MATLAB EXPO 2018

What’s New in MATLAB and Simulink  R2017b  R2018a

이영준 이사
Platform Productivity

Getting your work done faster

Workflow Depth

Support for your entire workflow

Application Breadth

Products for the work you do
- Create Your Designs Faster
- Simplify Analysis
- Simulate Faster and Scale Your Work
- Collaborate
Create Your Designs Faster

MATLAB

Live Editor
Create Your Designs Faster

MATLAB

App Designer
Create Your Designs Faster

MATLAB

App Designer

Find out more:

인터랙티브 프로그래밍 기법 및 진보된 GUI 개발도구 소개
Create Your Designs Faster

MATLAB

Simulink
Create Your Designs Faster

MATLAB

Simulink

Stateflow
Simplify Analysis with Apps

These interactive applications automate common technical computing tasks

- Econometric Modeler app
  - Perform time series analysis, specification testing, modeling, and diagnostics

- Analog Input Recorder app
  - Acquire and visualize analog input signals

- Wavelet Signal Denoiser app
  - Visualize and denoise time series data
Simplify Analysis by Simulating at Wall Clock Speed

Slow down the simulation for easier model interactivity

- Especially for models controlled and monitored via Dashboard blocks and other displays
- Useful when model is connected to hardware
Scale Your Work

Use parallel computing to run multiple simulations faster

- Run multiple parallel simulations with `parsim`
- Monitor simulation status and progress in the Simulation Manager
Scale Your Work

Use tall arrays to manipulate and analyze data that is too big to fit in memory

- Use familiar MATLAB functions and syntax
- Support for hundreds of functions
- Works with Spark + Hadoop clusters
Simulate Faster

Redesigned execution engine runs MATLAB code faster

- All MATLAB code can now be JIT compiled
- MATLAB runs your code over twice as fast as it did just three years ago
- No need to change a single line of your code
- Increased speed of MATLAB startup in R2018a
Team Collaboration

Use advanced software development features to manage, test, and integrate MATLAB code.
Team Collaboration

Use advanced software development features to manage, test, and integrate MATLAB code

MATLAB® Test Report

Timestamp: 04-Jan-2017 13:28:06
Host: AH-SDI
Platform: win64
MATLAB Version: 9.1.0.441655 (R2016b)

Number of Tests: 17
Testing Time: 0.4516 seconds
Overall Result: PASSED

Overview

Details

Identify differences between model elements, Stateflow charts, and MATLAB Function blocks
▪ Create Your Designs Faster

▪ Simplify Analysis

▪ Simulate Faster and Scale Your Work

▪ Collaborate
- Deployment of MATLAB Algorithms and Applications
- Code Generation from Simulink Models
- Verification and Validation
Deploy MATLAB Algorithms and Applications

**Access Data**
- Sensors
- Files
- Databases

**Analyze Data**
- Data exploration
- Preprocessing
- Domain-specific algorithms

**Develop**
- AI model
- Algorithm development
- Modeling & simulation

**Deploy**
- Desktop apps
- Enterprise systems
- Embedded devices
Deploy MATLAB Algorithms and Applications

Share your work outside of MATLAB without having to recode your algorithms

- Standalone desktop applications
- Add-ins for Microsoft Excel
- Software components to integrate with other languages (C/C++, .NET, Python, Java)
- Software components for web and enterprise applications
Deploy MATLAB Algorithms and Applications

Share your work outside of MATLAB without having to recode your algorithms

- Standalone desktop applications
- Add-ins for Microsoft Excel
- Software components to integrate with other languages (C/C++, .NET, Python, Java)
- Software components for web and enterprise applications

Find out more:
엔터프라이즈, 빅 데이터 및 애널리틱 솔루션 활용을 위한 MATLAB 적용기술 소개

Demo Booth
Deploy MATLAB Algorithms

Deploy machine learning and deep learning models using automatically generated code

- Generate C code for predictive machine learning and deep learning models
- Generate optimized CUDA code for deep learning, embedded vision, and autonomous systems
Deploy MATLAB Algorithms

