Modeling and Simulation Made Easy with Simulink

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Questions covered in this presentation

1. Why do we do modeling and simulation?
2. Why use Simulink and Stateflow for modeling and simulation?
Why do we do modeling and simulation?

- To get a better understanding of the system’s:
  - Structure and interface connections
  - Robustness to environmental conditions
  - Response to user input

- And why is that important?
  - Find and fix bugs early
  - Test system under conditions difficult to replicate in the real world

- And why is that important?
  - Because early testing and fixing bugs early saves a lot of money down the road
Simulink helps you solve engineering problems

Model multi-domain systems in one tool

Simulate your model and view system behavior

Use MATLAB for further analysis

```matlab
aileron_out =
    time: []
signals: [1x1 struct]
blockName: [1x109 char]
```
Let’s check out Simulink
Fixing bugs late is very expensive

Errors introduced early but found late in the process are expensive to fix!

Errors introduced in:
- coding phase
- design phase
- requirements phase

Save money w/ early modeling and simulation

- Model-Based Design Development Costs: $127,605
- Traditional Development Costs: $380,805

Total Savings: $253,200
Percent Savings: 66%
Breakdown of $253K saved
Example: NASA HL-20 Lifting Body
FDIR system

- HL-20 has an actuator system to control the left and right elevators
- Each system has a backup in case a failure occurs
- We’re going to test to see how well that backup system works.
Key takeaways

- Simulink provides a multi-domain modeling and simulation platform that is designed for engineers and scientists
  - Model and simulate controls, signal processing, mechanical, electrical, and logical systems in a domain that is natural for engineers and scientists to understand.
- With Simulink, testing is done earlier so that bugs can be found and eliminated as early as possible
  - Simulink includes a simulation engine for early testing and debugging