【学生向け】 MATLABとSimulinkの基礎

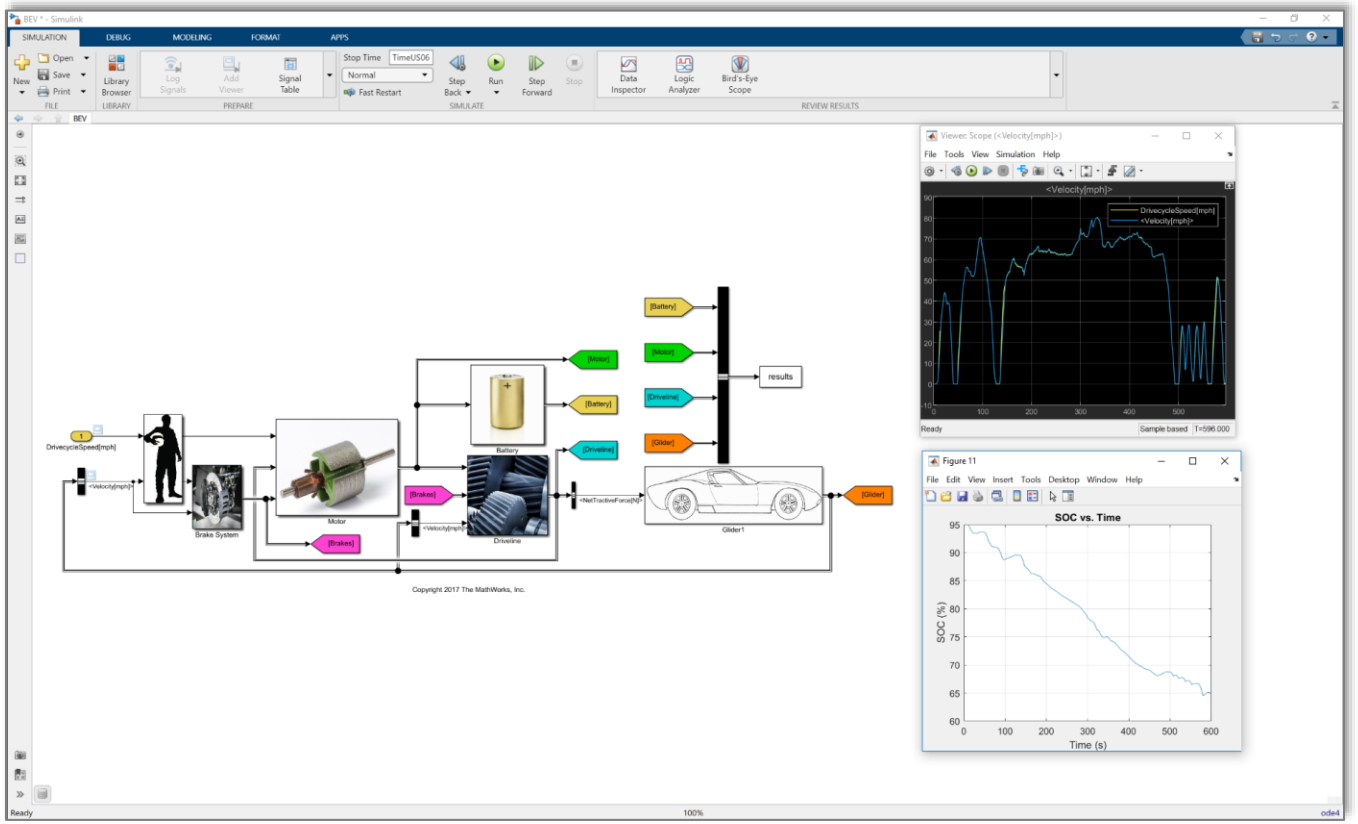
Introduction to MATLAB and Simulink

Nobu Iijima,

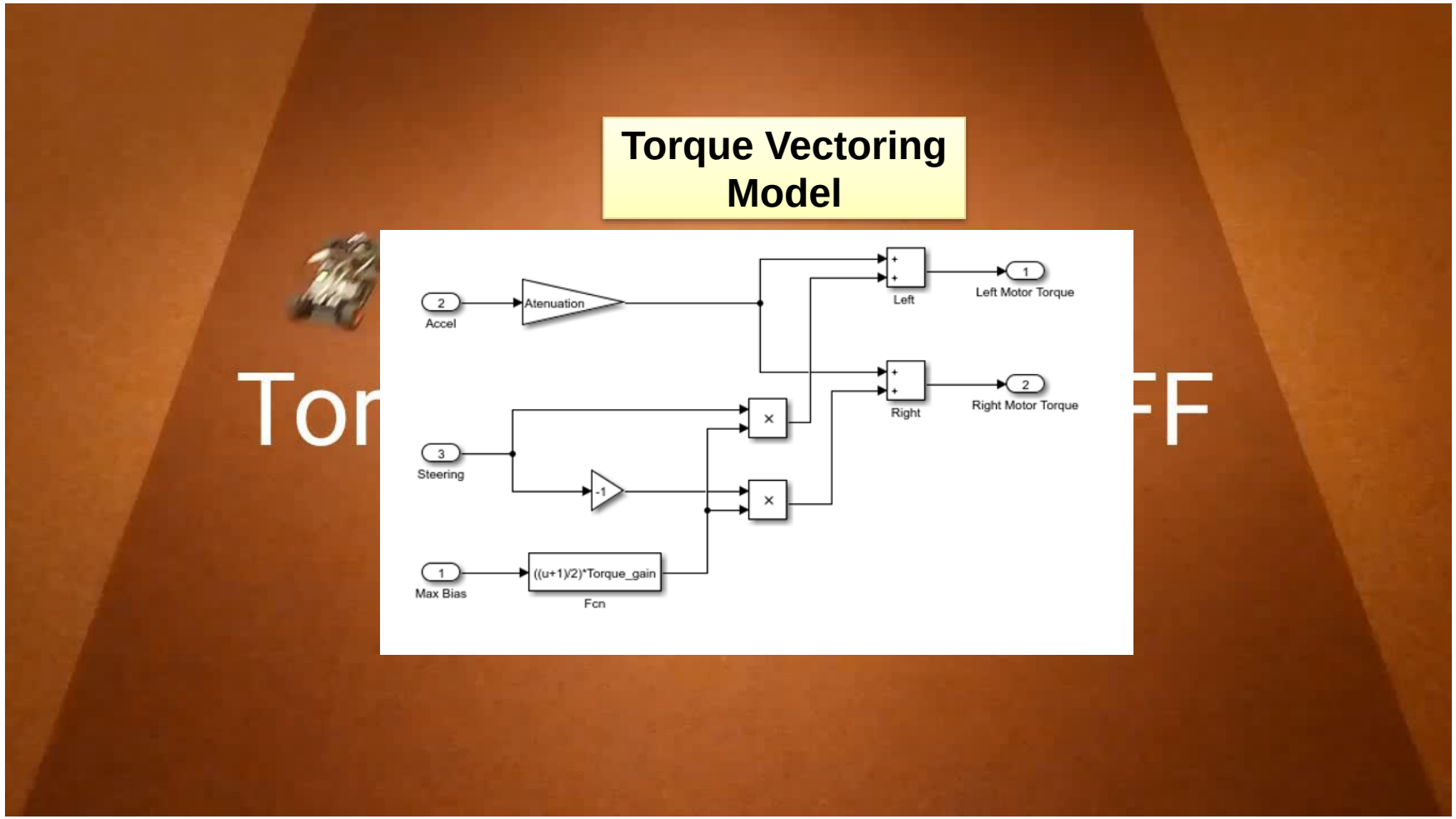
