MATLAB EXPO 2015
KOREA
2015년 5월 21일 목요일
인터컨티넨탈 코엑스, 서울
New approach of Test Management with Simulink Test

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Senior Application Engineer
## MathWorks V&V Product Portfolio

<table>
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<tr>
<th>Product</th>
<th>Capabilities</th>
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<tr>
<td>Simulink Test</td>
<td>Author, execute, and manage simulation-based tests for models and generated code</td>
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<tr>
<td>Simulink Verification &amp; Validation</td>
<td>Trace to requirements, check model standards, perform coverage analysis</td>
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<tr>
<td>Simulink Design Verifier</td>
<td>Identify design errors, automatically generate test vectors, verify designs against requirements</td>
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<tr>
<td>Report Generator</td>
<td>Design and generate reports from MATLAB applications</td>
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<td>Polyspace Bug Finder</td>
<td>Find software bugs and check compliance to MISRA</td>
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<td>Polyspace Code Prover</td>
<td>Prove the absence of run-time errors in software</td>
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<td>Simulink Code Inspector</td>
<td>Automate source code reviews for safety standards</td>
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<tr>
<td>Simulink Real-Time</td>
<td>Build, run, and test real-time applications</td>
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Simulink Test

Capabilities to test simulation outputs throughout the project lifecycle

Do legacy subsystem models work in new application?
The model worked last week... does it still?
Another engineer modified the algorithm... still working ok?
Does the generated code performance match the model?
Does subsystem/system meet the design requirements?
# Product Overview

<table>
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<tr>
<th>1. Test Harnesses</th>
<th>2. Test Sequence Block</th>
<th>3. Test Manager</th>
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| • Synchronized, simulatable test environment | • Inputs and assessments based on logical, temporal conditions | • Author, execute, manage test cases  
• Review, export, report |

### Test Harness

- Main Model
- Component under test
- Test Harness

### Test Sequence

- Test Sequence
- Test Manager

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Applying Simulink Test Case Study: Seat Belt Reminder
Design Seat Belt Reminder

Inputs
- Key Position
- Seat Belt Status
- Vehicle Speed

Outputs
- Embedded Controller
- Seat Belt Reminder Warning Lamp
SBR Algorithm Model

Functional Requirements
Conceptual Test with Dashboard
Simulink Test
Tool for authoring, managing, and executing simulation-based tests

1. Test Harnesses

✔ Synchronized testing environment
✔ Enables unit testing without requiring new model
✔ Component or system
✔ Configure, build, simulate
✔ Supports SIL, or PIL
✔ Supports direct “adhoc” testing

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Coverage metrics identifies untested portions of your model

Coverage Report for sbr

Tests

Test 1

Started Execution: 27-Feb-2008 13:36:21
Ended Execution: 27-Feb-2008 13:36:21

Summary

Model Hierarchy/Complexity:

<table>
<thead>
<tr>
<th>Test</th>
<th>D1</th>
<th>C1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. sbr</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>2. Inputs</td>
<td>3</td>
<td>NA</td>
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<tr>
<td>3. Automatic Tests</td>
<td>2</td>
<td>NA</td>
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<tr>
<td>4. Outputs Assertions</td>
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<tr>
<td>5. Verification Subsystem</td>
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<tr>
<td>6. SBR Logic</td>
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<td>7. SBR</td>
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<td>10. SF_SBF_UNFASTEN</td>
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<td>12. SBR Logic1</td>
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<td>59</td>
</tr>
<tr>
<td>13. SBR</td>
<td>22</td>
<td>59</td>
</tr>
</tbody>
</table>

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Improving Test Suite for Coverage

- Need to create test inputs and assessments
- Test cases need to be designed with the combination of multiple inputs including temporal or logic-based scenarios

* Simulink Design Verifier supports test generation. But expected outputs still need to be analyzed.
Simulink Test

*Tool for authoring, managing, and executing simulation-based tests*

2. **Test Sequence Block**

- MATLAB Action Language
- Steps are temporal or logic-based
- Create complex test inputs and assessments
- Trouble shooting aids

“Formerly referred to as the reactive testing block”

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Simulink Test
Tool for authoring, managing, and executing simulation-based tests

3. Test Manager

- Create Test Cases
- Group into Suites and Test Files
- Execute individual or batch
- View summary and detailed results
- Archive, export, report

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Test Case Templates

1. Simulation Test
   - Input
   - Output
   - Assessment Criteria

2. Baseline Test
   - Input
   - Output
   - File
   - Expected Outputs
   - Assessment Criteria

3. Equivalence Test
   - Input
   - Output
   - Input
   - Output
   - Assessment Criteria
1. Simulation Test
   Pass/Fail assessments with blocks (Assertion)

2. Baseline Test
   Regression test for float-to fixed-point conversion of low-pass filter

3. Equivalence Test
   Comparison between Normal and Software-In-the-Loop tests
Q&A