Feature Documentation: Handrail and Route Recoloring

for

NASA EVA Path Phase 3

Version 2.1

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Table of Contents

i. Revision History

Revision	Author	Date	Description
1.0	Lincoln Powell	7/15/18	Initial document.
1.1	Tenadam Weldesemayat	7/22/18	Reviewed document.
2.0	Lincoln Powell	7/28/18	Updated section 2.1 based on stakeholder feedback.
2.1	Tenadam Weldesemayat	8/12/18	Reviewed document.

1. Introduction

1.1 Background

The finalized NASA EVA Navigator web application delivered from Phase 2 completed tailored backlog items designed by Daren to meet existing objectives for the product, one being the coloring of the start and end handrails in the International Space Station (ISS) model. The desired coloring scheme was as follows:

- Blue (#0823D1) start handrail
- Purple (#7744D6) end handrail

Daren elicited feedback from the user group on the coloring of the start and end handrails and, based on feedback, prioritized adding extra highlighting or a halo effect in order to make the start and end handrails more obvious.

1.2 Intent

Daren's intent for this change is to make the start and end handrails more obvious for users of the EVA Navigator web application. Toward this goal, he desired the start and end handrails have a highlighting or halo effect applied.

1.3 Agreed Change(s)

During requirements elicitation on this change request, Lincoln suggested, instead of adding a highlighting or halo effect, to make the start and end handrails more logically obvious by changing the color of the start handrail to green (logically for start or begin) and the end handrail to red (logically for stop or end). Lincoln also added that this change will require the route coloring to be modified, as route 2 was green. Thus, all handrail colors will first be evaluated for fit in regards to accessibility standards of WCAG 2.0 and then changed to meet such standards along with keeping the look and feel of the application. Daren accepted this suggestion and directed the project team to apply this change.

2. Development

2.1 Code Additions or Modifications

Handrail and route colors were first evaluated for accessibility and checked for their contrast against the white colored ISS model using WebAIM (https://webaim.org/resources/contrastchecker/). The handrails were treated as images of text in regard to their purpose to indicate pathing via a visual effect (coloring). Further, since the model can be resized, for the intent of determining if the application meets accessibility standards, handrails were considered normal text.

Phase 2 handrail and route chosen colors returned contrast ratios of:

- Start handrail - Blue (#0823D1): **9.67:1**
- End handrail - Purple (#7744D6): **5.86:1**
- Route 1 - Magenta (#FF00CB): **3.43:1**
- Route 2 - Green (#07D10B): **2.07:1**
- Route 3 - Gold (#FFB200): **1.81:1**

It is of note that the Web Content Accessibility Guidelines (WCAG) 2.0 (2008), section 1.4.3 Contrast (Minimum), states “The visual presentation of text and images of text has a contrast ratio of at least 4.5:1”. The handrails within the ISS model fall underneath the definition of images of text, defined by WCAG 2.0 (2008), as “text that has been rendered in a non-text form (e.g., an image) in order to achieve a particular visual effect”. Therefore, all route colors from Phase 2 did not conform to WCAG 2.0 level AA.

The chosen colors for this change request return contrast ratios of:

- Start handrail - Green (#008000): **5.14:1**
- End handrail - Red (#EB0000): **4.63:1**
- Route 1 - Blue (#0000FF): **8.59:1**
- Route 2 - Orange (#FF8000): **2.52:1**
- Route 3 - Purple (#8000FF): **6.25:1**

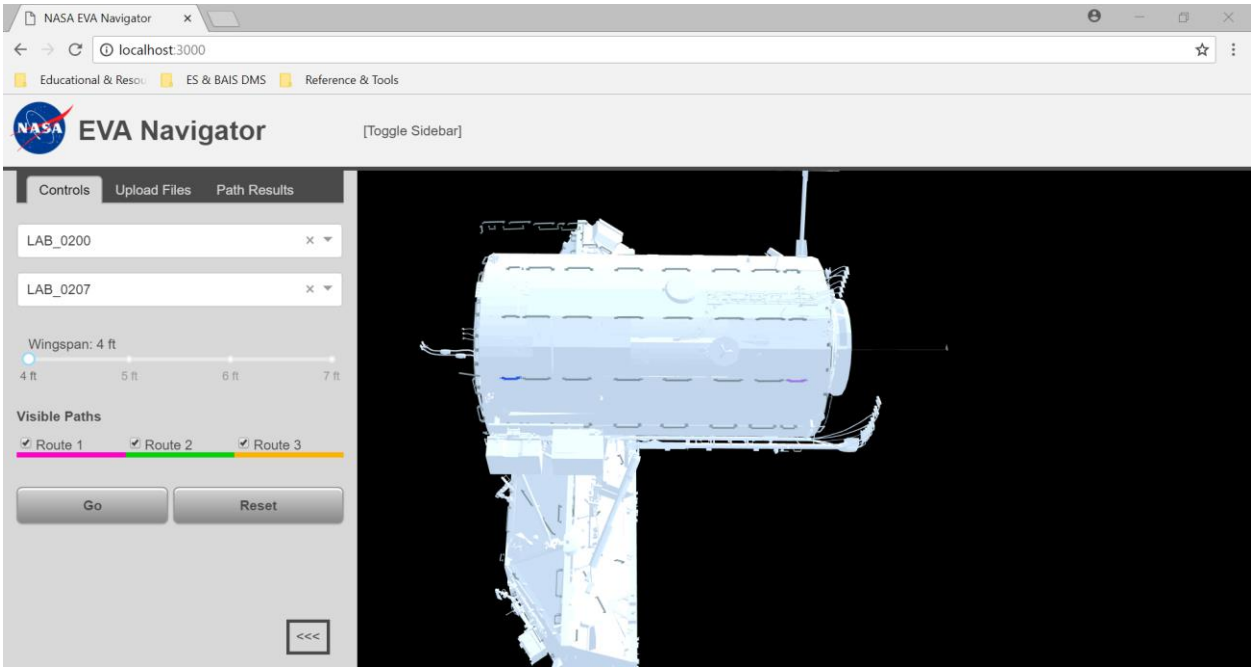

Figure 1. Blue start and purple end handrails from Phase 2.

