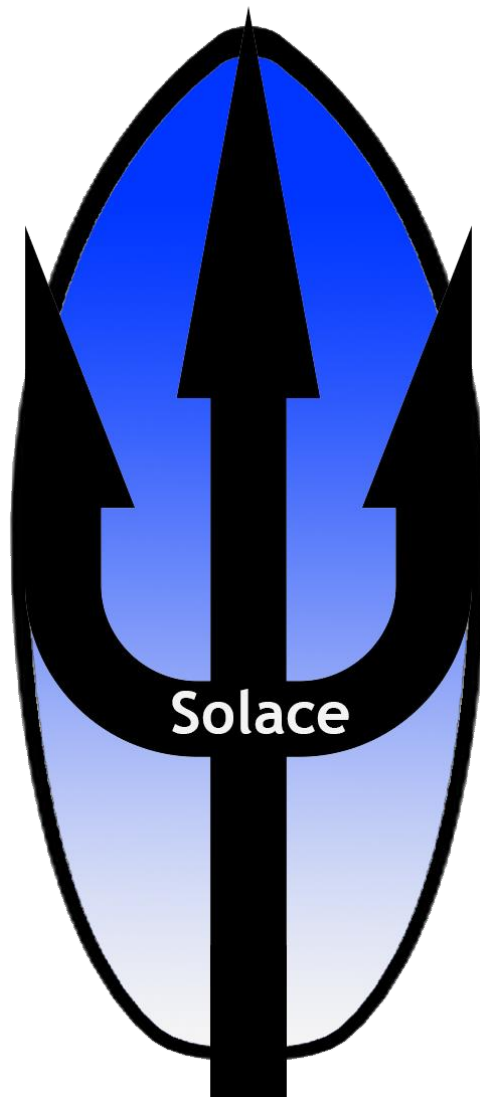




SOUTHAMPTON SOLENT UNIVERSITY
School of Media Arts and Technology

Solace - Solent Autonomous Circumnavigation of the Earth : GUI User Guide



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Contents

| | |
|--------------------------------------|----|
| Documents Purpose: | 3 |
| GUI Navigation | 4 |
| Reading sensors from the vessel..... | 12 |
| Loading waypoint files | 8 |
| Saving waypoint files..... | 9 |
| Adding Waypoints..... | 11 |
| Map Scrolling | 11 |
| Uploading waypoints | 13 |
| Clearing waypoints | 14 |
| Loading current waypoints | 16 |
| Emergency stopping a run..... | 17 |
| Communication status messages | 18 |
| Boat status messages..... | 18 |
| Exiting the GUI correctly | 20 |

Figures

| | |
|---|---|
| Figure 1: Homepage..... | 5 |
| Figure 2: Mission Control Button - Homepage | 5 |
| Figure 3: Mission Control Page | 5 |
| Figure 4: User Guide Button - Homepage | 6 |
| Figure 5: About Window - Homepage..... | 6 |
| Figure 6: Exit Button - Homepage..... | 6 |
| Figure 7: Mission Control Page | 7 |
| Figure 8: Load Waypoints Button - Mission Control Page | 8 |
| Figure 9: File Chooser - Mission Control Page | 8 |
| Figure 10: Waypoints loaded from file - Mission Control Page..... | 9 |

Documents Purpose:

The purpose of this document is to teach a user how to use the Solace GUI, this includes:

- Deploying the application
- GUI Navigation
- Overview of the mission control Page
- Reading sensors from the vessel
- Loading waypoint files
- Saving waypoint files
- Adding Waypoints
- Map Scrolling
- Uploading waypoints
- Clearing waypoints
- Loading current waypoints
- Emergency Stopping a run
- Communication status messages
- Boat status messages
- Reading saved sensor data
- Exiting the GUI correctly

Deploying the Application

To be done

GUI Navigation

The first screen shown to the user is the Control System Homepage.

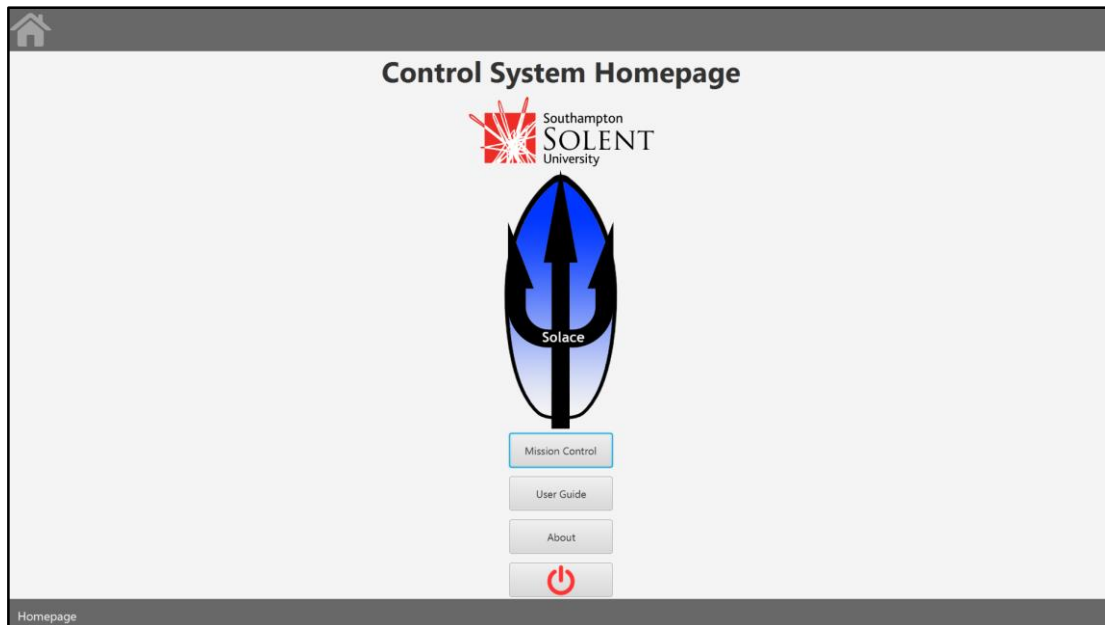


Figure 1: Homepage

On this page there's a four buttons, the first is Mission Control.

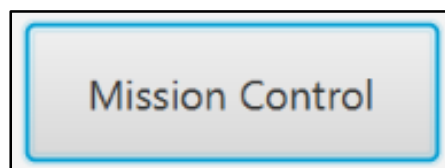


Figure 2: Mission Control Button - Homepage

By left clicking on this button the user will be taken to the Mission Control Page.

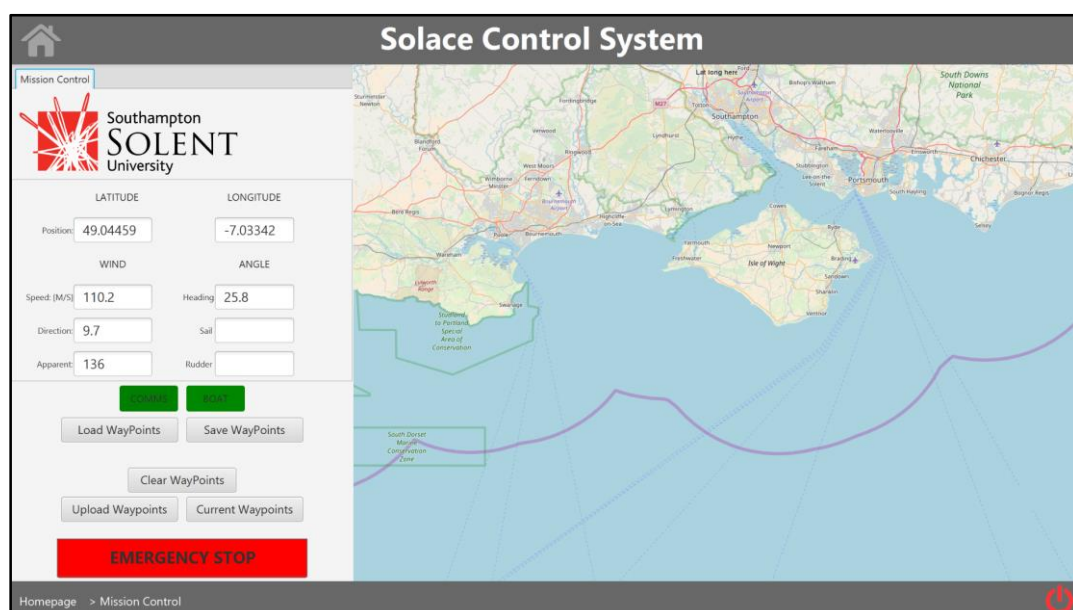


Figure 3: Mission Control Page

The next button on the main menu is the User Guide button.

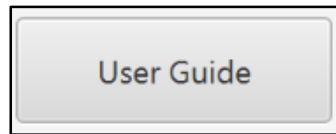
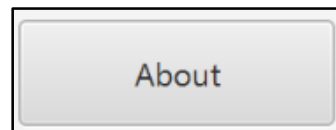


Figure 4: User Guide Button - Homepage

By left clicking on this button the user will open up this document in a new window. It can be closed by left clicking on the **xxxxxxx**

The next button in the list is the About button.



By left clicking on this button the user will be displayed information about the GUI as seen below.

