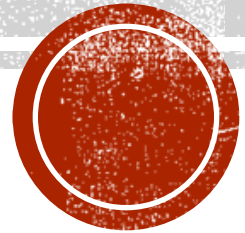
ISR360 (UPDATE)

- Trajectory Generators
- Solo Interceptors
- Coordinated Interceptors



TRAJECTORY GENERATORS:

- Multi-Objective Hypersonic Reconnaissance Vehicle with Temperature Constraints
  - Features:
    - 3D End-to-End Offline Trajectory with Max Throttle and Dynamic Pressure Constraints
    - Spherical Earth, 1976 Standard Atmosphere, GHAME Vehicle
    - Take-off, Cruise and Landing with Fixed Speed Waypoints and Multiple No-Fly-Zones
    - Optimization Goal: Minimizes combination of flight time and control deflections
    - Optimization Tool: ICLOCS and IPOPT MATLAB
  - Implementation Status: (Fully Integrated and Tested)
    - Object Mapped to the Catalogue
    - Parametrization Enabled through Default GUI File
    - Interfacing via MATLAB iTruthGenerator Object
    - Interface is also available via C++ library but not integrated

TRAJECTORY GENERATORS: (CONT.)

- Multiphase High-Speed Vehicle for Ascent Entry Missions with Heating Constraints
  - Features:
    - 3D End-to-End Offline Trajectory with Heating Rate and Dynamic Pressure Constraints
    - Spherical Rotating Earth and 1962 U.S. Standard Atmosphere
    - Rocket Boost to Suborbital Exo-Atmosphere, Unpowered Re-Entry and Gliding Trajectory
    - Optimization Goal: Minimizes control angle deflections in each phase
    - Optimization Tool: IPOPT Julia
  - Implementation Status: (Fully Integrated and Tested)
    - Object Mapped to the Catalogue
    - Parametrization Enabled through Default GUI File
    - Interface Path:
      - MATLAB iTruthGenerator > Operating System > WSL Shell Script > Julia

TRAJECTORY GENERATORS: (CONT.)

- Multiphase Hypersonic Boost-Glide Waverider with Heat Load Constraint
  - Features:
    - 3D End-to-End Offline Trajectory with Heating and Dynamic Pressure Constraints
    - Spherical Non-Rotating Earth and 1976 ICAO Atmospheric Model
    - Rocket Boost to Suborbital Exo-Atmosphere, Unpowered Re-Entry and Gliding Trajectory
    - Optimization Goal: Maximizes the downrange in the final phase at the end time
    - Optimization Tool: OptimTraj MATLAB
  - Implementation Status: (Fully Integrated and Tested)
    - Object Mapped to the Catalogue
    - Parametrization Enabled through Default GUI File
    - Interfacing via MATLAB iTruthGenerator
    - Multiple Waypoints and No-Fly-Zones Enabled

SOLO INTERCEPTORS:

- Multi-phase Boost Glide Missile for Gliding Hypersonic Targets
  - Boost, Glide, Aim (PNG Law), and Hit-to-Kill (Booster Rockets based Maneuvers)
  - CAV-H Model and 3D Target Tracking Based on LOS Rate
  - Implementation Status: (Fully Integrated and Tested)
    - Object Mapped to the Catalogue and Parametrization Enabled through Default GUI File
    - Interfaced via iInterceptor C++ Class and MOP enabled
- Robust Fractional Calculus Guidance in a Hypersonic Pursuit-Evasion Game
  - Fractional Calculus Guidance Law, Non-Linear Tracking Differentiator based PNG Law
  - 2D Target Tracking Based on LOS Acceleration
  - Implementation Status: (Fully Integrated and Tested)
    - Object Mapped to the Catalogue and Parametrization Enabled through Default GUI File
    - Interfaced via iInterceptor C++ Class and MOP enabled

SOLO INTERCEPTORS: (CONT.)

- Nonlinear Model Predictive Control for Near-Space Interceptor Based on Finite Time Disturbance Observer
  - 3D Euler Angles based Model with Reaction Jets and External Disturbances
  - DCA with Actuator Saturation and Rate Constraints of Aerodynamic Fins
  - Proportional Navigation Guidance Law Target Tracking Based on LOS Data
  - Implementation Status (Partially Integrated):
    - Object Mapped to the Catalogue
    - Parametrization Enabled through the Default GUI File
    - Interfaced via iInterceptor C++ Class and MOP enabled
    - Integrated but Testing in Progress

SOLO INTERCEPTORS: (CONT.)

- An Adaptive Reaching Law Based Three-Dimensional Guidance Laws for Intercepting Hypersonic Vehicle
  - Finite-Time Adaptive Guidance Law to Converge along the Target Direction
  - Approaching, Turning and Endgame Phases
  - 3D Target Tracking and Slow Speed Interception
  - Implementation Status (Partially Integrated):
    - Object Mapped to the Catalogue
    - Parametrization Enabled through Default GUI File
    - Interfaced via MATLAB iObjectManager and MOP enabled
    - Integrated but Testing in Progress

COORDINATED INTERCEPTORS:

- Coordinated Guidance Strategy for Heterogeneous Missiles Intercepting Hypersonic Weapon
  - Independent Leader equipped with High Performance Seeker follows MNPG Law
  - Coordination as per Directed Spanning Tree Structure for Position Information Exchange
  - 2D Target Tracking and Convergence to the Leader Position using Consensus Protocol
  - Implementation Status (Fully Integrated and Tested):
    - Object Mapped to the Catalogue
    - Parametrization Enabled through Default GUI File
    - Interfaced via iInterceptor C++ Class and MOP enabled
    - Trajectory is available for one interceptor, but interception logic covers all of them

COORDINATED INTERCEPTORS: (CONT.)

- Three-Dimensional Cooperative Guidance Strategy and Guidance Law for Intercepting Highly Maneuvering Target
  - Interception by multiple missiles with weak maneuverability
  - Cooperative Coverage Algorithm for Quickly Calculating the Number of Required Missiles
  - Guidance Law to Achieve 3D Interception under the Acceleration Limit
  - Implementation Status (In Progress):

- Coverage-Based Three-Dimensional Cooperative Guidance Strategy Against Highly Maneuvering Target
  - Virtual Aiming Points to Bias the Reachable Set of True PNG Law
  - Optimization Algorithm for Cooperation by Finding a Set of Proper Virtual Aiming Points
  - Implementation Status (In Progress):

THE END