6/26（金）17:00-18:15

アジェンダ

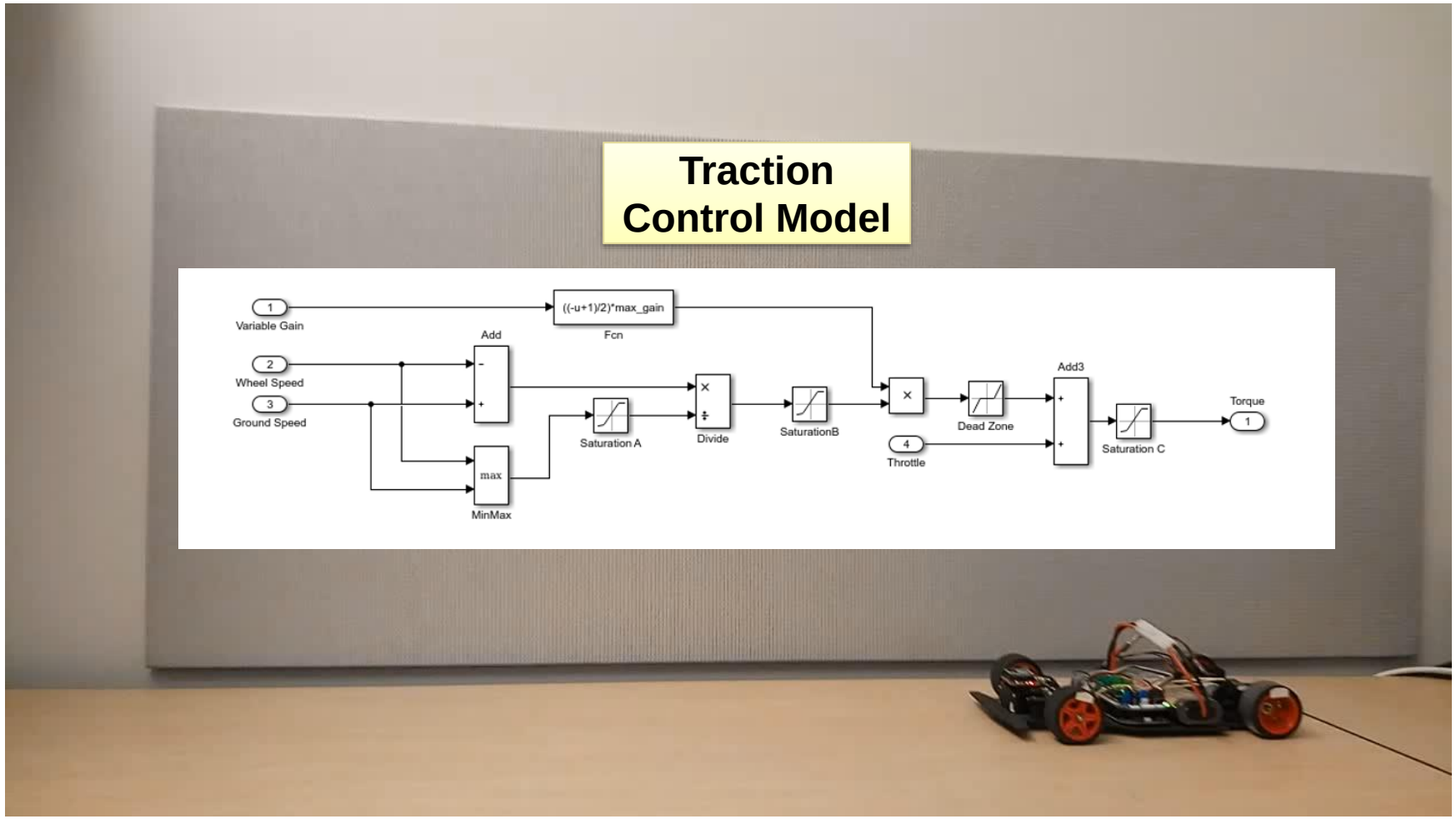
- MATLAB
  - 基本操作
  - バネ・マス・ダンパーモデル
- Simulink
  - 基本操作
  - DCモーターのプラントと制御モデル
  - 電気自動車
- Resources
- Q&A