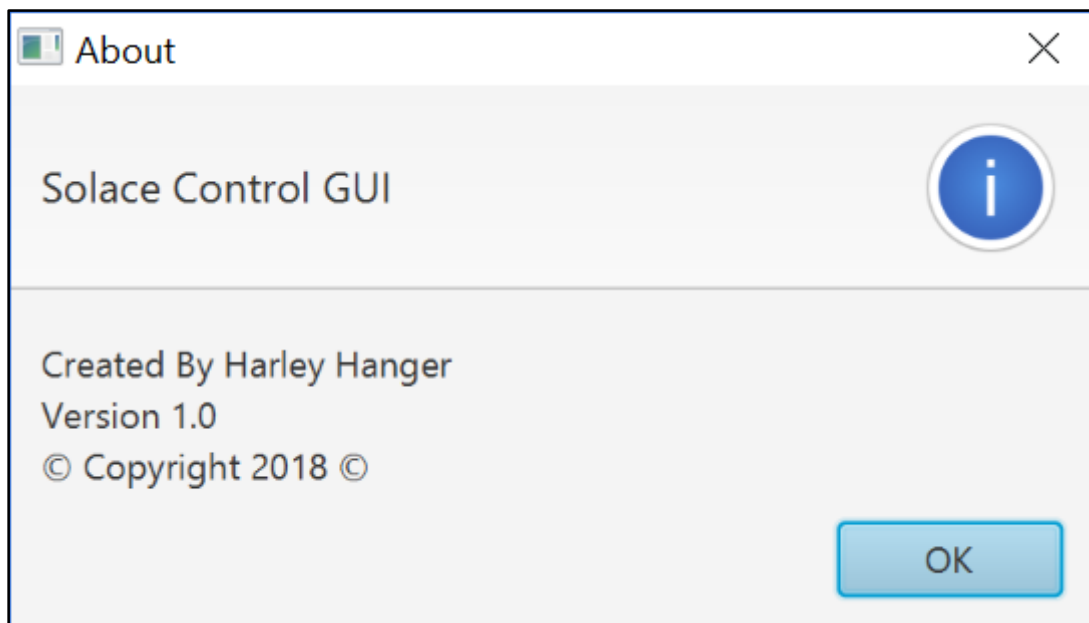


Figure 5: About Window - Homepage

The final button on the homepage is the Exit button.



Figure 6: Exit Button - Homepage

By left clicking on this button the user will exit the GUI application safely closing all running processing in the application.

Mission Control Page Overview

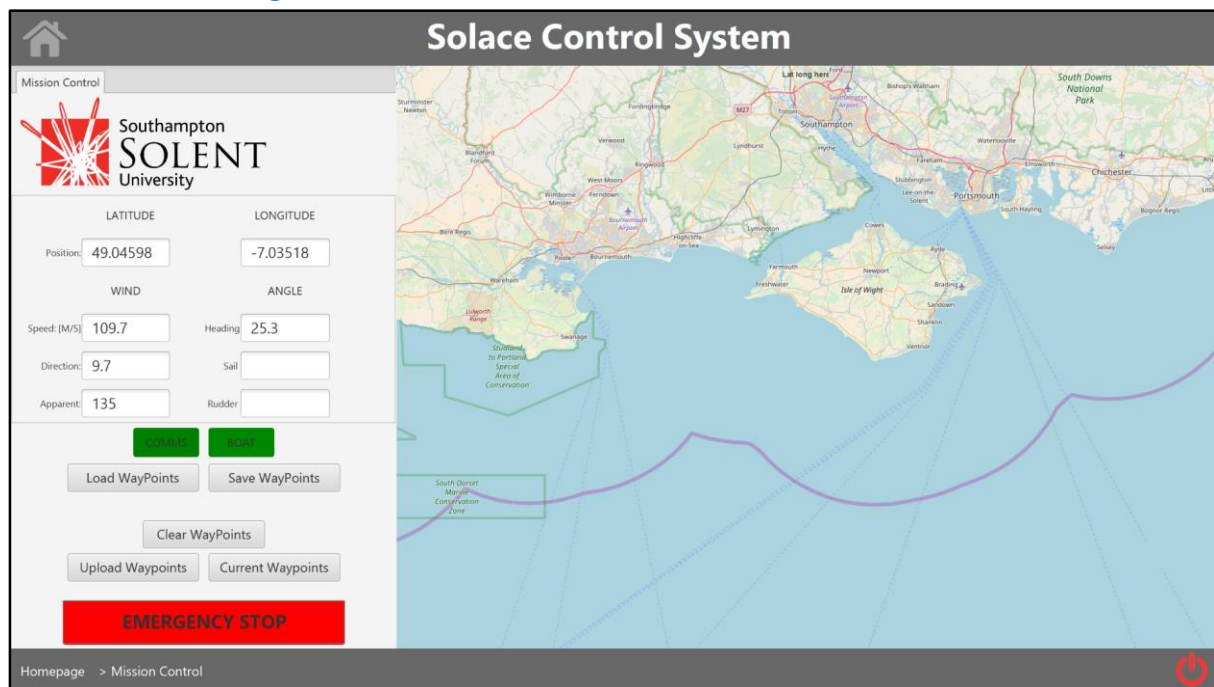


Figure 7: Mission Control Page

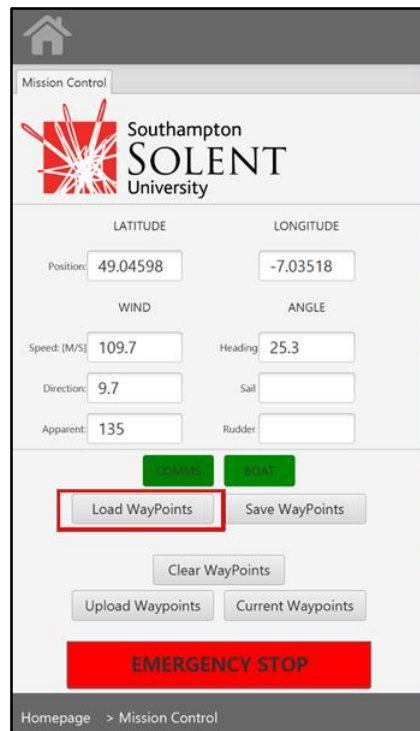
As seen on screen there are two main elements on the Mission control page, on the left there is the Mission Control Tab and on the right there is the Map.

The Mission Control Tab displays Solace boat position, boat sensor data, error alerts, five buttons that perform waypoint actions and an Emergency Stop button.

The Map contains a world map that is used to display and plot waypoints as well as display the current Solace boat position.

Loading waypoints from files

To load waypoints from a file on to the map the user must left click on the 'Load WayPoints' button.



The screenshot shows the 'Mission Control' interface for Southampton Solent University. It features a header with the university logo and a home icon. Below the header, there are input fields for Latitude (49.04598) and Longitude (-7.03518). Further down, there are fields for Wind Speed (109.7), Wind Direction (9.7), Wind Apparent (135), Angle (25.3), and Sail. A red box highlights the 'Load WayPoints' button, which is located below the 'Save WayPoints' button. Other buttons include 'Clear WayPoints', 'Upload Waypoints', 'Current Waypoints', and a large red 'EMERGENCY STOP' button at the bottom. The footer shows the navigation path: 'Homepage > Mission Control'.

Figure 8: Load Waypoints Button - Mission Control Page

After left clicking on this button the user will be prompted with a Windows file chooser. The user can then select any JSON file containing the correct format. By default, the file chooser will open in the waypoints file directory but this can be changed by the user in the usual way of file choosing in Windows.

After clicking on a filename the user then left clicks on the Open in the bottom right of the file chooser.

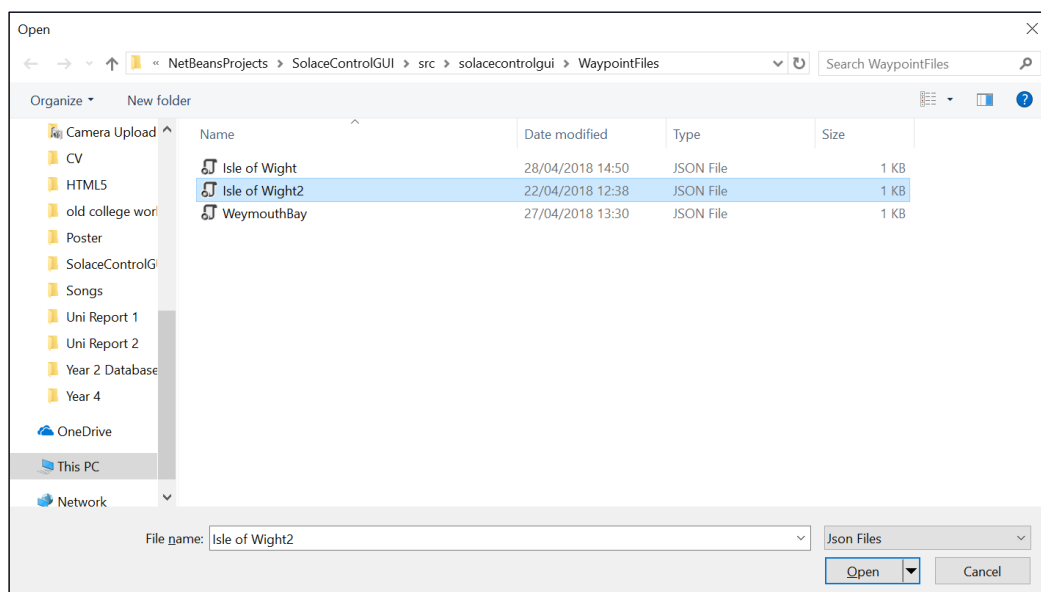


Figure 9: File Chooser - Mission Control Page

After opening JSON file, if it contains the correct file structure, the map will display the specified waypoints markers.