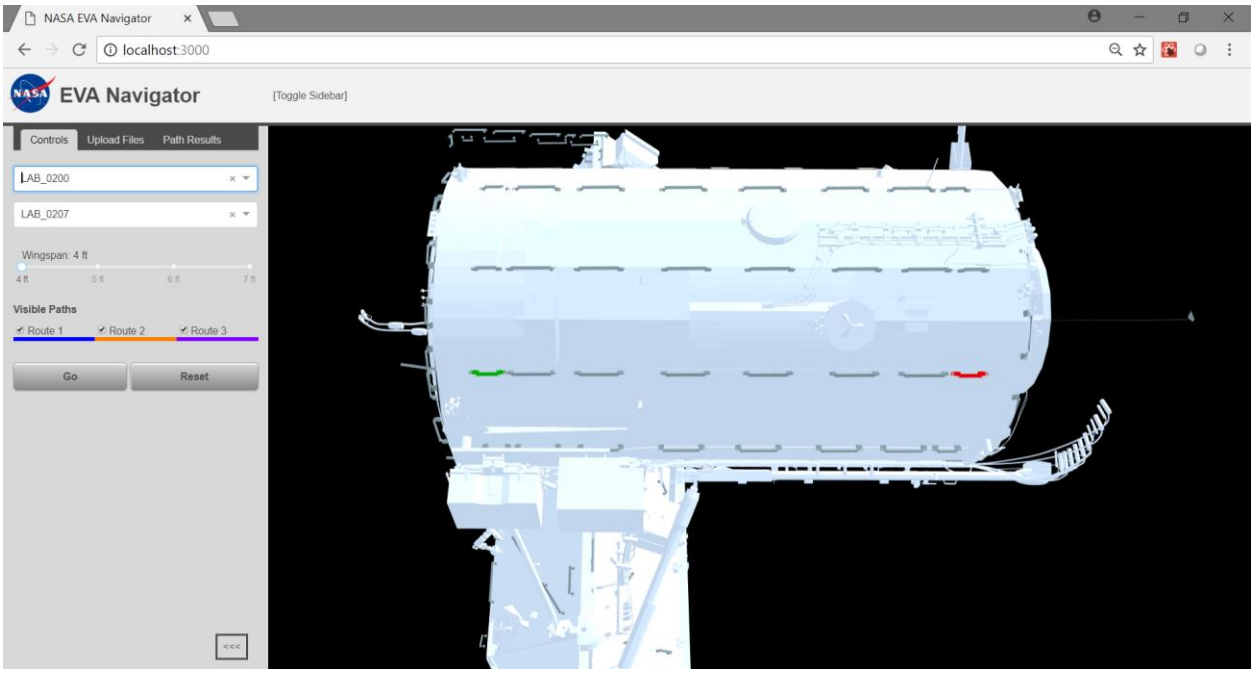

Figure 2. Green start and red end handrails chosen for this change request.

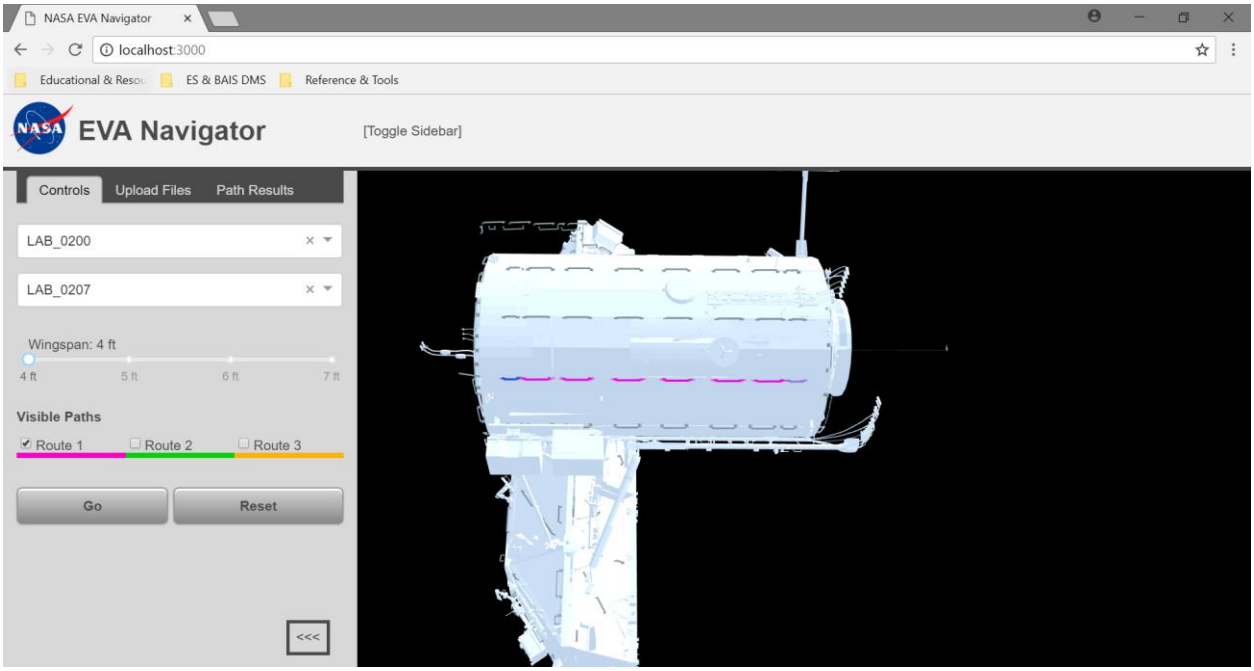

Figure 3. Magenta route 1 coloring from Phase 2.