サンプル1: トルクベクタリング



サンプル2: トラクションコントロール

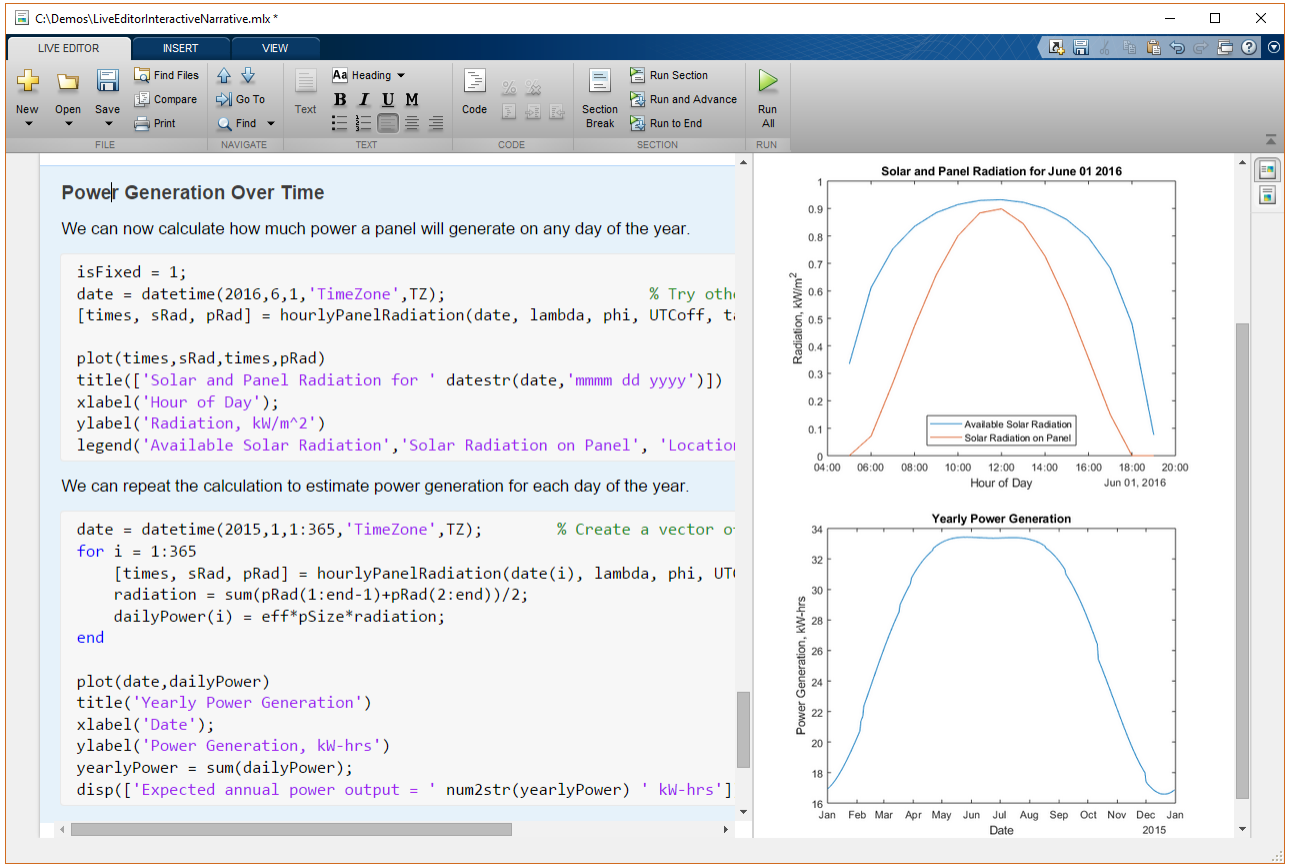


MATLABとは?