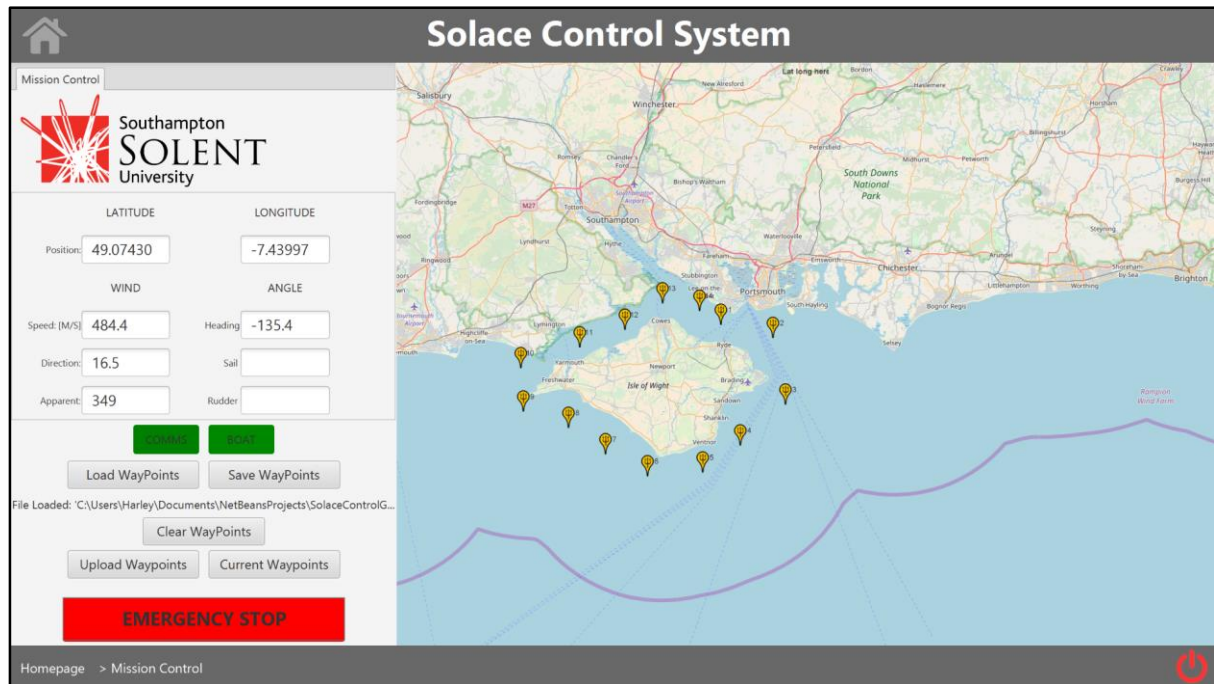


Figure 10: Waypoints loaded from file - Mission Control Page

Note: The waypoint JSON file can be read by applications such as Notepad and Visual Studio. This file when opened shows the latitude and longitude position of each waypoint marker.

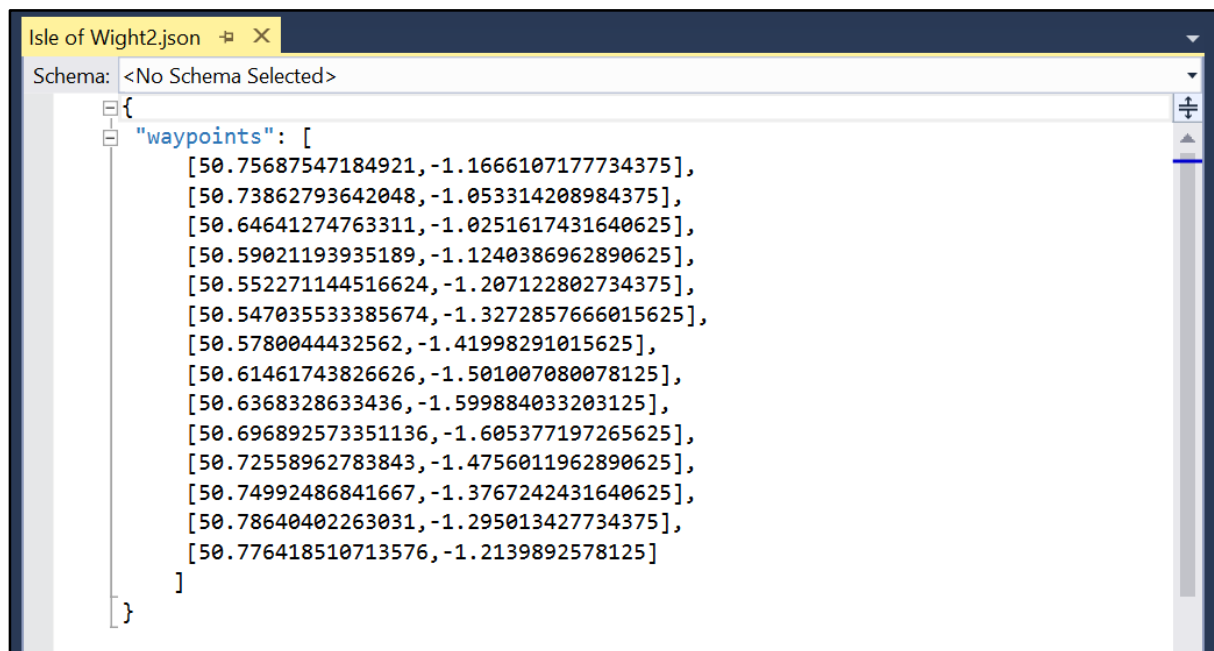
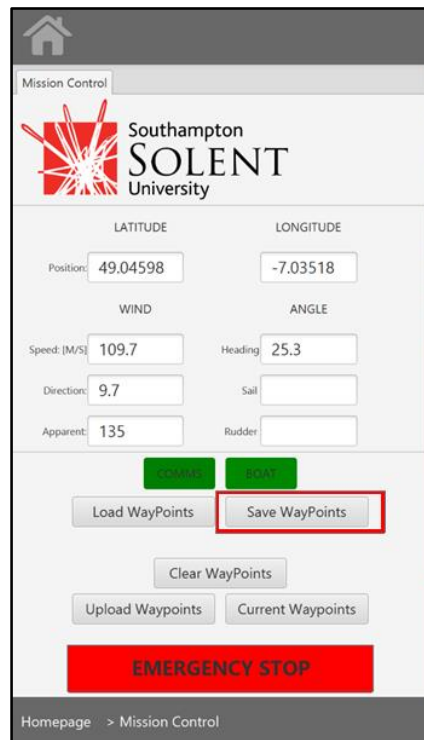


Figure 11: Json File Open In Visual Studio

Saving waypoint files

To save waypoints from the map in to a JSON file the user must left click on the ‘Save WayPoints’ button.



The screenshot shows the 'Mission Control' page of the Southampton SOLENT University application. The page features a header with the university logo and a navigation bar. Below the header, there are input fields for Latitude (49.04598) and Longitude (-7.03518). Further down, there are input fields for Wind Speed (109.7), Wind Direction (9.7), Apparent (135), Angle (25.3), and Rudder. A red box highlights the 'Save WayPoints' button, which is located below the 'Load WayPoints' button. Other buttons visible include 'Clear WayPoints', 'Upload Waypoints', and 'Current Waypoints'. A large red 'EMERGENCY STOP' button is at the bottom.

Figure 12: Save waypoints button - Mission Control Page

Once this button has been pressed, a similar file chooser to the Load Waypoint file chooser will open. The user can specify a name and directory of the file and then left click the ‘Save’ button in the bottom right hand of the page to save the file. The window will then close and the file will be saved in the JSON file format.

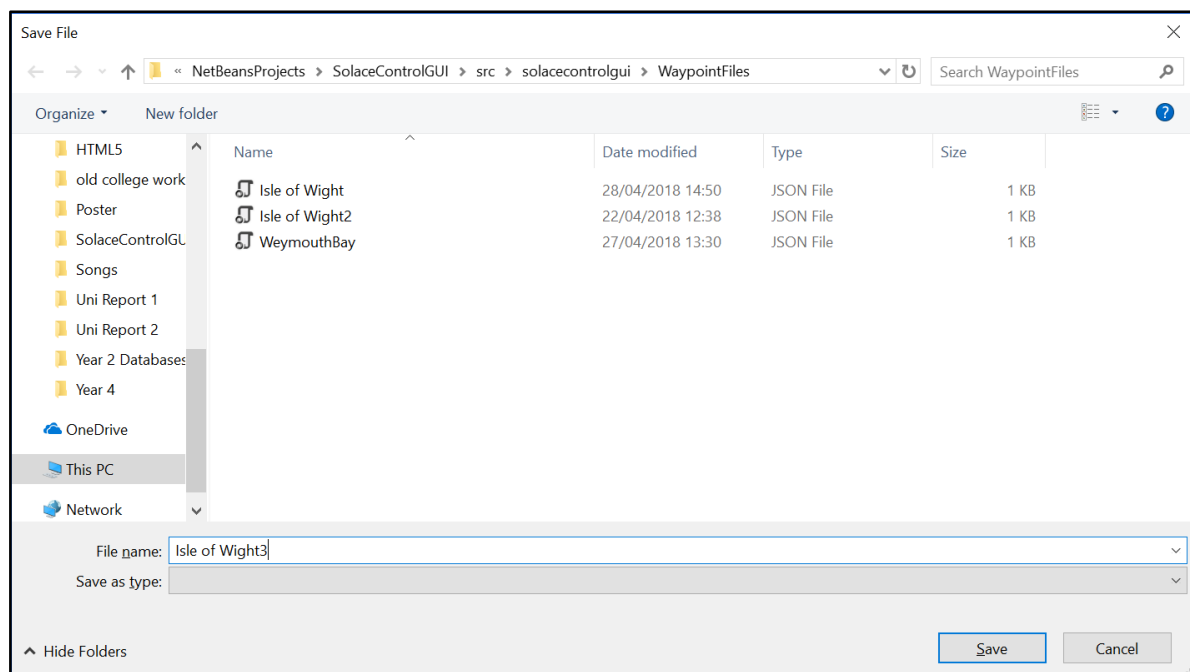


Figure 13: Save File Chooser - Mission Control Page

Adding Waypoints to the Map

To add a waypoint marker on the map the user can right click at any position on the sea. The user continues to add waypoints, with each waypoint numbered in order.

