UAV Hardware in the Loop Simulator

SIM-1000

Tellumat

The SIM-1000 Hardware in the Loop Simulator (HILS) is a debugging, verification, flight-test design, qualification and flight demonstration tool for Unmanned Aerial Vehicles (UAVs), providing simulated sensor information in real-time, based on MATLAB mathematical models of the UAV, its sensors and the physical environment.

The HILS accepts servo commands from the flight computer, propagating the simulation forward in time. The flight computer / avionics system controls a virtual aircraft, in a virtual environment with virtual sensors and servos, allowing correct avionics operation to be verified before flight testing.

The simulator interfaces via sensor and servo buses to both primary and secondary avionic subsystems.

The HILS also interfaces with the Ground Control Station (GCS) simulating various data required by the flight computer.

The simulator interfaces to Commercial off the Shelf (COTS) visualisation software for aircraft and environment display, providing a training environment for GCS operators and support technicians. Simulated flight failures and scenarios can be activated, providing a realistic flight environment for training purposes.

FEATURES	BENEFITS
Complete aircraft and environment simulation	Provides for de-risking of avionics prior to flight testing
Real-time operation	Configurable to any aircraft configuration
COTS hardware	Doubles as a training aid

EARTH/ENVIRONMENTAL MODELS

WGS-84 elliptic, rotating earth model

World Magnetic Model (WMM2010) magnetic field model as specified with accuracy requirements in MIL-W-89500

WGS-84 ellipsoidal gravity formula gravitational field model

ISA pressure model valid from -1 600 ft to 25 000 ft

ISA density model valid from -1 600 ft to 25 000 ft

ISA temperature model valid from 1 600 ft to 25 000 ft

Wind gust model based on MIL-F-8785C

Wind gusts configurable from the scenario script

Wind shear model based on MIL-F-8785C

Wind turbulence model based on the Dryden model as defined in MIL-F-8785C

AVIONICS SENSOR MODELS	AIRCRAFT DYNAMIC MODEL
IMU (3-axis accelerometers and rate gyroscopes)	Airframe aerodynamic model
	Aircraft inertia properties
GPS	Servo model
Absolute pressure sensor	Engine and propeller model
Differential pressure sensor	Undercarriage/surface interaction model
Magnetometer	
Engine RPM	

MAJOR HARDWARE COMPONENTS	MAJOR SOFTWARE COMPONENTS
Target computer	Vehicle system
Host computer	Environment system
Visualisation computer	Sensor system
	Scenario system
	Hardware I / O system
	Output system

INTERFACES

External sensor bus

External control bus

Internal state bus

Internal engine bus

Internal environmental bus

Internal sensor bus

Internal scenario bus

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