- エンジニアや科学者のために特別に設計されたプログラミングプラットフォーム
- Matrix Laboratory

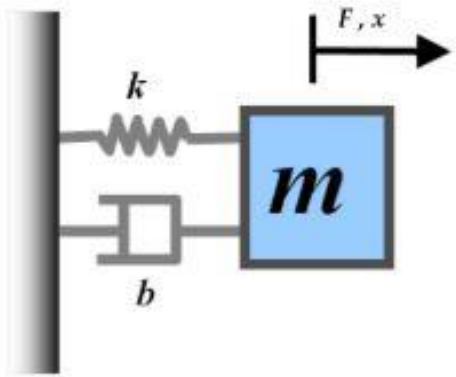
☆ MATLAB使用例

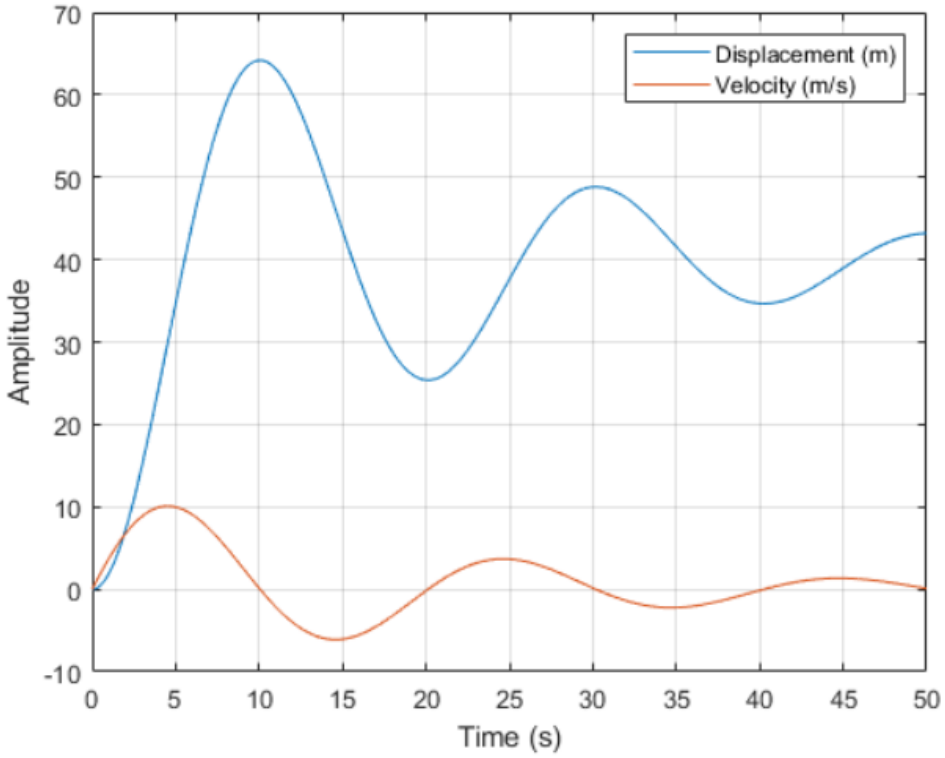
- データ解析
- アルゴリズム開発
- 組み込みや制御
- モデルの作成とシミュリレーション