Deploy machine learning and deep learning models using automatically generated code

- Generate C code for predictive machine learning and deep learning models
- Generate optimized CUDA code for deep learning, embedded vision, and autonomous systems
PID Control Tuning

Implement an embedded PID auto-tuning algorithm

- Automatically tune PID controller gains in real time against a physical plant
- No model of plant dynamics required
- Deploy the auto-tuning algorithm to embedded software using automatic code generation
Prepare Your Model for Code Generation

Prepare model components for code generation

Scheduling Compositions with Different Modeling Styles
Prepare Your Model for Code Generation

Prepare model components for code generation

Prepare model data for code generation
Prepare Your Model for Code Generation

Prepare model components for code generation

Find out more:
대규모 SW 개발에 적합한 모델링 패턴 및 코드 생성 방안
Generate Code from Simulink Models

Access and define all the information in your model related to code generation

- View and define implementation data in one place
- View implementation details without model details
Generate Code from Simulink Models

Access and define all the information in your model related to code generation

- View and define implementation data in one place
- View implementation details without model details

Find out more:
대규모 SW 개발에 적합한 모델링 패턴 및 코드 생성 방법

Code Perspective
Generate Code from Simulink Models

Access and define all the information in your model related to code generation

- View and define implementation data in one place
- View implementation details without model details
- Improve code performance and ease integration with other C code

Row-major memory layout option
Generate Code from Simulink Models

Access and define all the information in your model related to code generation

- View and define implementation data in one place
- View implementation details without model details
- Improve code performance and ease integration with other C code

Find out more:

MATLAB 코드의 C코드 생성 워크플로우 및 최적화 요령

Row-major memory layout option
Connecting Your Design to Hardware

Connect directly to hardware with support packages

- Live streaming to and from hardware
- Run Simulink models on low-cost hardware, such as Arduino, Raspberry Pi, and LEGO
- Automatically generate code and run it on microprocessors, FPGAs, and more.
Deploying to FPGA or ASIC Hardware

- HDL Verifier
- HDL Coder
- Fixed-Point Designer
- Vision HDL Toolbox
- LTE HDL Toolbox

Native Floating Point

Matrix Support

Vision HDL Toolbox

LTE HDL Toolbox

HDL Checks in Model Advisor

MathWorks
Deploying to FPGA or ASIC Hardware

- Algorithm
- Algorithm w/ Hardware Implementation
- HDL Coder
- Fixed-Point HDL
- FPGA/ASIC Implementation

Find out more:
Tech Talk: FPGA/ASIC을 타겟으로 한 알고리즘의 효율적인 생성 방법 및 신기능 소개

- Native Floating Point
- Vision HDL Toolbox
- LTE HDL Toolbox
- HDL Checks in Model Advisor

HDL Verifier
HDL Coder
Fixed-Point Designer
Vision HDL Toolbox
LTE HDL Toolbox
Verification and Validation

Products for the entire workflow

Simulink Requirements R2017b

Simulink Design Verifier

Simulink Coverage R2017b

Simulink Test

Simulink Check R2017b

Polyspace

now supports

MATLAB EXPO 2018
Verification and Validation

Products for the entire workflow

Simulink Requirements
- Requirements tracing
- Simulation
- Test Management
- Code inspection

Simulink Design Verifier
- Property proving
- Standards checks
- Code verification

Simulink Check
- Test generation

Simulink Test
- Standards checks
- Code verification

Polyspace
- now supports

Find out more:
임베디드 SW 개발에서의 품질 확보 방안
- Deployment of MATLAB Algorithms and Applications
- Code Generation from Simulink Models
- Verification and Validation
Platform Productivity

Workflow Depth

Application Breadth

- Autonomous Systems
- Wireless Communications
- Artificial Intelligence (AI)
Designing Autonomous Systems
Designing Autonomous Systems

Mapping of environments using sensor data

- Segment and register lidar point clouds
- Lidar-Based SLAM: Localize robots and build map environments using lidar sensors
Designing Autonomous Systems

