MATLAB EXPO 2014
INDIA

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What’s New in MATLAB & Simulink

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Agenda

- Flashback
  - Key Areas of Focus from 2013

- Key Areas of Focus & What’s New in 2013b/2014a
  - MATLAB product family
  - Simulink product family
  - Polyspace product family
Key Areas of Focus – 2013

MATLAB product family

- Harnessing Capabilities
  - MATLAB Toolstrip
  - MATLAB Apps Gallery
  - Command Line Suggestions
  - Help System

- Building and Sharing Tools
  - MATLAB Apps

- Building Production Tools
  - GPU Computing
  - MATLAB Production Server
  - xUnit-style Testing Framework
Key Areas of Focus – 2013

Simulink product family

- Building and navigating through large complex models
  - Combined Editor, Explorer Bar, Tabbed Windows, Smart Signal Routing

- Leveraging powerful modeling semantics
  - State Transition Tables, System Objects, CAD Import

- Understanding system behavior
  - Simulation Stepper, Breakpoints, Commenting out blocks, Data Inspector, Performance Advisor, Visualization, Low-Cost Hardware Support, FPGA-in-the-loop Verification
# Data-Driven Decision and Design Across Many Application Areas

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<th>System Design</th>
<th>Signal Processing</th>
<th>Image Processing</th>
<th>Model-Based Design</th>
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<td>Hybrid and electric vehicles</td>
<td>Sound quality analysis</td>
<td>Advanced driver assistance system</td>
<td>Engine Calibration</td>
<td>Portfolio risk optimization</td>
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- **System Design**: Hybrid and electric vehicles
- **Signal Processing**: Sound quality analysis
- **Image Processing**: Advanced driver assistance system
- **Model-Based Design**: Engine Calibration
- **Data Analysis**: Portfolio risk optimization
Key Areas of Focus
MATLAB Product Family

- Access
- Explore and Discover
- Share
- Teach & Learn
Connecting to Low Cost Hardware

Access

Your application
MATLAB algorithm or Simulink model

Data I/O
Ethernet / USB / Bluetooth

Low cost hardware

• MATLAB Support Package for Raspberry Pi™

• Webcam support package for previewing and acquiring live images

TETHERED
Write code and communicate with the board
table Data Type

Access

- A new fundamental data type in MATLAB
- Container for mixed-type tabular data
  - Holds both data and metadata
- Supports flexible indexing
- Built-in functionality (merge, sort, etc.)
Categorical Arrays

Access

- A new fundamental data type in MATLAB
- Container for discrete non-numeric data
  - Values drawn from a finite set of possible values ("categories")
- More memory efficient than a cell array of strings
- Can be compared using logical operators (similar to numeric arrays)
System Identification Integrated into PID Tuner App

Explore & Discover

Easy way to estimate a plant model and tune PID controller gains in one app

- Import measured input-output data directly into PID Tuner app
- Identify plant transfer function interactively or automatically
- Automatically tune PID controller gains
LTE System Toolbox
Explore & Discover

- ~200 functions for physical layer (PHY) modeling
- LTE and LTE-Advanced
- Golden reference to verify in-house PHY models
- Link-level simulation
- Signal generation and analysis
- Signal information recovery
Image Processing Toolbox
Share

- C-code generation for 25 new functions
  - Total of 35+ functions supported now
  - Requires MATLAB Coder

- GPU acceleration for 9 new functions
  - Total of 40+ functions now
  - Requires Parallel Computing Toolbox

```
imfilter  imbothat
imhist    imclose
fspecial  imdilate
edge      imerode
mean2     imfill
imwarp    imhmax
label2rgb imhmin
bwlookup  imopen
bwselect  imreconstruct
bwmorph   imtophat
```
Cody for MATLAB Practice

Teach & Learn

- Challenge and expand your MATLAB knowledge
- Solve problems related to MATLAB code
- Create and contribute problems for the community to solve
- Comment on & like any problem or solution

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- Gain insights through Solution Maps
- Download grading data

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Other New Features in MATLAB R2014a

- **Phased Array System toolbox**
  - C code generation for functions and objects using MATLAB Coder

- **Optimization Toolbox**
  - New solver (intlinprog) for mixed-integer linear programming (MILP) problems

- **Financial Instruments Toolbox**
  - Dual curve construction
  - Functions to compute credit exposure and exposure profile
  - Black's model pricing of caps, floors, and swaptions

- **Econometrics Toolbox**
  - ssd model for performing univariate and multivariate time-series data analysis

- **SimBiology**
  - Unified functions for model estimation
  - Desktop enhancements for model exploration
Key Areas of Focus
Simulink Product Family