バネマスダンパーモデル

モデル: サスペンション





目標: 乗り心地のいい車を作るためのモデルの作成

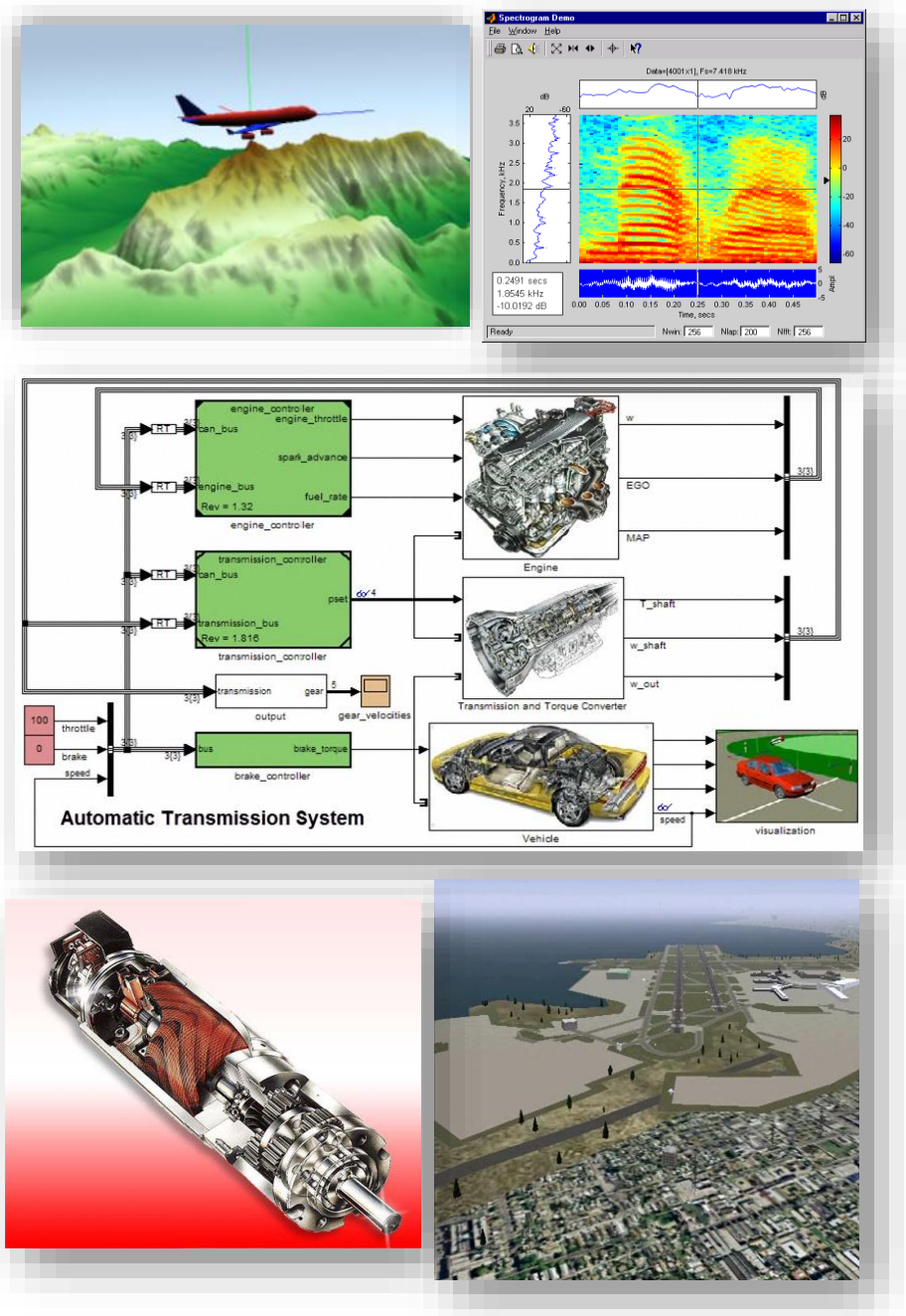
既知: 力F, 質量m, ばね定数k, ダンパー係数b
解: 変位x, 速度v

Software Demonstration

Simulinkとは?

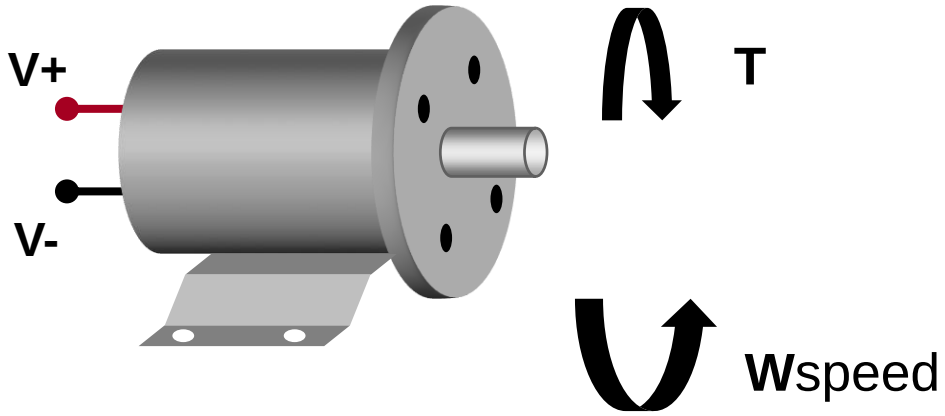
組み込み、動的システムのモデリング、シミュレーション、および実装のための主要な環境

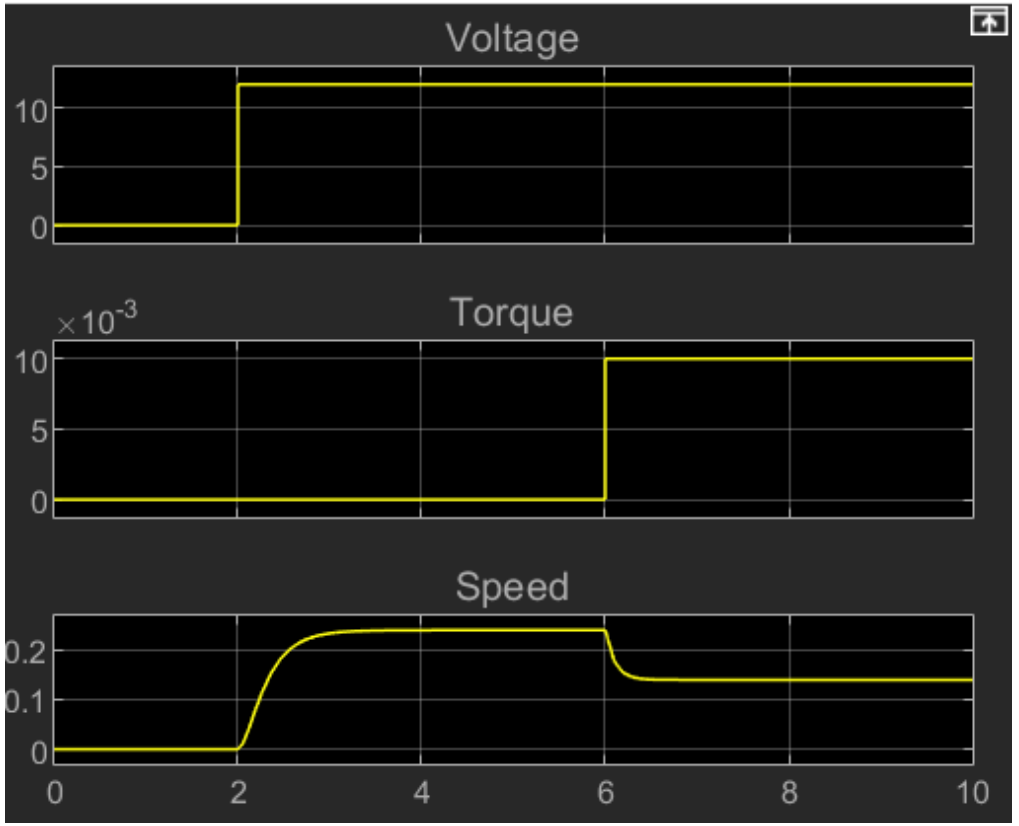
- Simulinkはブロック環境です
- 複雑なシステムを正確に設計、実装、およびテストできる:
  - 制御
  - 信号処理
  - 動画および画像処理
- モデルベース開発のプラットフォーム



