MATLAB EXPO 2019

Ingegneria dei Sistemi
Dai Requisiti all’Architettura alla Simulazione

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Key Takeaways

- Digital thread providing traceability between requirements, architecture, and design

REQ 3.1 ENABLING CRUISE CONTROL
Cruise control is enabled when
......

ENABLE SWITCH DETECTION
If the Enable switch is pressed
......

Implemented By

Derives

Implemented By

reqMode.Cruise
Key Takeaways

- Digital thread providing traceability between requirements, architecture, and design
- Connected environment for designing and analyzing architectures and designs
Key Takeaways

- Digital thread providing traceability between requirements, architecture, and design

- Connected environment for designing and analyzing architectures and designs

- Integrated platform for analyzing all parts of your architecture in one multi-domain environment

Dynamic Systems  State Machines  Discrete-Event  Physical Modeling
What does that mean?

Early in the Process
Concepts/Descriptions

Later in the Process
Models
What is the Gap?

Early in the Process
Concepts/Descriptions

Later in the Process
Models

Digital Thread
Connected Environment
Analysis & Simulation Platform
What goes into the bridge?

1. Functional Requirements

1.1 Normal Mode of Operation

During the normal mode of operation, the Fault Tolerant Fuel Control System shall determine the fuel rate which is injected at the valves.

1.1.1 Stoichiometric mixture ratio

During normal mode of operation, the System shall maintain the stoichiometric mixture target ratio of 14.6.

1.1.2 Oxygen Sensor (EGO)
MathWorks Solution: System Composer R2019a and

- Be Intuitive
- Facilitate Analysis
- Tackle Complexity
- Enable Implementation

Requirements Coverage Reporting and Impact Analysis

Simulink Requirements

Simulink
Now let’s see it in action
Gas Engine: Nine-cylinder, air-cooled, radial aircraft engine
Fuel type: 80/87 grade aviation gasoline
Dry weight: 290 kg
Power output: 400 hp (298 kW) at
#35: Propulsion Power

**Description**

- Type: Functional
- Index: 1.4.2
- Custom ID: #35
- Summary: Propulsion Power

**Engine**

- Nine-cylinder, air-cooled, radial aircraft engine

**Fuel Type**

- 80/87 grade aviation gasoline

**Dry Weight**

- 1.03 kW/kg: 290 kg

**Power Output**

- 400 hp (298 kW) at 2,200 RPM

**Weight**

- 5,000 lb (2,268 kg)

**Keywords**

- Construction
- Modularity
- Propulsion Power
- Flying Qualities
- Ground Station Capabilities

**Links**

- Implemented by: Propulsion Power Subsystem
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<th>Power</th>
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Simulink Requirements
Digital Thread from Requirements to Architecture and Design

- Author requirements or view from external source
- Link requirements, architectures, design, code and test
- Identify gaps in architecture or design
- Identify impact of requirement changes
System Composer
Intuitively design system and software architectures

Description
==
Architecture
System Composer
Perform trade studies based on data driven analysis to optimize architectures

Add custom data
Create analysis model
Calculate mass roll-up data
System Composer
Tackle Architecture complexity with spotlight views

Composition

Spotlight
System Composer
System and software architectures connected to implementations in Simulink

Generate Simulink models from architecture components

Link Simulink models to architecture components

Autogenerated by System Composer on March 25, 2019 2:00 pm EST
Simulink: A Multi-Language Simulation Environment

- Dynamic Systems
- State Machines
- Discrete-Event Systems
- Physical Modeling
- Object-Oriented
Learn More

- Simulink Requirement Webpage
- System Composer Webpage
- System Modeling and Simulation Webpage

- Trial