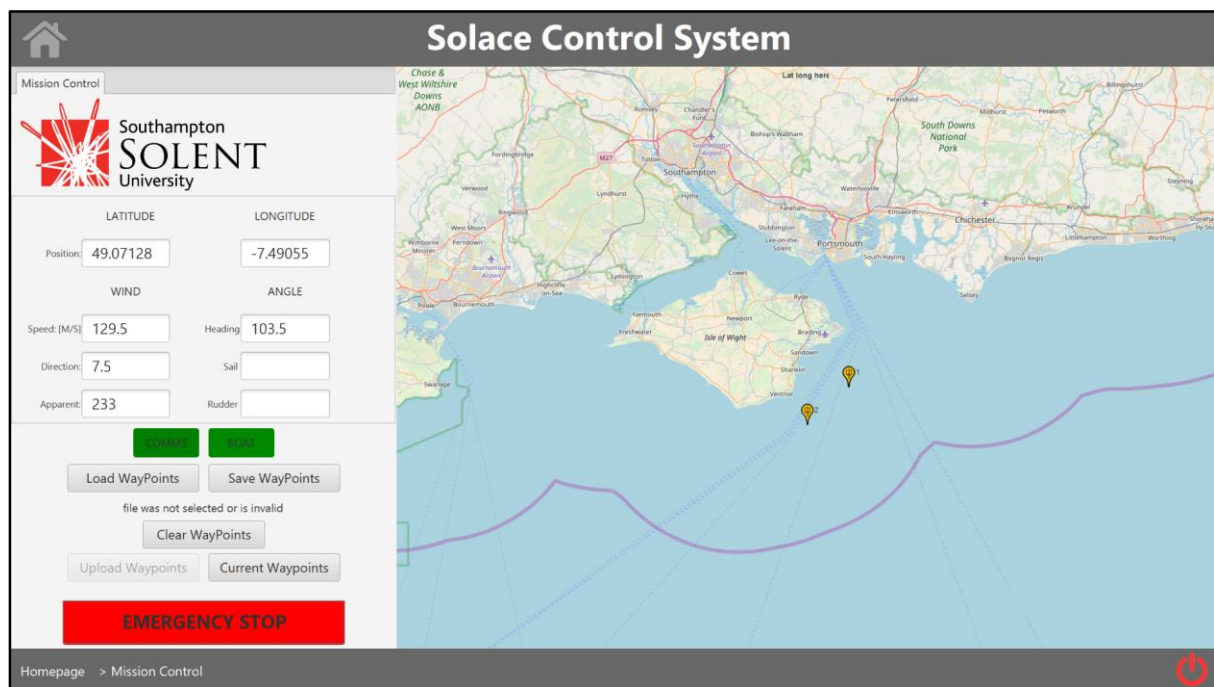


Figure 14: Added Waypoints - Mission Control Page

Map Scrolling

To scroll the map left, right, up and down the user left clicks on the map and drags.

To zoom, the use the mouse wheel and scroll in (forward) to zoom in and scroll out (back) to zoom out.

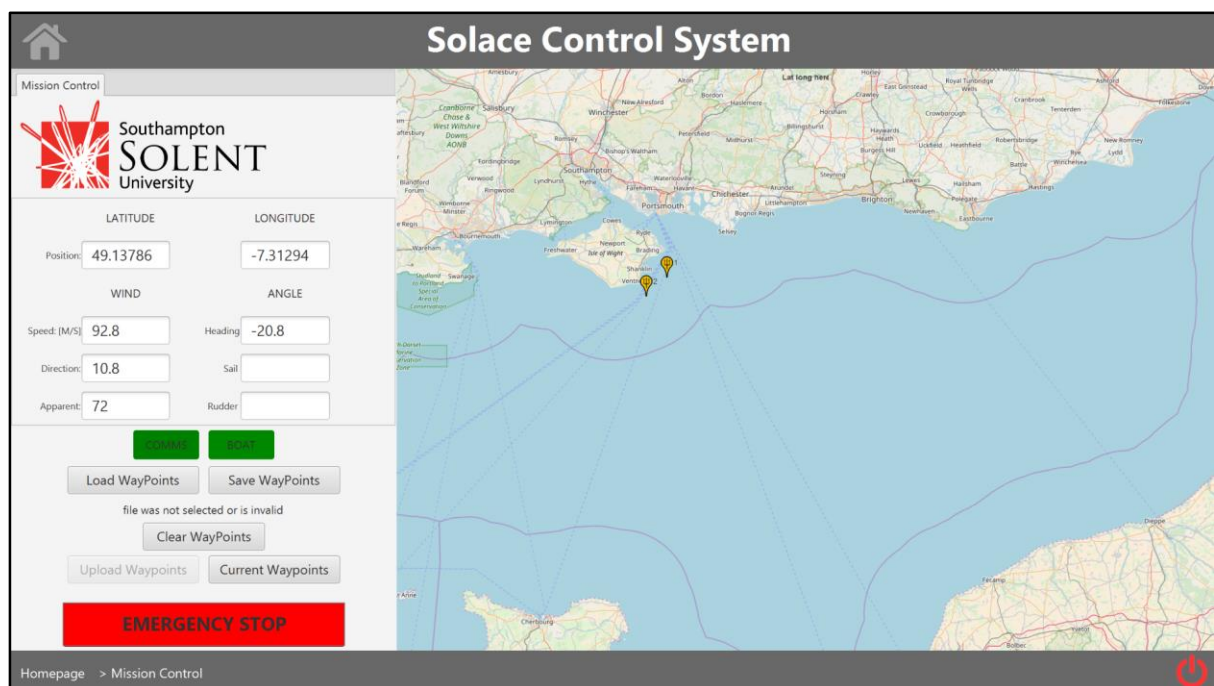
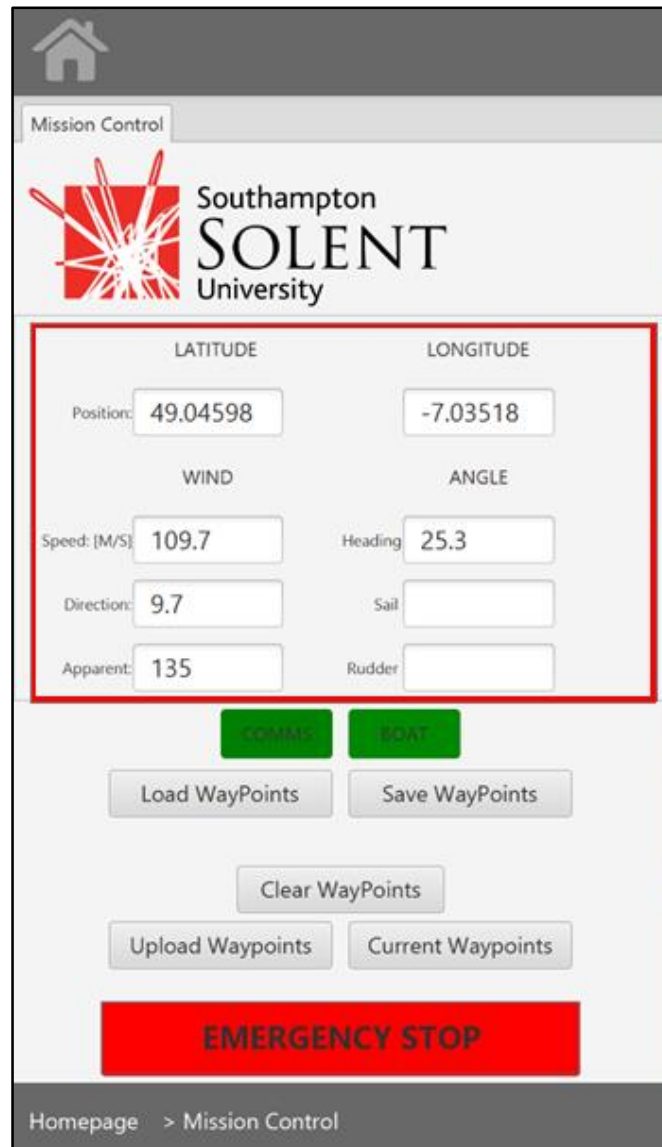


Figure 15: Zoomed Out Map - Mission Control Page

Reading sensors from the vessel

Sensor data appears at the top left of the Mission Control Tab. The vessel position values in the form of latitude and longitude, wind values in speed (m/s), direction (angle) and Wind apparent (**UNIT**) and finally the vessel heading angle. The angle of the vessel's sail and rudder are not currently supplied by BoatD simulation so these values are left blank.