DCモーターのモデリングと制御

モデル:





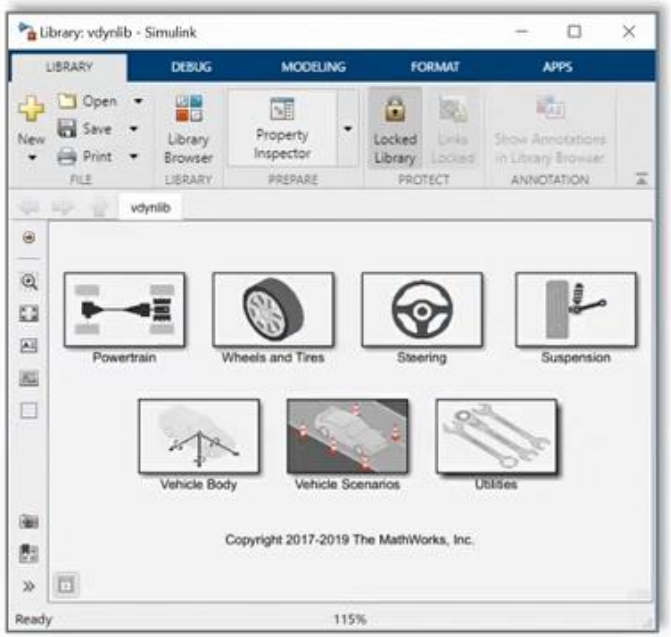
目標: DCモーターの回転速の計測と制御

既知: 電圧, トルク
解: 回転速

Software Demonstration

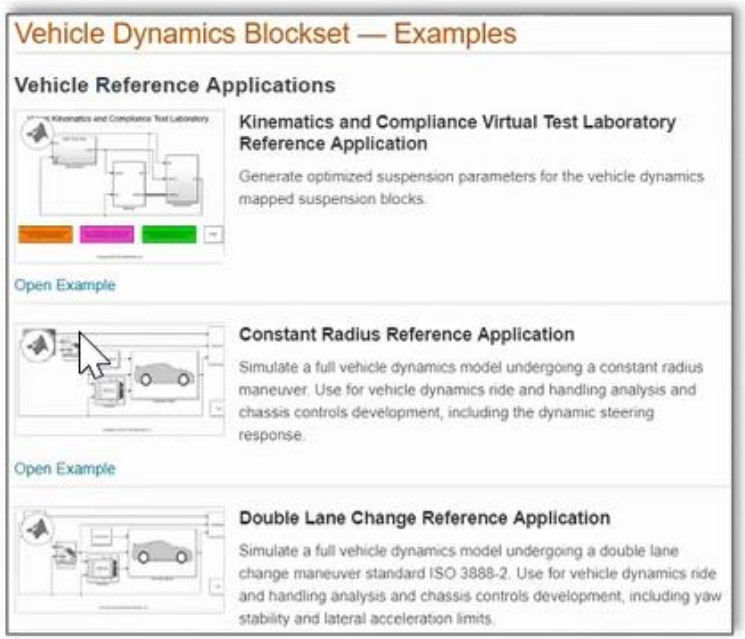
Software Demonstration

Vehicle Dynamics Blockset



Library of Blocks

Prebuilt Scenes



Fully Assembled Reference Applications

Student Competition Tutorials and Videos

Learn how to use MATLAB and Simulink to solve competition tasks

» Get started now

https://www.mathworks.com/academia/student-competitions/tutorials-videos.html

Student Competition: Code Generation Training, Overview

Code Generation

Learn how to generate readable, standalone C/C++ code from MATLAB functions and Simulink models. Navigate and customize the generated code before deploying directly onto target hardware boards. Use Simulink as an integration environment and generate code for multirate systems.

» Detailed Syllabus

Access tutorials (7 Videos)

Student Competition: Mobile Robotics Training: Overview

Mobile Robotics

Learn how to design and simulate common mobile robotics algorithms in MATLAB and Simulink, such as open- and closed-loop feedback control systems, for your robot to perform tasks like dead reckoning, line following, and obstacle detection. Use custom simulation tools to test algorithms within Simulink before deploying them to an actual robot.

» Detailed Syllabus

Access tutorials (6 Videos)

Student Competition: Physical Modeling Training Overview

Physical Modeling

Get started with modeling, simulating, and analyzing automotive systems, including longitudinal vehicle dynamics and 3D suspension modeling. These tutorials will help your team set up a vehicle model, and predict lap times, fuel consumption, and battery life.

» Detailed Syllabus

Access tutorials (12 Videos)

Student Competition: Computer Vision Training Overview

Computer Vision

Understand fundamental computer vision techniques, such as feature extraction, object detection, text recognition, and point cloud processing. These tutorials will enable your team to design and deploy computer vision algorithms in MATLAB and Simulink to perform tasks such as autonomous recognition of targets and obstacle avoidance.

