directions or move away from the object by using the back function

4.2 Map Panel

Initially the map panel will be blank. It will be populated once map data has been imported or when the rover maps any features.

4.2.1 Navigation

By default the map will be centered on the Lunar Rover but it can be panned to show other sections by clicking and dragging. After panning the map it is possible to recenter the map on the Lunar Rover by clicking the Center Rover button.

4.2.2 Legend

The legend for the map panel is shown in the figure below and shows all possible elements of the map.

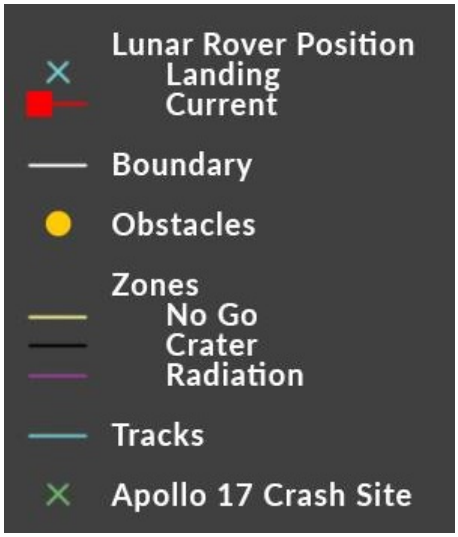

Figure 9: Map legend