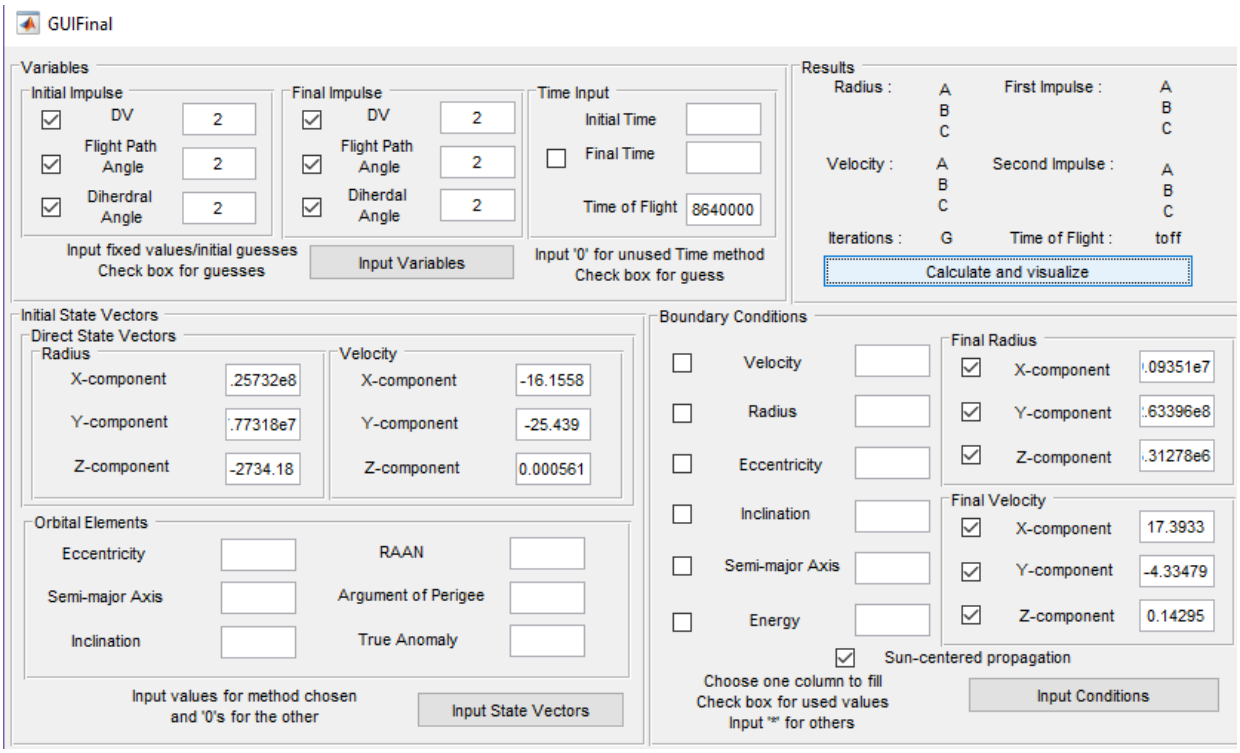
What the GUI looks like:



1) VARIABLES PANEL:

- This includes the variables: First impulse (VUW frame), second impulse (VUW frame), and time of flight.
- The impulse is defined by a scalar magnitude (DV), flight path angle, and dihedral angle (delta).
- The user should check the boxes next to the variables that he wants freed (that we want the program to solve for) and write an initial guess in the text box next to them.
- As for the variables that he wants fixed at certain values he should leave the box unchecked and write their values in the text box next to them.
- Finally, he should click input variables so the variables are saved in the program.

2) INITIAL STATE VECTORS PANEL:

The user needs to input the values and put "o" in the unused ones. Finally, he should click input state vectors so the variables are saved in the program.

a) Direct State Vectors

- He inputs r and v initial vectors as x,y,z components.

b) Orbital Elements

- He inputs the 6 orbital elements for the initial orbit to fully define it.

3) BOUNDARY CONDITIONS PANEL:

- The user should check the boundary conditions he wants set and write their values in the text box next to them. He should leave the boundary conditions that are not used unchecked.

- The program default is Earth-centered propagation. In case the user wants to switch it to a sun-centered propagation, he should check that box.
- Finally, he should click input conditions so the variables are saved in the program.

a) Orbital Elements

- The user can input some of the final orbital elements as his boundary conditions.

b) R and V final State Vectors

- The user can input some of the final r and v state vector components as his boundary conditions.