Understanding the environment using computer vision and deep learning techniques

- Object detection and tracking
- Semantic segmentation using deep learning

Designing Autonomous Systems

Design synthetic driving scenarios to test controllers and sensor fusion algorithms

- Interactively design synthetic driving scenarios composed of roads and actors (*vehicles, pedestrians, etc.*)
- Generate visual and radar detections of actors
Designing Autonomous Systems

Model predictive control for adaptive cruise control and lane-keeping algorithms

- Use prebuilt blocks instead of starting from scratch
- Simplified application-specific interfaces for configuring model predictive controllers
- Flexibility to customize for your application

Model Predictive Control Toolbox
Designing Autonomous Systems

Model predictive control for adaptive cruise control and lane-keeping algorithms

- Use prebuilt blocks instead of starting from scratch
- Simplified application-specific interfaces for configuring model predictive controllers
- Flexibility to customize for your application

Model Predictive Control Toolbox

Find out more:
Teck Talk: MATLAB 기반 로봇 및 자율 시스템의 개발
Demo Booth
Full Vehicle Simulation

Ride & handling

Chassis controls

Automated Driving
Full Vehicle Simulation

Ride & handling
Chassis controls
Automated Driving

Find out more:
Tech Talk: Vehicle Dynamics Blockset 소개
Demo Booth
Design with the Latest Wireless Standards

- LTE
- 5G
- Wi-Fi 802.11ax
- ZigBee
- NB-IoT
Design with the Latest Wireless Standards

Find out more:

5G 이동통신 표준 무선시스템 개발
Model-Based Design for Wireless Communications

- Algorithm Design and Verification
- RF, Digital and Antenna Co-Design
- System Verification and Testing
- Rapid Prototyping and Production

**Design**
- Transmitter
  - Baseband
  - Digital Front End
  - Digital PHY
  - DAC
  - Antenna

- Receiver
  - Baseband
  - Digital Front End
  - Digital PHY
  - ADC
  - Antenna

**Prototype**
- C Code
- HDL
- SDR Platform

**Implement**
- Processor
- FPGA
- ASIC

**Code Generation and Verification**
- Fixed-Point Designer
- HDL Coder
- HDL Verifier
- LTE HDL Toolbox
- Embedded Coder

MATLAB EXPO 2018
RF and Antenna Design and Prototyping

Use RF and Antenna models through your entire development cycle

- RF top-down design with RF Budget Analyzer app
- Adaptive hybrid beamforming and MIMO system modeling
- RF Power Amplifier modeling and DPD linearization
- RF propagation and 3D terrain visualization
- Design and fabrication of printed (PCB) antennas

From idea ... to implementation
RF and Antenna Design and Prototyping

Use RF and Antenna models through your entire development cycle

- RF top-down design with RF Budget Analyzer app
- Adaptive hybrid beamforming and MIMO system modeling
- RF Power Amplifier modeling and DPD linearization
- RF propagation and 3D terrain visualization
- Design and fabrication of printed (PCB) antennas

Find out more:
Demo Booth
Model Moist Air Systems

Model HVAC and environmental control systems

- Model and simulate HVAC systems for a plant, such as a building, automobile, aircraft

- New library contains chambers, reservoirs, local restrictions, energy converters, sources and sensors

- Ensure acceptable temperature, pressure, humidity, condensation within the environment

- Note for Simscape in general: Run simulations about 5x faster with local solver option
Artificial Intelligence
Text Analytics

```
repairNotes = 617x1 string array
    "PM SERVICE, CHECK TURN SIGNAL, CLUNKING NOISE"
    "SERVICEROB,EXT,5684"
    "NEED 4 PLow PINS"
    "INSTALL SPINNER ASSY"
    "DONT START"
    "DOG BONE PIN BROKEN"
    "NEED SERVICE, CHECK BRAKES"
    "HYD CAP CHECK ENGINE LIGHT ON"
    "TARP VALVE STICKING RIGHT SIDE MIRROR BRACKET"
    "HANDLES IN CAB LOOSE"
    "NO PLow LIGHTS"
    "WHEEL LIFT PINS"
```
Text Analytics