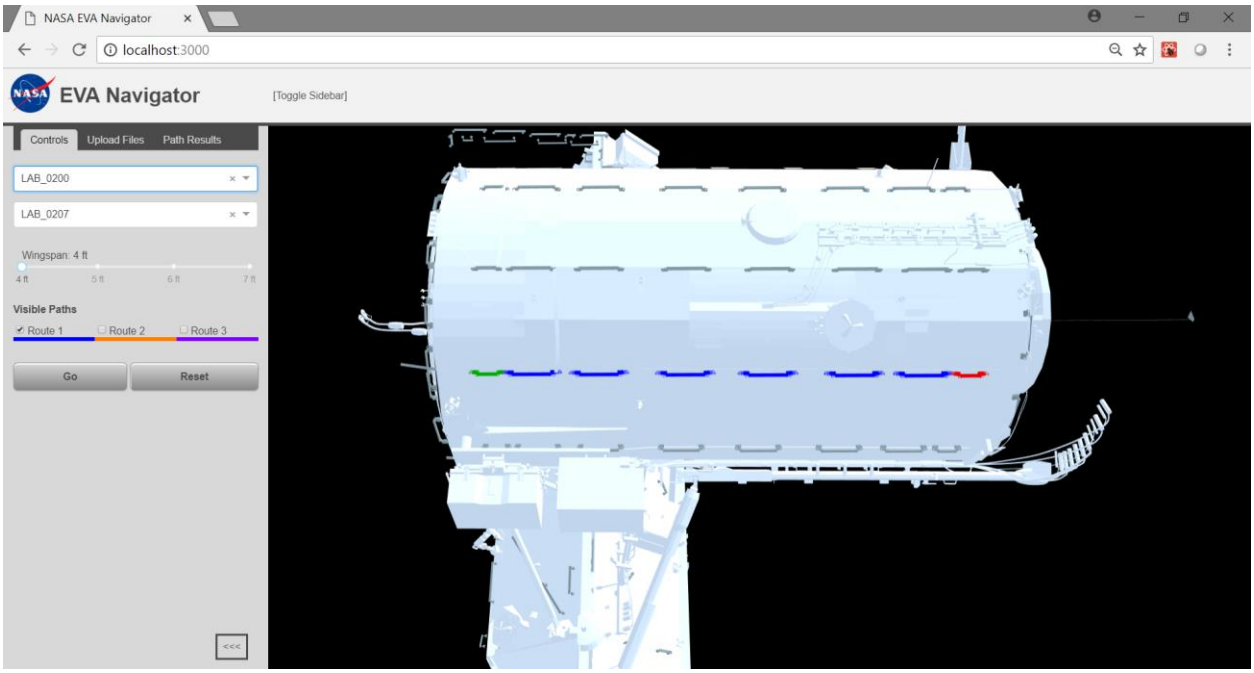

Figure 4. Blue route 1 recoloring chosen for this change request.

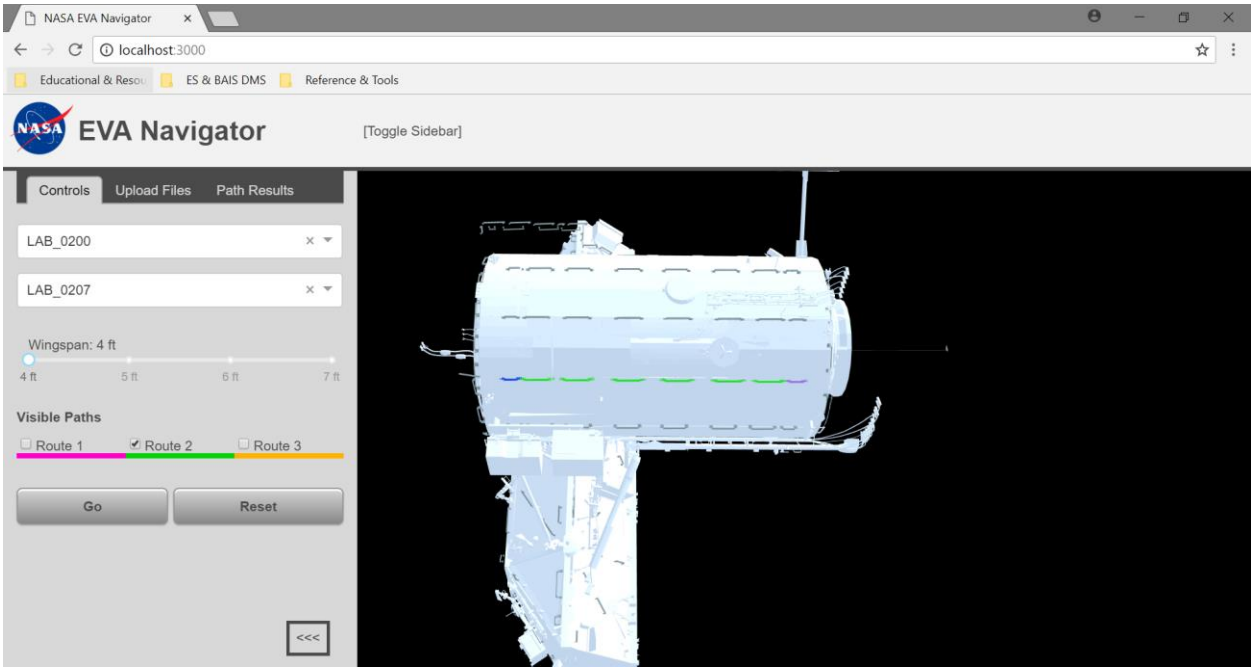

Figure 5. Green route 2 coloring from Phase 2.