The screenshot displays the 'Mission Control' interface of the Southampton Solent University BoatD simulation. A red rectangular box highlights the sensor data section, which includes fields for Latitude (49.04598), Longitude (-7.03518), Wind Speed (109.7 M/S), Wind Direction (9.7), Wind Apparent (135), and Heading (25.3). The 'Sail' and 'Rudder' fields are empty. Below the sensor data, there are buttons for 'COMMS', 'BOAT', 'Load WayPoints', 'Save WayPoints', 'Clear WayPoints', 'Upload Waypoints', and 'Current Waypoints'. A large red 'EMERGENCY STOP' button is located at the bottom of the sensor data section. The bottom of the page shows a breadcrumb trail: 'Homepage > Mission Control'.

| LATITUDE | | LONGITUDE | |
|-----------|----------|-----------|----------|
| Position: | 49.04598 | | -7.03518 |

| WIND | | ANGLE | |
|--------------|-------|----------|------|
| Speed: (M/S) | 109.7 | Heading: | 25.3 |
| Direction: | 9.7 | Sail: | |
| Apparent: | 135 | Rudder: | |

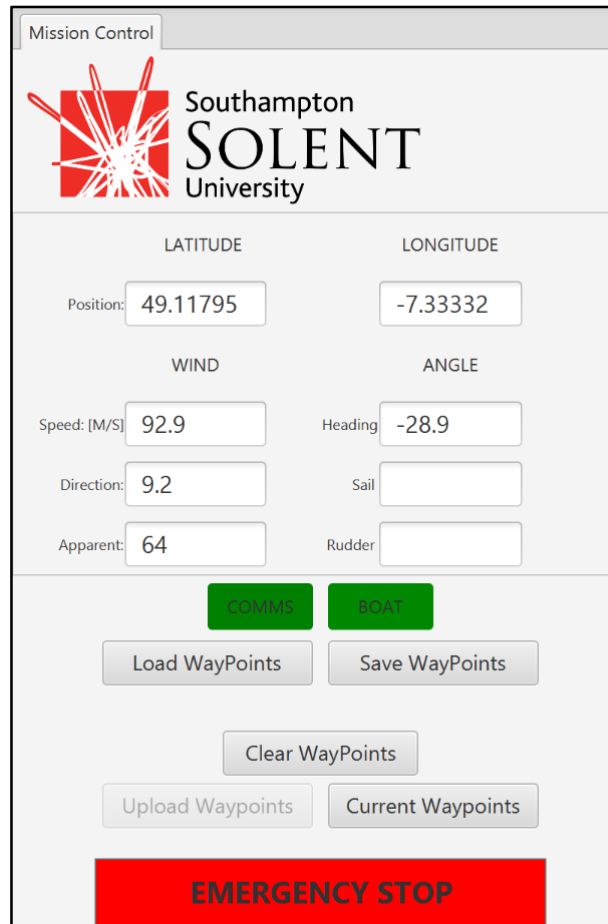
EMERGENCY STOP

Homepage > Mission Control


Figure 16: Sensor Data - Mission Control Page

Uploading waypoints

For safety and to keep a record of a mission the user can upload the waypoint to the vessel only if it has been first saved. If the waypoints on the map have not been saved the Upload Waypoint button is greyed out and will not operate.



Mission Control

 Southampton
SOLENT
University

| LATITUDE | | LONGITUDE | |
|--------------|---------------------------------------|---------------------------------------|------------------------------------|
| Position: | <input type="text" value="49.11795"/> | <input type="text" value="-7.33332"/> | |
| WIND | | ANGLE | |
| Speed: [M/S] | <input type="text" value="92.9"/> | Heading | <input type="text" value="-28.9"/> |
| Direction: | <input type="text" value="9.2"/> | Sail | <input type="text"/> |
| Apparent: | <input type="text" value="64"/> | Rudder | <input type="text"/> |

Figure 17: Blanked Out Upload Waypoints Button - Mission Control Page

After the JSON waypoints file has been saved, the user can left click on the Upload Waypoints button to send the waypoints to the BoatD server.

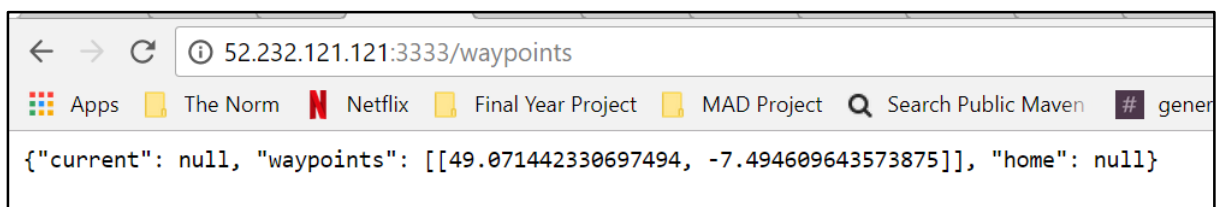
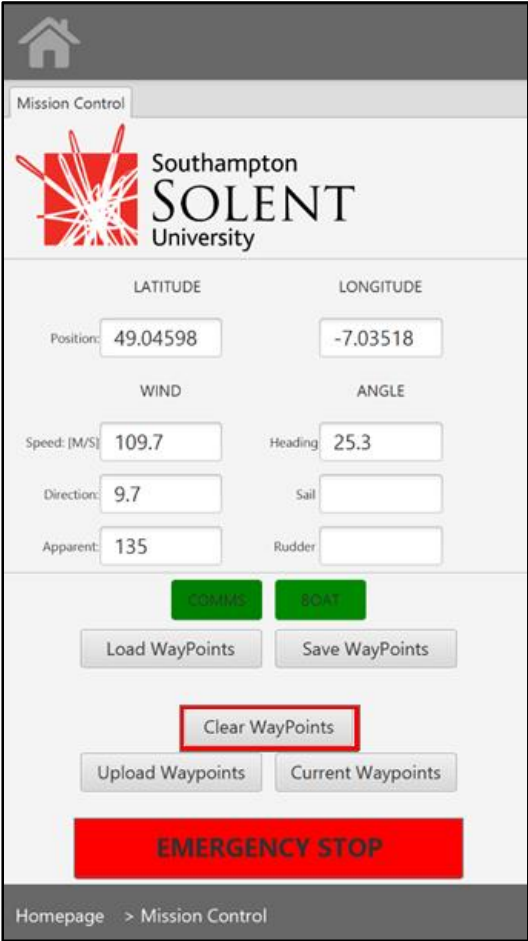


Figure 18: Waypoints Uploaded to the BoatD server

Clearing waypoints

By left clicking on the 'Clear Waypoints' button all waypoint markers on the map will be removed.



The screenshot displays the 'Mission Control' interface for Southampton Solent University. At the top, there is a home icon and the text 'Mission Control'. Below this is the university's logo and name. The interface is divided into several sections for data entry and control. The 'LATITUDE' section shows a position of 49.04598. The 'LONGITUDE' section shows a position of -7.03518. The 'WIND' section includes fields for Speed (109.7 M/S), Direction (9.7), and Apparent (135). The 'ANGLE' section includes fields for Heading (25.3), Sail, and Rudder. Below these are two green buttons labeled 'COMMS' and 'BOAT'. Further down are buttons for 'Load WayPoints', 'Save WayPoints', 'Clear WayPoints' (which is highlighted with a red box), 'Upload Waypoints', and 'Current Waypoints'. At the bottom is a large red button labeled 'EMERGENCY STOP'. The footer shows a breadcrumb trail: 'Homepage > Mission Control'.

| LATITUDE | | LONGITUDE | |
|-----------|----------|-----------|----------|
| Position: | 49.04598 | | -7.03518 |

| WIND | | ANGLE | |
|--------------|-------|---------|------|
| Speed: (M/S) | 109.7 | Heading | 25.3 |
| Direction: | 9.7 | Sail | |
| Apparent: | 135 | Rudder | |