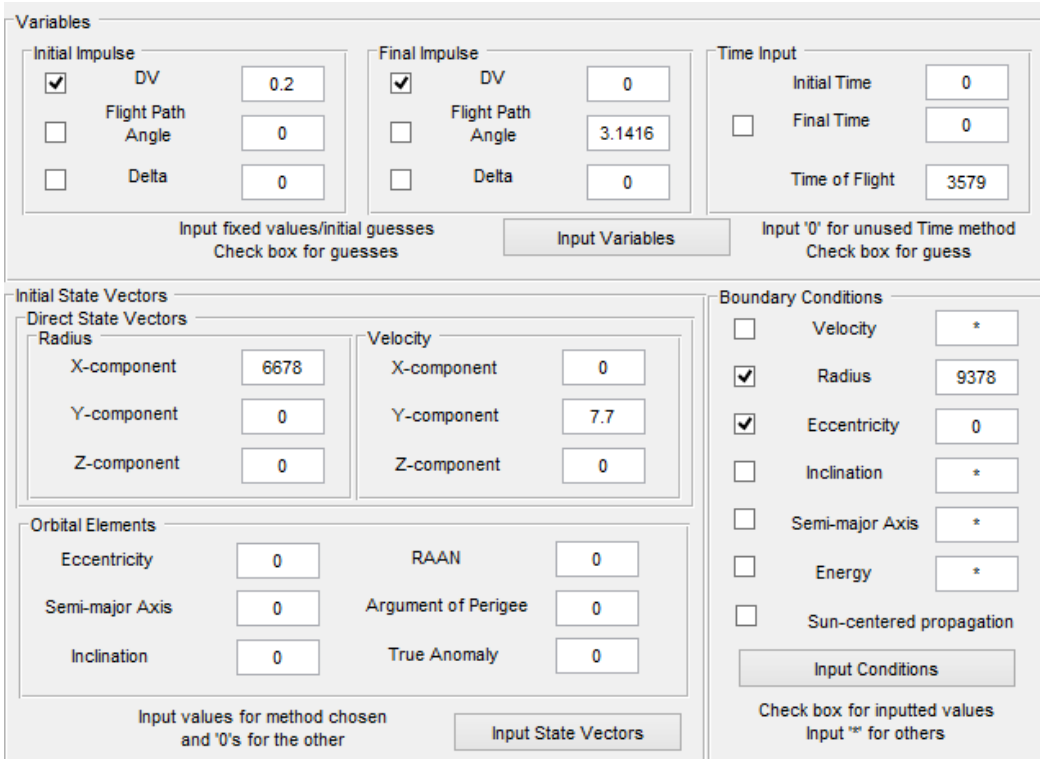
4) RESULTS PANEL:

- The user should click calculate and visualize so the results are showed in the results panel, and two new figure windows are opened.
- Final radius and velocity vectors are shown, along with the number of iterations it took the program to converge, and the first and second impulses defined in VUW frame and the time of flight it will take to reach the target orbit with the given boundary conditions.
- One figure shows the initial, final, and transfer orbits that the program reached after convergence. The other figure shows the iterations it took the program to reach the solution.

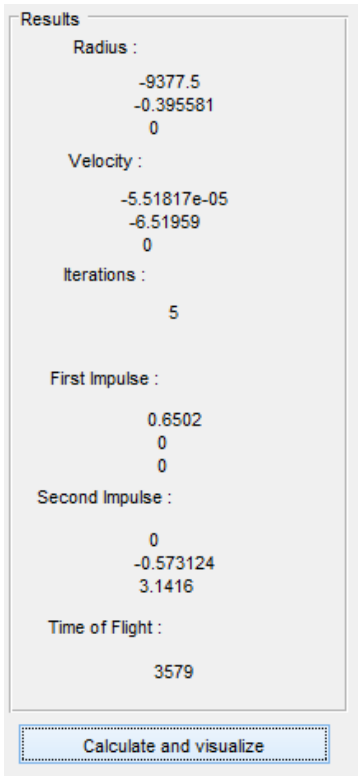
Example Walkthrough

- This will be a walkthrough in a Hohmann transfer example. Other examples were tested and documented and shown in the report.
  Problem:
  - Earth Centered
  - Vo = [0 7.7 0]
  - Ro = [6678 0 0]
  - R magnitude final = 9378
  - Eccentricity final = 0
  - Freed variables: Impulse 1 magnitude (guess: 0.2), Impulse 2 magnitude (guess: 0)
  - Fixed variables: Flight path angle 1 = Dihedral angle 1 = Dihedral angle 2 = 0, Flight path angle 2 = pi.
  - Time of flight = 3579 s.

  1- Write the inputs as specified in this manual.



2- Click input variables, input state vectors, input conditions, and calculate and visualize buttons. Results will be shown in the results panel.



3- Two figures are shown.