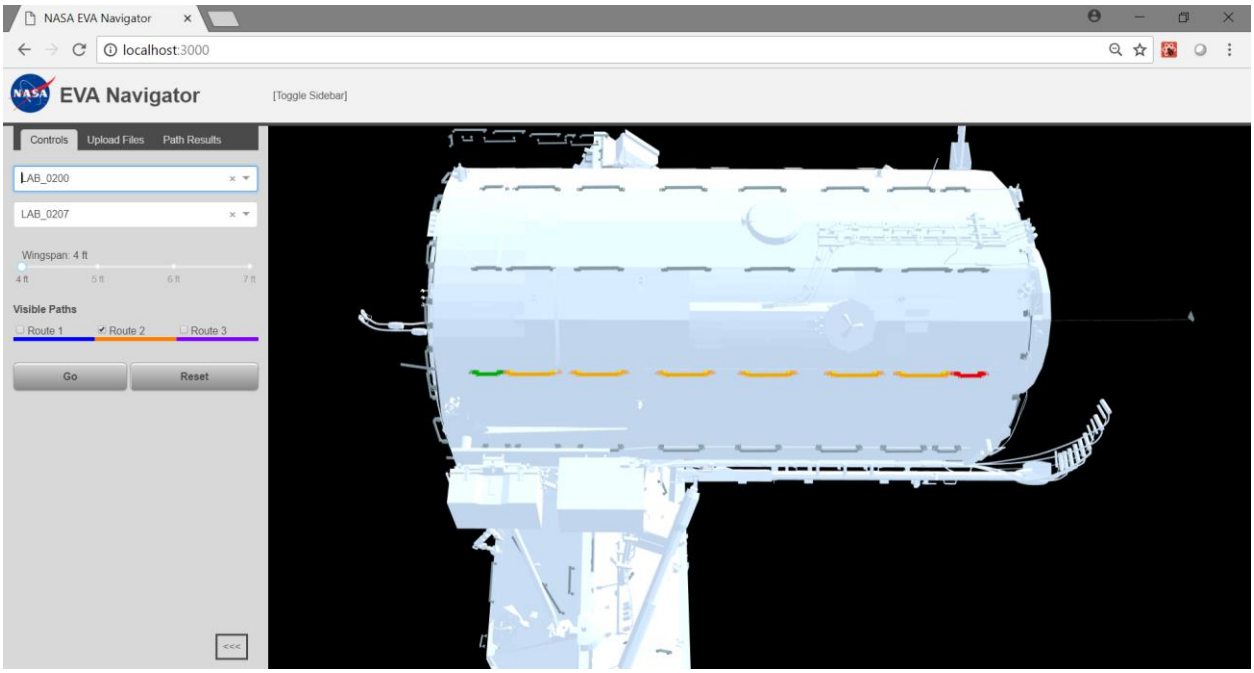

Figure 6. Orange route 2 recoloring chosen for this change request.

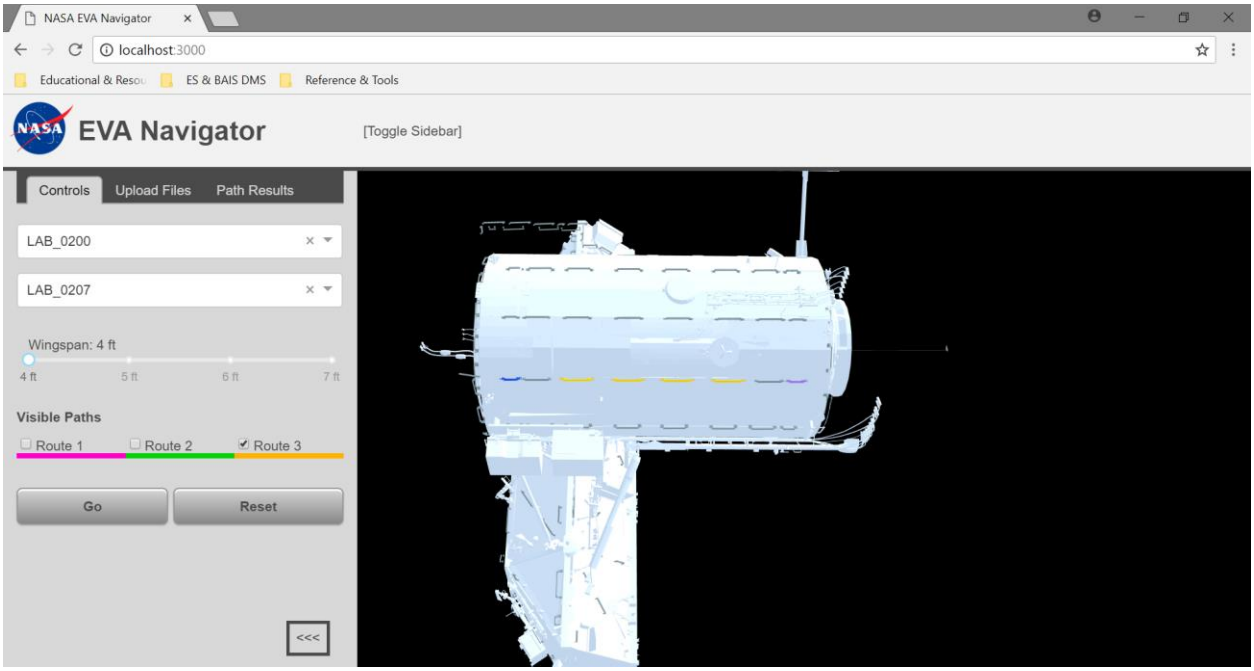

Figure 7. Gold route 3 coloring from Phase 2.