COMMS BOAT

Load WayPoints Save WayPoints

Clear WayPoints

Upload Waypoints Current Waypoints

EMERGENCY STOP

Homepage > Mission Control

Figure 19: Clear Waypoint's Button - Mission Control Page

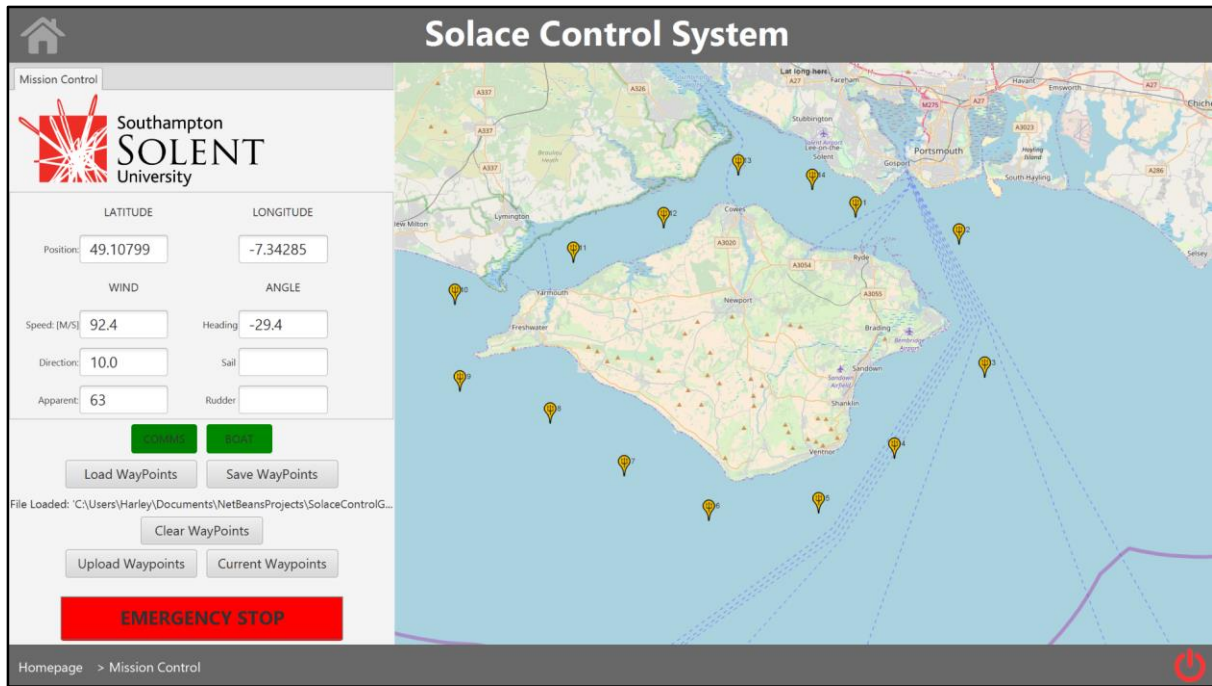


Figure 20: Waypoints Before Clearing - Mission Control Page

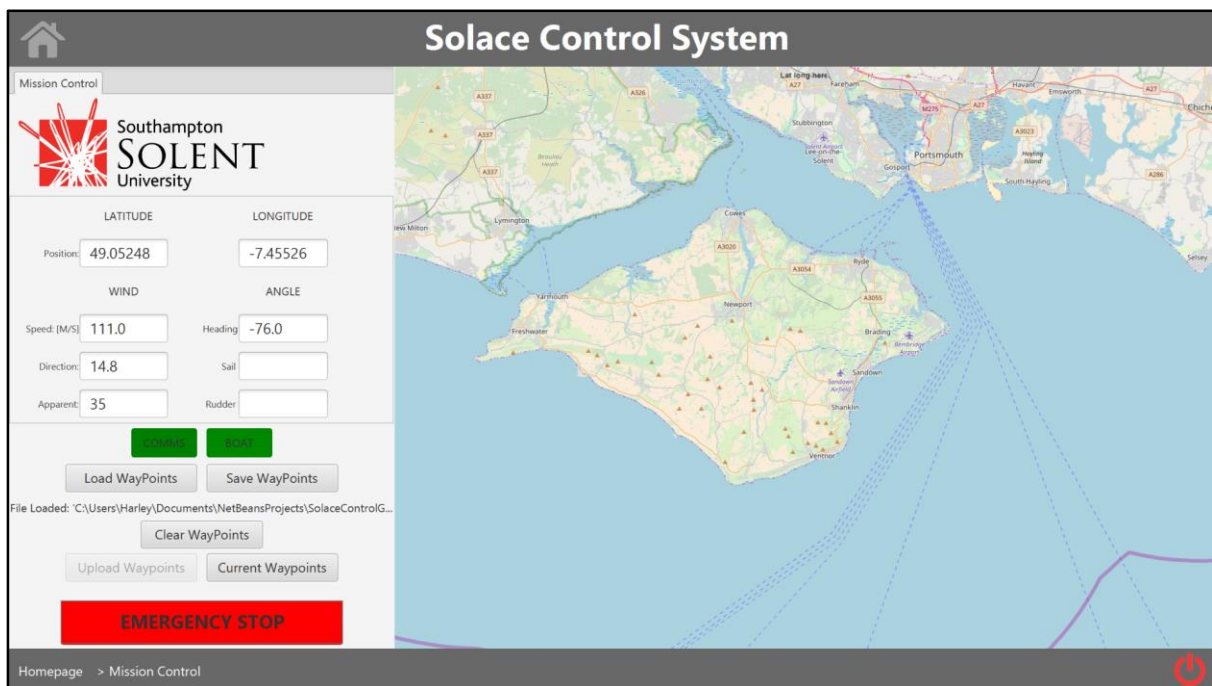


Figure 21: Waypoints After Clearing - Mission Control Page

Loading current waypoints

By left clicking the Current Waypoints button, the waypoints currently uploaded to the BoatD server are displayed to the map.

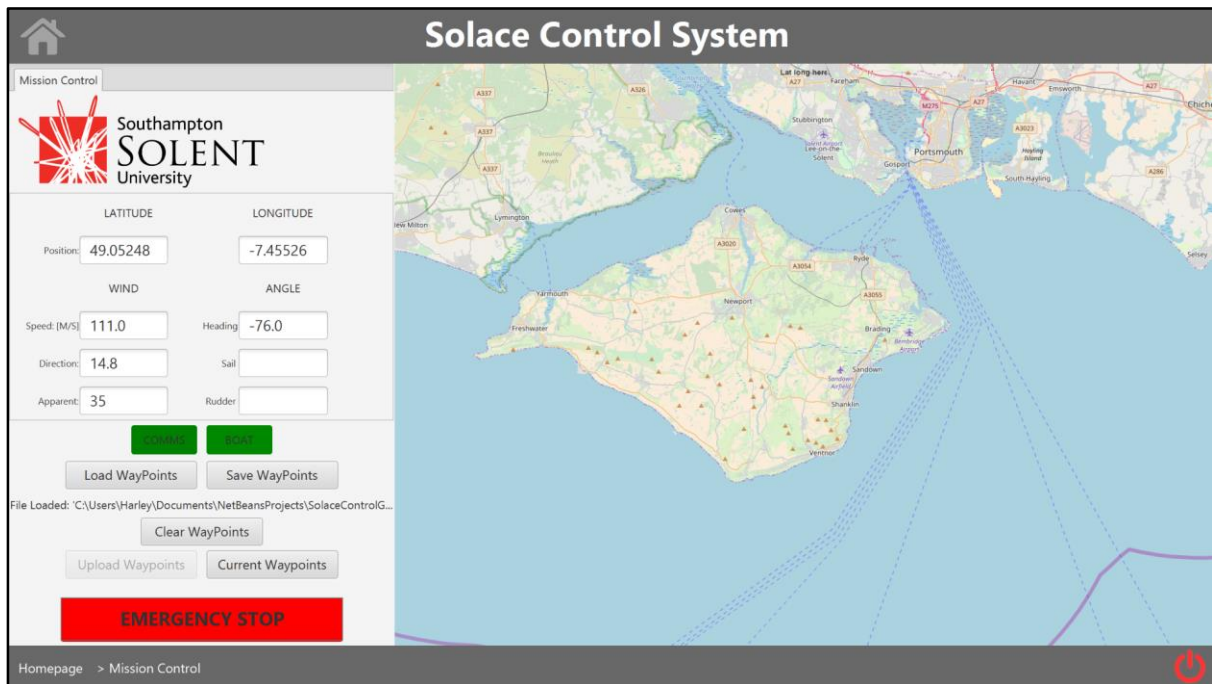


Figure 22: Before Loading Current Waypoints - Mission Control Page

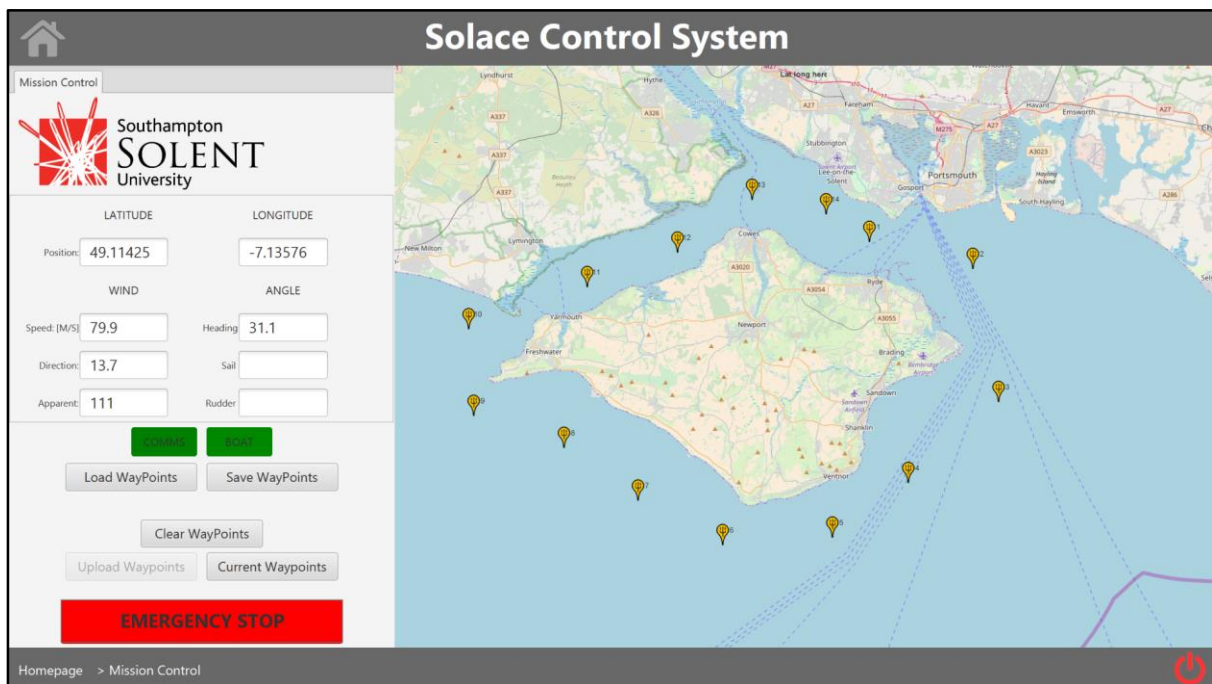
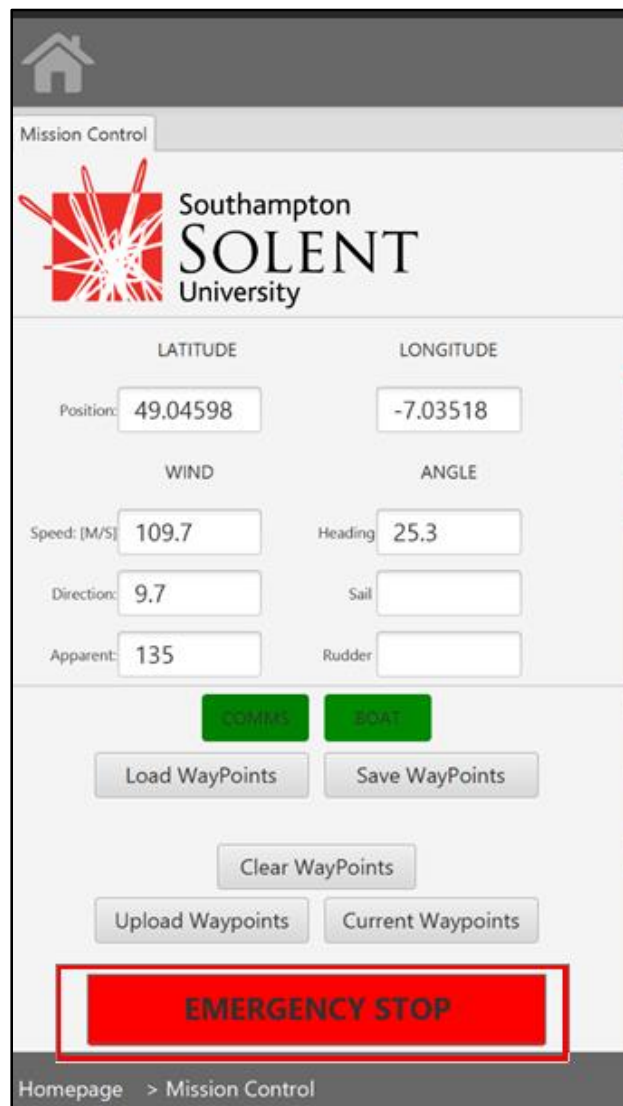


Figure 23: After Loading Current Waypoints - Mission Control Page

Emergency stopping a run

By pressing the emergency stop button the vessel will clear all of its current waypoints and set its current position as the new waypoint keeping it in place until commanded otherwise.



