GPOPS-2: Evaluate Optimality in IPOPT [4]

6DOF Dynamics [4.1.1]

GPOPS-2: Evaluation of Trajectory Iteration [4]

Aerodynamic Databases [3.1.3, 3.2.1, 3.3.3]

Vehicle Models [3]

C-REST Engine Model [3.1.2]

Iteration

Vehicle

Aerodynamics

Propulsion Properties

Scramjet

Thrust

Scramjet

Fuel

Flow

Constraint

Violations

Conical Shock Model [3.1.2]

Engine Inlet

Conditions

Inputs

Atmospheric Data

Initial guesses

Third Stage Unpowered Ascent and Hohmann Transfer Simulation [4.2.5 - 4.2.6]

Integrated Cost (if applicable):

Cost:

Rocket Engine Models [3.2, 3.3]

Rocket

Thrust

Rocket

Fuel

Flow

Endpoint Cost (Payload Mass):

Aerodynamic

Coefficients

Derivatives:

Path Constraints:

Path constraints

Initial and end constraints

Optimised Solution Analysis [4.3]

Output

Optimised Solution

Most Accurate Solution

Initiation of Parallel Loop

Termination of Parallel Loop

Trajectory Solution Node Mesh

Vehicle Dynamics

Payload-to-Orbit

Constraints

Cost

Updated Solution

4

3

2

1

IPOPT

LODESTAR

Optimal Solution

GPOPS-2