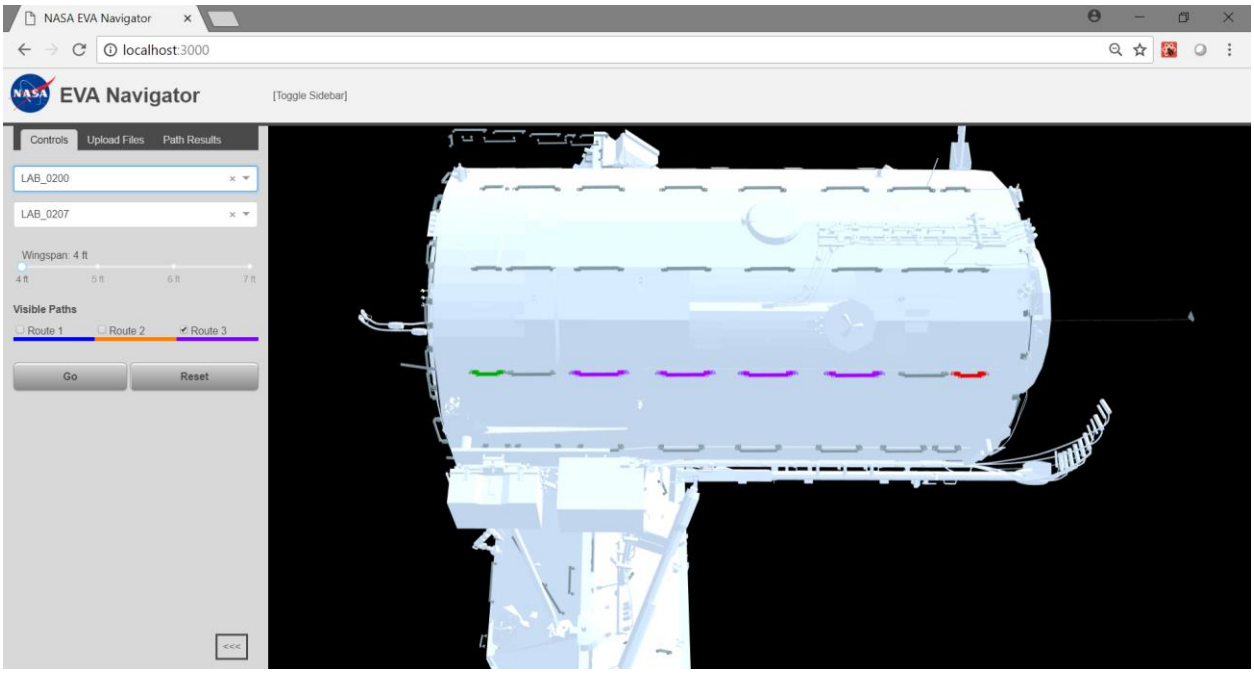

Figure 8. Purple route 3 recoloring chosen for this change request.

The changes made to EVA Navigator project were to the Renderer.js and Container.js files. Within the Renderer.js file, Phase 2 handrail color scheme was commented out and recoloring was applied (see Figure 9 below).

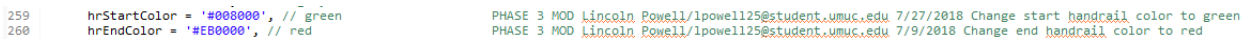

Figure 9. Renderer.js changes to recolor handrails.

Within the Container.js file, Phase 2 route color scheme was commented out and recoloring was applied (see Figure 10 below). Also note that color changes apply to the color line for each route on the browser page and the handrail coloring for the route in the ISS model.

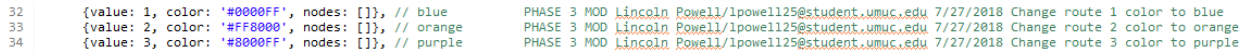

Figure 10. Container.js changes to recolor routes.

3. Functional Testing

3.1 Proposed Functional Test Cases

3.1.1 Test Case 1: Start handrail is green

Description: The user should see a green handrail when a starting handrail is selected from the drop-down menu.

Requirements:

1. The starting handrail will be changed to green.
2. The shading of green must comply with WCAG 2.0 standards.

Prerequisites:

1. Start handrail drop-down menu must work as intended.

Steps:

1. Load “EVA Navigator” web application by navigating browser to http://127.0.0.1:3000 or http://localhost:3000.
2. Select LAB_0200 as the starting handrail.
3. Check that the starting handrail on the ISS model is green.

Input: Click on the starting handrail drop-down menu and select the “LAB_0200” handrail.

Expected Output: Starting handrail, LAB_0200, on the ISS model is green.

Assumptions: None.

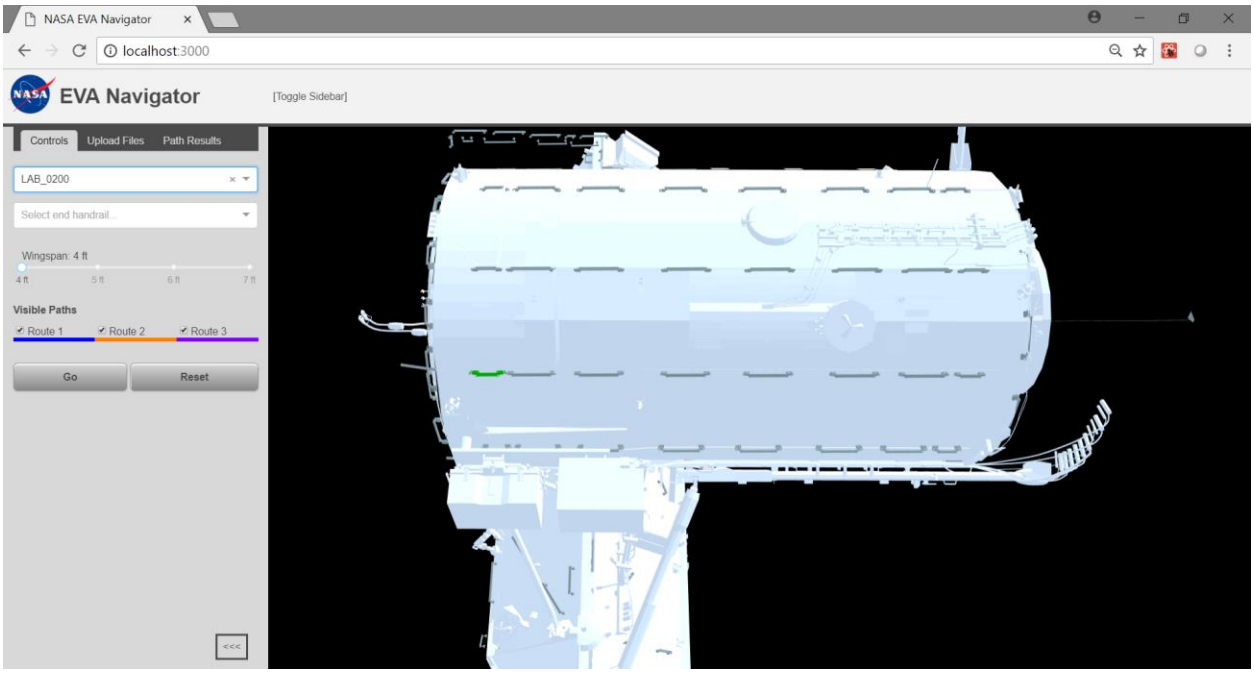

Figure 11. Test case 1 displaying green handrail, LAB_0200.