The screenshot shows the 'Mission Control' page of the Southampton Solent University interface. At the top, there is a home icon and the text 'Mission Control'. Below this is the Southampton Solent University logo. The main area contains several input fields for vessel data:

| LATITUDE | | LONGITUDE | |
|--------------|----------|-----------|----------|
| Position: | 49.04598 | | -7.03518 |
| WIND | | ANGLE | |
| Speed: [M/S] | 109.7 | Heading | 25.3 |
| Direction: | 9.7 | Sail | |
| Apparent: | 135 | Rudder | |

Below the input fields are several buttons: 'COMMS' and 'BOAT' (green), 'Load WayPoints' and 'Save WayPoints' (grey), 'Clear WayPoints' (grey), 'Upload Waypoints' and 'Current Waypoints' (grey). At the bottom, a large red button labeled 'EMERGENCY STOP' is highlighted with a red border. The footer shows 'Homepage > Mission Control'.

Figure 24: Emergency Stop Button - Mission Control Page

Communication Status Error Messages

The communications status message lets the user know if there's an issue with communications to the BoatD server. If the COMMS button is green then the communication is good. However, if the 'COMMS' button is red there is a communications issue, either the Internet connection on the computer might be disabled or the boatD server is not running.

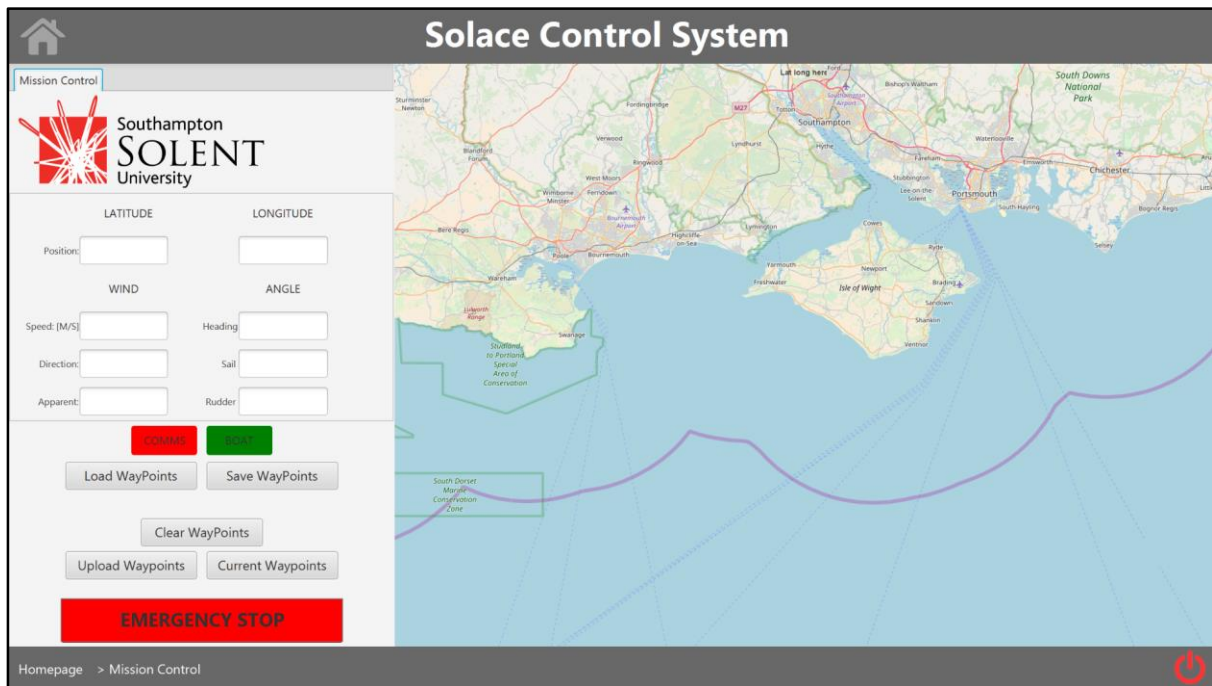


Figure 25: COMMS Button Red - Mission Control Page

By clicking on the COMMS button the user can manually check to see if connection has been remade or wait for the button to automatically turn green again once the error is fixed.

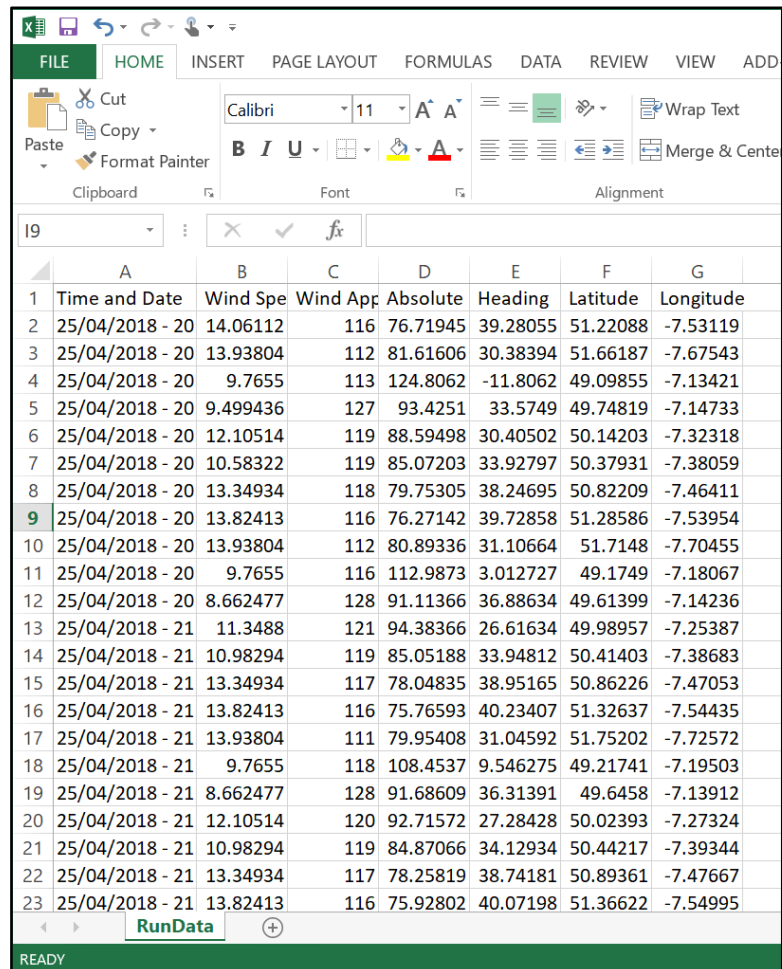
Boat Status Error Messages

This status message will appear red until the boat status is returned true and then revert back to green. If this button is red it means that a vessel is currently not running although connection to BoatD has been met.

Reading Saved Vessel Sensor Data

As the GUI runs data is recorded to a csv file. To access this data the user can go to the workspace directory then to SolaceControlGUI\src\solacecontrolgui\RecordedData\.

Alternatively posting \SolaceControlGUI\src\solacecontrolgui\RecordedData\RunData.csv after the working directory will open the CSV file usually by default in Excel.