Work with text from equipment logs and operator reports

- **Preprocess** raw text data by extracting, filtering, and splitting

- **Visualize** text using word clouds and text scatter plots

- **Develop** predictive models using built-in machine learning algorithms (LDA, LSA, word2vec)
Work with text from equipment logs and operator reports

- **Preprocess** raw text data by extracting, filtering, and splitting
- **Visualize** text using word clouds and text scatter plots
- **Develop** predictive models using built-in machine learning algorithms (LDA, LSA, word2vec)
Predictive Maintenance

Normal Operation

Monitor Closely

Maintenance Needed

Predictive Maintenance Toolbox

New Product
Predictive Maintenance

Data

Sensors

Normal Operation

Monitor Closely

Maintenance Needed

Find out more:
물리모델 시뮬레이션을 활용한 고장 예측

Predictive Maintenance Toolbox
New Product
Predictive Maintenance

Design and test condition monitoring and predictive maintenance algorithms

- Import sensor data from local files and cloud storage (Amazon S3, Windows Azure Blob Storage, and Hadoop HDFS)
- Use simulated failure data from Simulink models
- Estimate remaining useful life (RUL)
- Get started with examples (motors, gearboxes, batteries, and other machines)
Predictive Maintenance

Design and test condition monitoring and predictive maintenance algorithms

- Import sensor data from local files and cloud storage (Amazon S3, Windows Azure Blob Storage, and Hadoop HDFS)
- Use simulated failure data from Simulink models
- Estimate remaining useful life (RUL)
- Get started with examples (motors, gearboxes, batteries, and other machines)
Deep Learning

Data → Model → Output

Neural Network Toolbox
Computer Vision System Toolbox
GPU Coder
Deep Learning

Find out more:
딥러닝을 활용한 영상 인식 응용프로그램 개발 워크플로우
Demo Booth

Neural Network Toolbox
Computer Vision System Toolbox
GPU Coder
Deep Learning

Design, build, and visualize convolutional neural networks

- Access the latest models
- Import pretrained models and use transfer learning
- Automate ground-truth labeling using apps
- Design and build your own models
- Use NVIDIA GPUs to train your models
- Automatically generate high-performance CUDA code for embedded deployment

![Diagram showing prediction rates for different models on TitanXP GPU]

- TensorFlow
- MATLAB
- MXNet
- GPU Coder

Neural Network Toolbox
Computer Vision System Toolbox
GPU Coder
Deep Learning

Design, build, and visualize convolutional neural networks

- Access the latest models
- Import pretrained models and use transfer learning
- Automate ground-truth labeling using apps
- Design and build your own models
- Use NVIDIA GPUs to train your models
- Automatically generate high-performance CUDA code for embedded deployment

Find out more:
개발에서 구현까지 MATLAB 환경에서의 딥러닝
Demo Booth

TensorFlow
MATLAB
MXNet
GPU Coder

Images / sec

AlexNet
ResNet-50
VGG-16

Neural Network Toolbox
Computer Vision System Toolbox
GPU Coder
FREE

Learn to Use MATLAB for Deep Learning in 2 Hours

Launch Deep Learning Onramp
What’s New in MATLAB and Simulink?

**Platform Productivity**
- Design Creation
- Analysis
- Simulation, Scaling
- Collaboration

**Workflow Depth**
- Deployment
- Code Generation
- Verification and Validation

**Application Breadth**
- Autonomous Systems
- Wireless Communications
- Artificial Intelligence (AI)
What’s New in MATLAB and Simulink?

Platform Productivity
- Design Creation
- Analysis
- Simulation, Scaling
- Collaboration

Workflow Depth
- Deployment
- Code Generation
- Verification and Validation

Application Breadth
- Autonomous Systems
- Wireless Communications
- Artificial Intelligence (AI)
Upgrade your MATLAB Code and Simulink Models