3.1.2 Test Case 2: End handrail is red

Description: The user should see a red handrail when an ending handrail is selected from the drop-down menu.

Requirements:

1. The ending handrail will be changed to red.
2. The shading of red must comply with WCAG 2.0 standards.

Prerequisites:

1. End handrail drop-down menu must work as intended.

Steps:

1. Load "EVA Navigator" web application by navigating browser to http://127.0.0.1:3000 or http://localhost:3000.
2. Select LAB_0207 as the ending handrail.
3. Check that the ending handrail on the ISS model is red.

Input: Click on the ending handrail drop-down menu and select the "LAB_0207" handrail.

Expected Output: Ending handrail, LAB_0207, on the ISS model is red.

Assumptions: None.

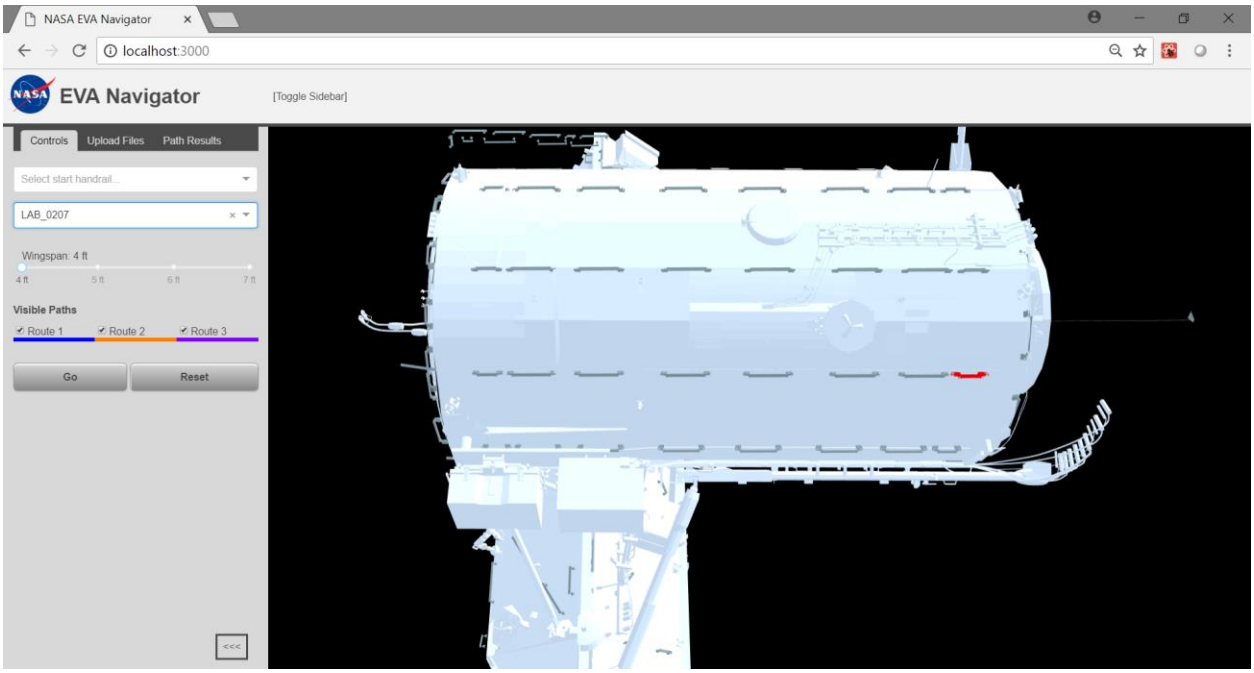

Figure 12. Test case 2 displaying red handrail, LAB_0207.

3.1.3 Test Case 3: Route 1 handrail path is blue

Description: The user should see a blue handrail path when a starting and ending handrail are selected from their respective drop-down menus, the "Route 1" checkbox is checked and the "Go" button is clicked.

Requirements:

1. The route 1 handrail path will be changed to blue.
2. The shading of blue must comply with WCAG 2.0 standards.

Prerequisites:

1. Start handrail drop-down menu must work as intended.
2. End handrail drop-down menu must work as intended.
3. Route 1 calculation must work as intended.
4. Route 1 handrail color pathing on ISS model must work as intended.

Steps:

1. Load "EVA Navigator" web application by navigating browser to http://127.0.0.1:3000 or http://localhost:3000.
2. Select LAB_0200 as the starting handrail.
3. Select LAB_0207 as the ending handrail.
4. Verify that the "Route 1" checkbox is checked.
5. Select the "Go" button.
6. Check that the route 1 handrail pathing on the ISS model is blue.

Input: Click on the starting handrail drop-down menu and select the "LAB_0200" handrail. Click on the ending handrail drop-down menu and select the "LAB_0207" handrail. Click on the "Go" button.

Expected Output: Starting handrail, LAB_0200, on the ISS model is green. Ending handrail, LAB_0207, on the ISS model is red. Route 1 handrail pathing on the ISS model from start to end is blue.

Assumptions: None.