» Detailed Syllabus

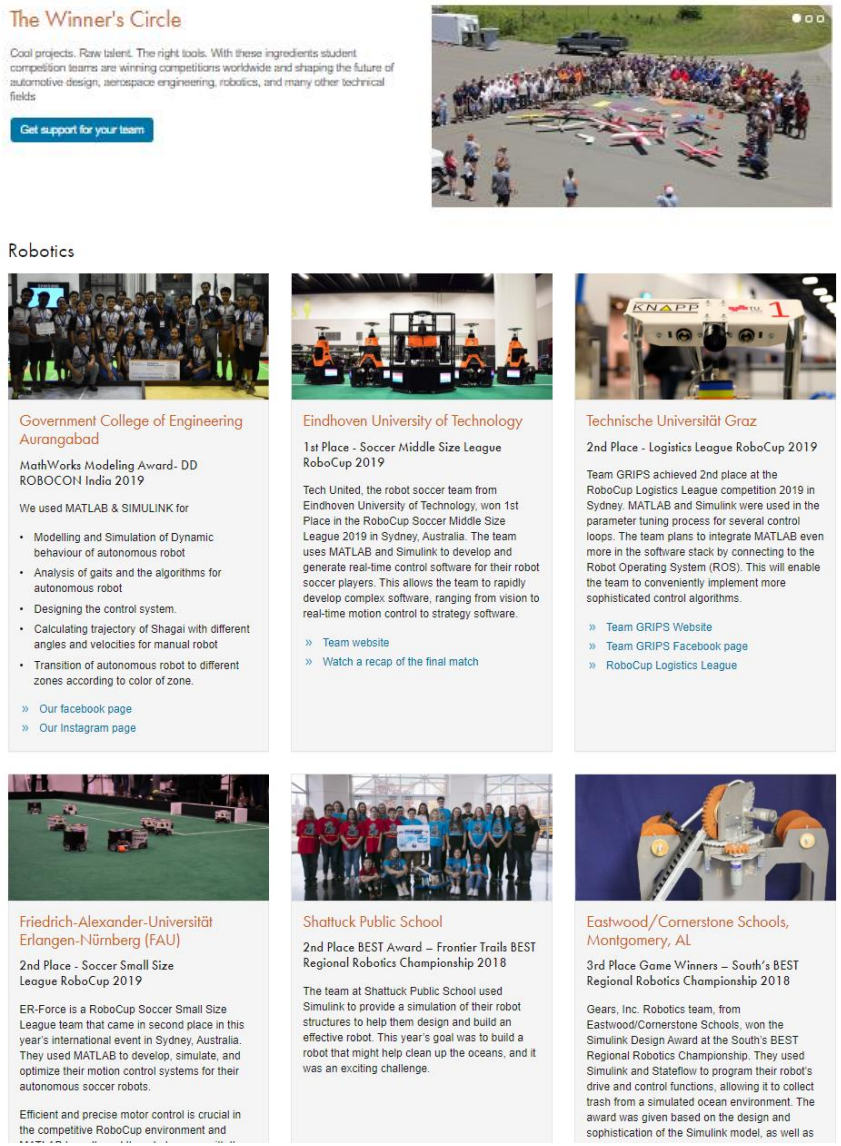
Access tutorials (12 Videos)

The Winner's Circle

See how students are winning competitions worldwide with MATLAB and Simulink

» Explore student projects

https://www.mathworks.com/academia/superstar-students.html



The Winner's Circle

Cool projects. Raw talent. The right tools. With these ingredients student competition teams are winning competitions worldwide and shaping the future of automotive design, aerospace engineering, robotics, and many other technical fields

Get support for your team

Robotics

Government College of Engineering Aurangabad

MathWorks Modeling Award- DD ROBOCON India 2019

We used MATLAB & SIMULINK for

- Modelling and Simulation of Dynamic behaviour of autonomous robot
- Analysis of gaits and the algorithms for autonomous robot
- Designing the control system.
- Calculating trajectory of Shagai with different angles and velocities for manual robot
- Transition of autonomous robot to different zones according to color of zone.

» Our facebook page
» Our Instagram page

Eindhoven University of Technology

1st Place - Soccer Middle Size League RoboCup 2019

Tech United, the robot soccer team from Eindhoven University of Technology, won 1st Place in the RoboCup Soccer Middle Size League 2019 in Sydney, Australia. The team uses MATLAB and Simulink to develop and generate real-time control software for their robot soccer players. This allows the team to rapidly develop complex software, ranging from vision to real-time motion control to strategy software.

» Team website
» Watch a recap of the final match

Technische Universität Graz

2nd Place - Logistics League RoboCup 2019

Team GRIPS achieved 2nd place at the RoboCup Logistics League competition 2019 in Sydney. MATLAB and Simulink were used in the parameter tuning process for several control loops. The team plans to integrate MATLAB even more in the software stack by connecting to the Robot Operating System (ROS). This will enable the team to conveniently implement more sophisticated control algorithms.

» Team GRIPS Website
» Team GRIPS Facebook page
» RoboCup Logistics League

Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)

2nd Place - Soccer Small Size League RoboCup 2019

ER-Force is a RoboCup Soccer Small Size League team that came in second place in this year's international event in Sydney, Australia. They used MATLAB to develop, simulate, and optimize their motion control systems for their autonomous soccer robots.

Efficient and precise motor control is crucial in the competitive RoboCup environment and

Shattuck Public School

2nd Place BEST Award – Frontier Trails BEST Regional Robotics Championship 2018

The team at Shattuck Public School used Simulink to provide a simulation of their robot structures to help them design and build an effective robot. This year's goal was to build a robot that might help clean up the oceans, and it was an exciting challenge.