- New Simulink Editor
- Component-Based Modeling
- Managing Projects and Data
- Design and Execute
Why MathWorks Is Investing in User Interface

Affords more time for designing and requires less time for building and configuring models

- Quickly create executable specifications.
- Access analysis tools without leaving the model editor.
- Manage data and model hierarchy from a single place.
- Verify designs using modeling standards.
Rich annotations
New Simulink Editor

Annotate Simulink models with rich text, graphics, and hyperlinks

- Add formatted text, tables and lists
- Copy and paste images or import a graphics file
- Add hyperlinks to Web pages or other documents
Simulink and Stateflow Content Preview

New Simulink Editor

View the contents of hierarchical systems

- Visually determine the contents of a subsystem, referenced model, Stateflow chart and subchart
- Individually enabled on each system
- Content preview default disabled
Comment Through Block Option

New Simulink Editor

Comment a block so that the output equals the input

- Signal passes through the block during simulation

- Comment out option remains available

- Works on blocks with the same number of inputs and outputs
Expand subsystem
New Simulink Editor

Flatten model hierarchy by bringing the contents of a subsystem up one level

- Pull a set of blocks into parent system by expanding the subsystem
- Inverse of Create Subsystem
- Quickly refactor models and subsystems
Why MathWorks Is Investing in Component-Based Modeling

Enables modular design for efficient and robust system development

- Facilitate collaboration, especially for modeling large systems.
- **Partition** algorithm specifications, physical models, and tests.
- Improve iteration, verification, and configuration.
Simulink Variant Manager
Component-Based Modeling

Create and validate variant configurations

- Visualize and explore variant hierarchies (including model variants)
- Create and validate variant configurations for automation
- Also accessible through Command-line API

Create/Edit Variant Configurations
Validate
Visualize, explore and edit variants and their properties
Control Variables
Hyperlinked Validation Results
MATLAB System Block
Component-Based Modeling

Utilize System objects in Simulink

- Create discrete-time Simulink blocks by authoring System objects in MATLAB language
- Simulate using code generation or the MATLAB Interpreter
- Block dialog automatically rendered based on list of public properties – no mask required

```matlab
classdef LMSFilter < matlab.System
    % LMSFilter: Least mean squares (LMS) adaptive filtering.
    %
    %#codegen

    properties
        % Mu Step size
        Mu = 0.005;
    end

    properties (Nontunable)
        % TrueCoefficients Actual Filter Coefficients
        TrueCoefficients = 0;
    end
end
```
Advisor-based workflow for converting subsystems to Model blocks
Component-Based Modeling

Simplify the process of converting a subsystem to a referenced model

- Guides users through all conversion steps
- Provides detailed information about problems
- Supports automatic fixing of certain problems
Why MathWorks Is Investing in Project Management

Improves how design components are shared and managed throughout a project’s life cycle

- **Identify dependencies** for distributing and recreating designs.
- **Compare versions** to track changes as the design evolves.
- **Improve iteration, verification, and configuration management.**
Simulink Projects
Managing Projects and Data

Impact Analysis to Find Dependencies

- Analyze modified files to determine set of files impacted
- View impacted files, required files, and all dependencies
- Export list of impacted files to Batch Job view or MATLAB workspace
- Branching support through Git source control
Data Dictionary
Managing Projects and Data

Store, edit and access design data using the data dictionary

- Change tracking and differencing
- Defined relationship with SLDD file
- Componentization
- Scalability and performance
- Integration with Simulink Projects
Performance Advisor
Design & Execute

- Performance Advisor analyzes your model for common performance bottlenecks
- Option to automatically apply the advice you receive
- Tool verifies whether its advice does indeed speed up your model
Connecting to Low-Cost Hardware
Design & Execute

- Support for popular low-cost platforms such as Arduino Due hardware, LEGO MINDSTORMS EV3 hardware, and Samsung Galaxy Android devices
- Connect directly to hardware from Simulink or Student Version
- Libraries of Simulink blocks that connect to I/O ports, sensors, and actuators

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EMBEDDED
Develop a model and program the board

LEGO MINDSTORMS EV3

Samsung Galaxy S4
What’s New in Polyspace Product Family

- **Polyspace Code Prover**: Prove the absence of run-time errors in software.
- **Polyspace Bug Finder**: Identify software defects via static analysis.
- **Takes advantage of MATLAB platform**

**Key**

- Optional
- Required
- Product stack
Key Areas of Focus

MATLAB Product Family

- Access
- Explore and Discover
- Share
- Teach & Learn

Simulink Product Family

- New Simulink Editor
- Component-Based Modeling
- Managing Projects and Data
- Design and Execute
Interact

Ask questions

Learn

Give us your feedback

Share

Network

Enjoy the Conference !!!