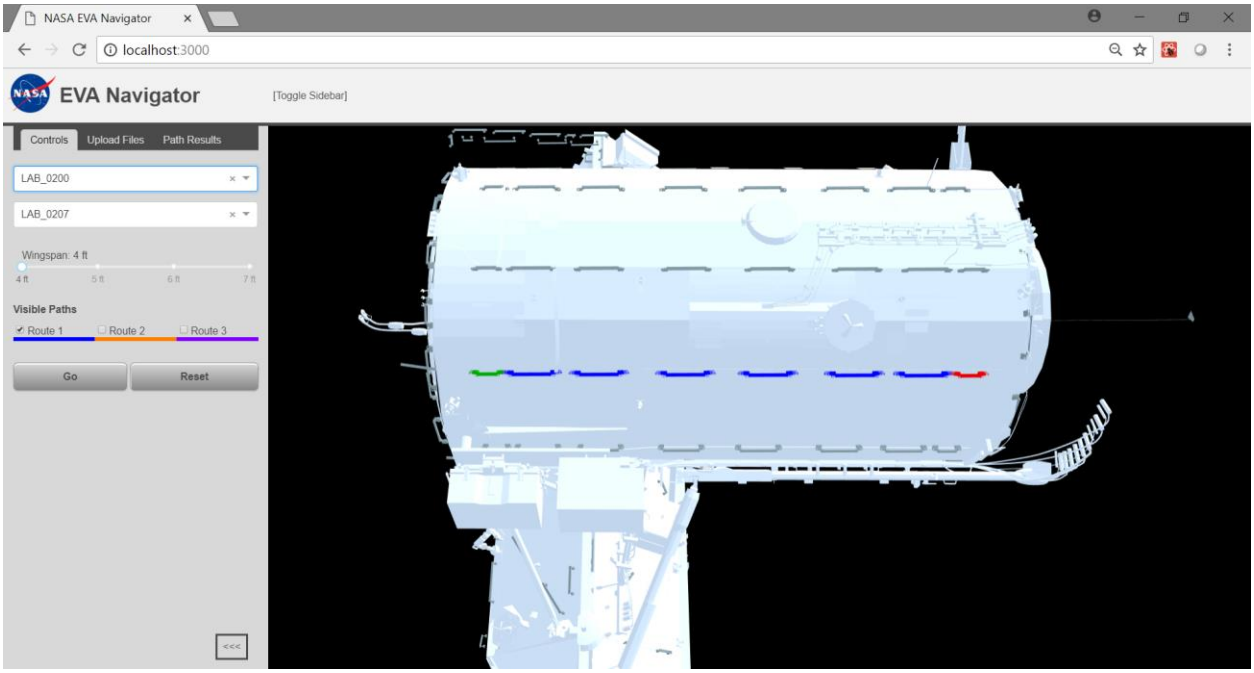

Figure 13. Test case 3 displaying blue colored Route 1 path.

3.1.4 Test Case 4: Route 2 handrail path is orange

Description: The user should see an orange handrail path when a starting and ending handrail are selected from their respective drop-down menus, the "Route 2" checkbox is checked and the "Go" button is clicked.

Requirements:

1. The route 2 handrail path will be changed to orange.

Prerequisites:

1. Start handrail drop-down menu must work as intended.
2. End handrail drop-down menu must work as intended.
3. Route 2 calculation must work as intended.
4. Route 2 handrail color pathing on ISS model must work as intended.

Steps:

1. Load "EVA Navigator" web application by navigating browser to http://127.0.0.1:3000 or http://localhost:3000.
2. Select LAB_0200 as the starting handrail.
3. Select LAB_0207 as the ending handrail.
4. Uncheck the "Route 1" checkbox.
5. Verify that the "Route 2" checkbox is checked.
6. Select the "Go" button.
7. Check that the route 2 handrail pathing on the ISS model is orange.

Input: Click on the starting handrail drop-down menu and select the "LAB_0200" handrail. Click on the ending handrail drop-down menu and select the "LAB_0207" handrail. Uncheck the "Route 1" checkbox. Click on the "Go" button.

Expected Output: Starting handrail, LAB_0200, on the ISS model is green. Ending handrail, LAB_0207, on the ISS model is red. Route 2 handrail pathing on the ISS model from start to end is orange.
Assumptions: Route 1 will override route 2's coloring if left checked; thus, this test will require Route 1 to be disabled.

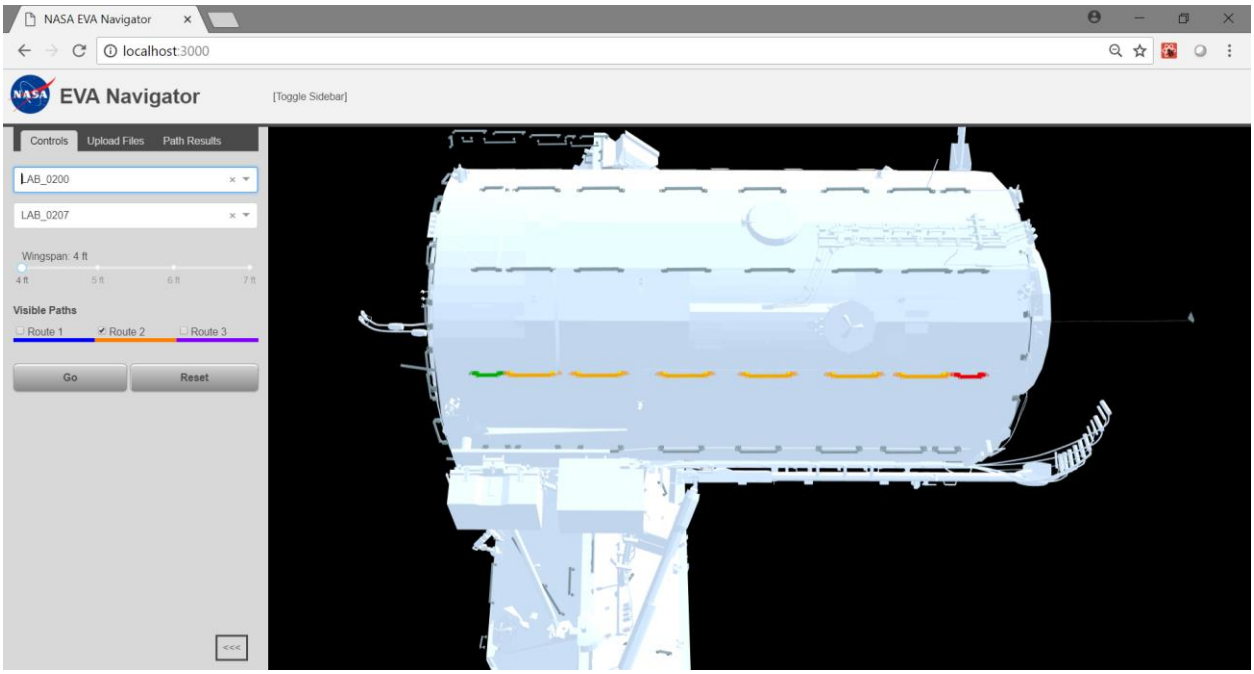

Figure 14. Test case 4 displaying orange colored Route 2 path.