| | A | B | C | D | E | F | G |
|----|-----------------|----------|----------|----------|----------|----------|-----------|
| 1 | Time and Date | Wind Spe | Wind App | Absolute | Heading | Latitude | Longitude |
| 2 | 25/04/2018 - 20 | 14.06112 | 116 | 76.71945 | 39.28055 | 51.22088 | -7.53119 |
| 3 | 25/04/2018 - 20 | 13.93804 | 112 | 81.61606 | 30.38394 | 51.66187 | -7.67543 |
| 4 | 25/04/2018 - 20 | 9.7655 | 113 | 124.8062 | -11.8062 | 49.09855 | -7.13421 |
| 5 | 25/04/2018 - 20 | 9.499436 | 127 | 93.4251 | 33.5749 | 49.74819 | -7.14733 |
| 6 | 25/04/2018 - 20 | 12.10514 | 119 | 88.59498 | 30.40502 | 50.14203 | -7.32318 |
| 7 | 25/04/2018 - 20 | 10.58322 | 119 | 85.07203 | 33.92797 | 50.37931 | -7.38059 |
| 8 | 25/04/2018 - 20 | 13.34934 | 118 | 79.75305 | 38.24695 | 50.82209 | -7.46411 |
| 9 | 25/04/2018 - 20 | 13.82413 | 116 | 76.27142 | 39.72858 | 51.28586 | -7.53954 |
| 10 | 25/04/2018 - 20 | 13.93804 | 112 | 80.89336 | 31.10664 | 51.7148 | -7.70455 |
| 11 | 25/04/2018 - 20 | 9.7655 | 116 | 112.9873 | 3.012727 | 49.1749 | -7.18067 |
| 12 | 25/04/2018 - 20 | 8.662477 | 128 | 91.11366 | 36.88634 | 49.61399 | -7.14236 |
| 13 | 25/04/2018 - 21 | 11.3488 | 121 | 94.38366 | 26.61634 | 49.98957 | -7.25387 |
| 14 | 25/04/2018 - 21 | 10.98294 | 119 | 85.05188 | 33.94812 | 50.41403 | -7.38683 |
| 15 | 25/04/2018 - 21 | 13.34934 | 117 | 78.04835 | 38.95165 | 50.86226 | -7.47053 |
| 16 | 25/04/2018 - 21 | 13.82413 | 116 | 75.76593 | 40.23407 | 51.32637 | -7.54435 |
| 17 | 25/04/2018 - 21 | 13.93804 | 111 | 79.95408 | 31.04592 | 51.75202 | -7.72572 |
| 18 | 25/04/2018 - 21 | 9.7655 | 118 | 108.4537 | 9.546275 | 49.21741 | -7.19503 |
| 19 | 25/04/2018 - 21 | 8.662477 | 128 | 91.68609 | 36.31391 | 49.6458 | -7.13912 |
| 20 | 25/04/2018 - 21 | 12.10514 | 120 | 92.71572 | 27.28428 | 50.02393 | -7.27324 |
| 21 | 25/04/2018 - 21 | 10.98294 | 119 | 84.87066 | 34.12934 | 50.44217 | -7.39344 |
| 22 | 25/04/2018 - 21 | 13.34934 | 117 | 78.25819 | 38.74181 | 50.89361 | -7.47667 |
| 23 | 25/04/2018 - 21 | 13.82413 | 116 | 75.92802 | 40.07198 | 51.36622 | -7.54995 |

Figure 26: Excel Sensor Data

The user can now see the recorded data.

Exiting the GUI

Exiting the Control System correctly is an important part of using the GUI. By correctly exiting the GUI, the application will be safely closed making sure to end all processes, loops and anything else that was running in the application.

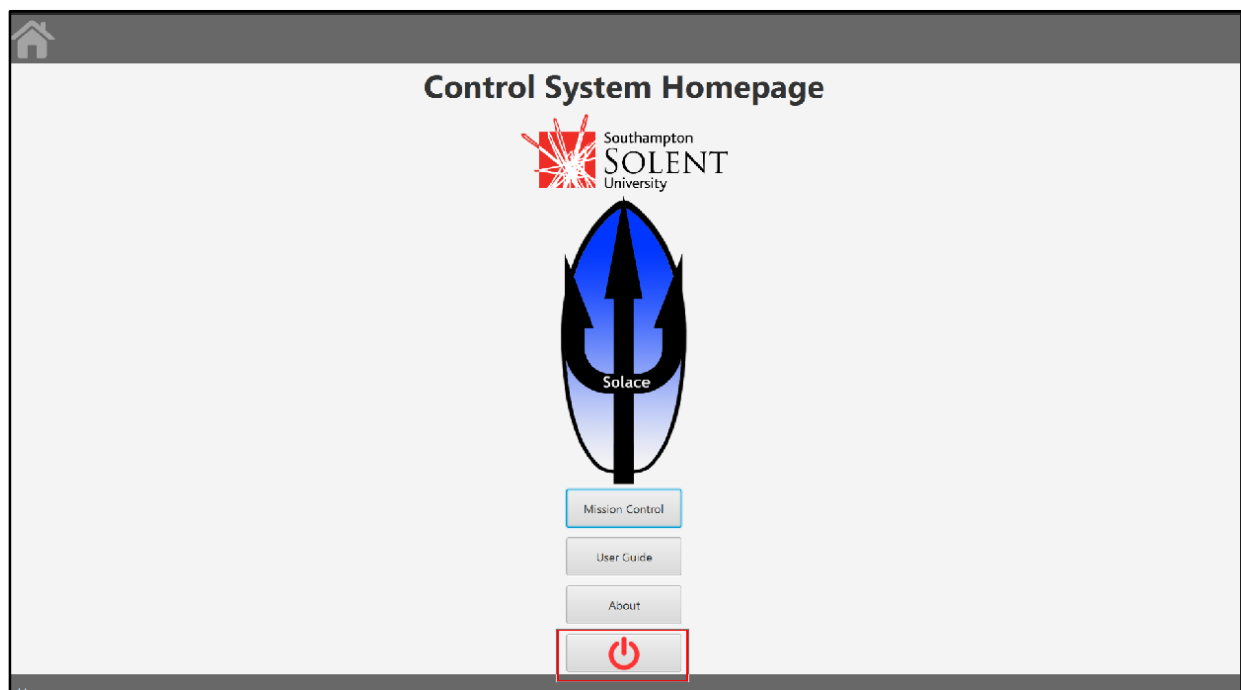


Figure 27: Exit GUI Button - Homepage

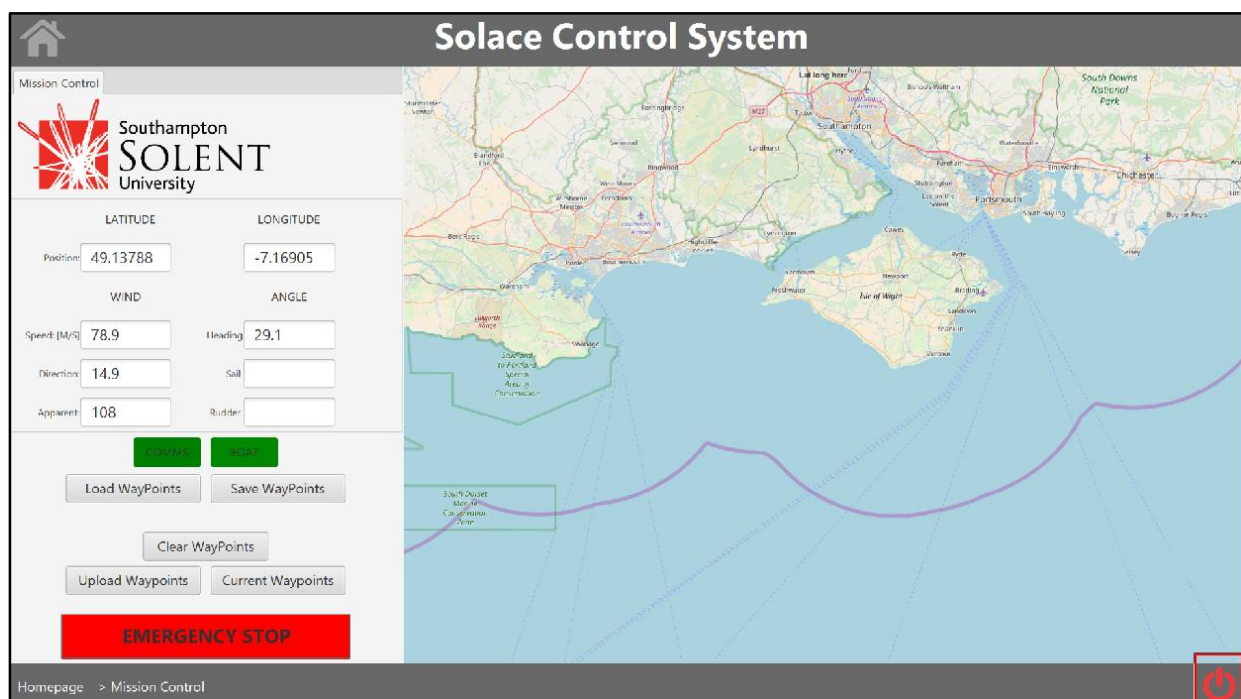


Figure 28: Exit GUI Button - Mission Control Page

By pressing either of these button the user will be prompted by a warning alert box that informs the user that they are exiting the GUI.

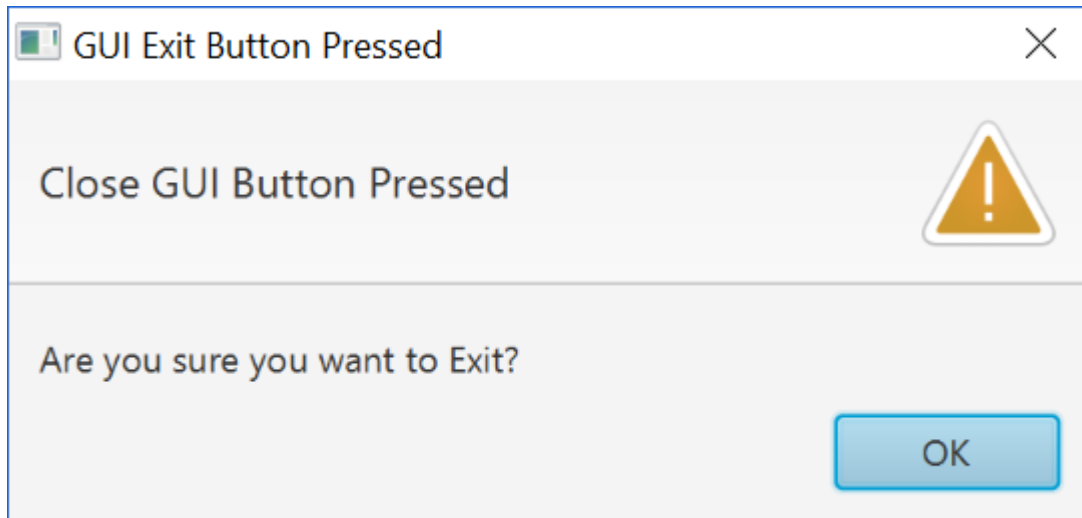


Figure 29: Close GUI Button

If the user presses the 'OK' button on this alert the application will close else if they press the X the GUI will continue to function.