3.1.5 Test Case 5: Route 3 handrail path is purple

Description: The user should see a purple handrail path when a starting and ending handrail are selected from their respective drop-down menus, the "Route 3" checkbox is checked and the "Go" button is clicked.
Requirements:

1. The route 3 handrail path will be changed to purple.
2. The shading of magenta must comply with WCAG 2.0 standards.

Prerequisites:

1. Start handrail drop-down menu must work as intended.
2. End handrail drop-down menu must work as intended.
3. Route 3 calculation must work as intended.
4. Route 3 handrail color pathing on ISS model must work as intended.

Steps:

1. Load "EVA Navigator" web application by navigating browser to http://127.0.0.1:3000 or http://localhost:3000.
2. Select LAB_0200 as the starting handrail.
3. Select LAB_0207 as the ending handrail.
4. Uncheck the "Route 1" checkbox.
5. Uncheck the "Route 2" checkbox.
6. Verify that the "Route 3" checkbox is checked.

7. Select the “Go” button.
8. Check that the route 3 handrail pathing on the ISS model is purple.

Input: Click on the starting handrail drop-down menu and select the “LAB_0200” handrail. Click on the ending handrail drop-down menu and select the “LAB_0207” handrail. Uncheck the “Route 1” checkbox. Uncheck the “Route 2” checkbox. Click on the “Go” button.
Expected Output: Starting handrail, LAB_0200, on the ISS model is green. Ending handrail, LAB_0207, on the ISS model is red. Route 3 handrail pathing on the ISS model from start to end is purple.
Assumptions: Route 1 and 2 will override route 3’s coloring if left checked; thus, this test will require Route 1 and 2 to be disabled.

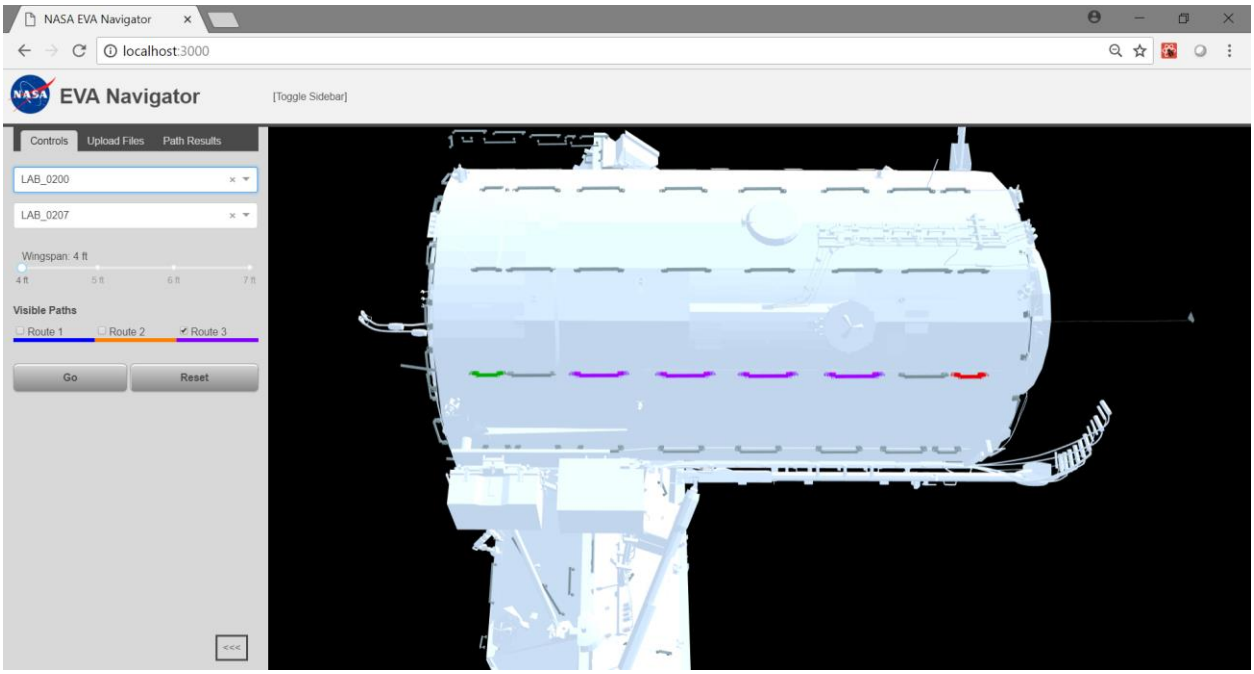

Figure 15. Test case 5 displaying purple colored Route 3 path.

3.2 Assumptions and Constraints

3.2.1 Assumptions

It is assumed that the EVA Navigator web application has been setup and launched correctly, following the User_Manual.docx, section 3, Software Installation based on your operating system.

3.2.2 Constraints

Despite color contrast fitness evaluation, stakeholder is the ultimate approval authority for determining appropriate color choices of handrails and routes. As such, the stakeholder can opt for color choices of handrails and routes to be excluded for accessibility standards of the Web Content Accessibility Guidelines (WCAG 2.0).

3.3 Findings

All functional tests worked as expected, resulting in the desired behavior.

References

Web Content Accessibility Guidelines 2.0. (2008). Retrieved from https://www.w3.org/TR/WCAG20/