Eastwood/Cornerstone Schools, Montgomery, AL

3rd Place Game Winners – South's BEST Regional Robotics Championship 2018

Gears, Inc. Robotics team, from Eastwood/Cornerstone Schools, won the Simulink Design Award at the South's BEST Regional Robotics Championship. They used Simulink and Stateflow to program their robot's drive and control functions, allowing it to collect trash from a simulated ocean environment. The award was given based on the design and sophistication of the Simulink model, as well as

Student Competition Communities

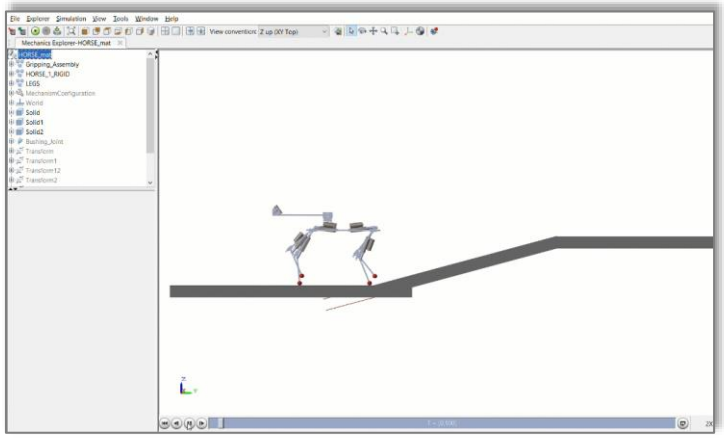
Overview

MATLAB and Simulink Racing Lounge

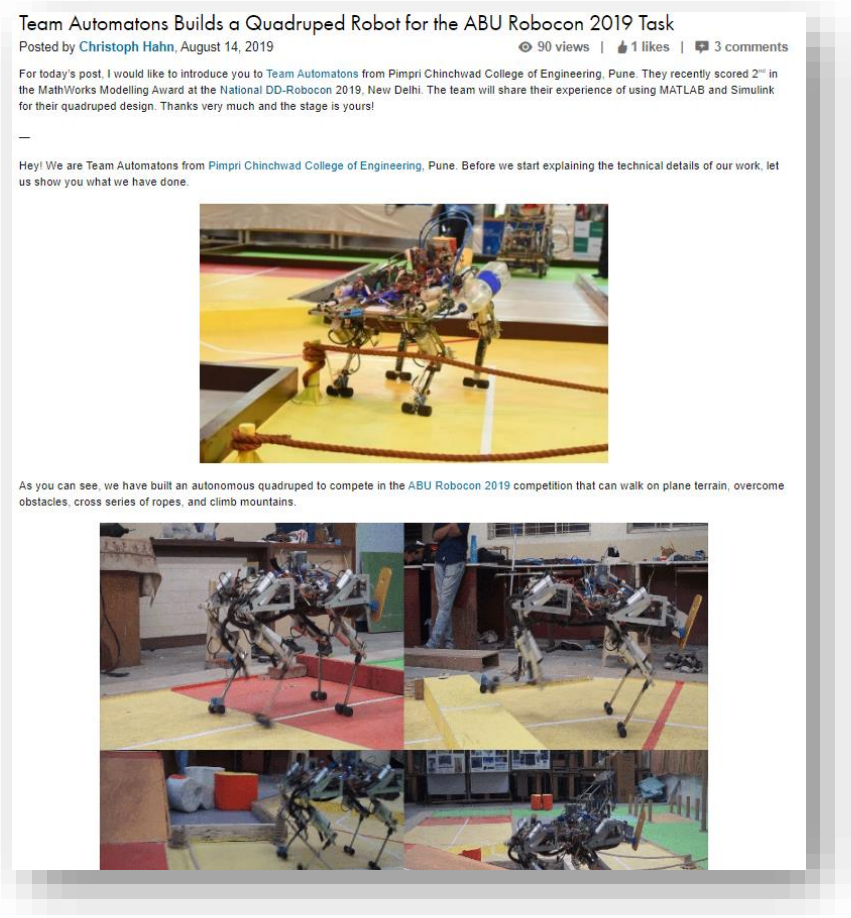
[Video series](#) - [Facebook Group](#)

MATLAB and Simulink Robotics Arena

[Video series](#) - [Facebook Group](#)



[Racing Lounge blog](#)
(for all competitions)



Team Automatons Builds a Quadruped Robot for the ABU Robocon 2019 Task

Posted by Christoph Hahn, August 14, 2019 — 90 views | 1 likes | 3 comments

For today's post, I would like to introduce you to Team Automatons from Pimpri Chinchwad College of Engineering, Pune. They recently scored 2nd in the MathWorks Modelling Award at the National DD-Robocon 2019, New Delhi. The team will share their experience of using MATLAB and Simulink for their quadruped design. Thanks very much and the stage is yours!

—

Hey! We are Team Automatons from Pimpri Chinchwad College of Engineering, Pune. Before we start explaining the technical details of our work, let us show you what we have done.

As you can see, we have built an autonomous quadruped to compete in the ABU Robocon 2019 competition that can walk on plane terrain, overcome obstacles, cross series of ropes, and climb mountains.

MATLAB Answers

- **誰でも利用できる質問ボックス**
- **日本語対応**

https://jp.mathworks.com/matlabcentral/answers/

Student Communities Twitter Account

- NobuthWorks https://twitter.com/NobuthWorks

- セミナーの告知
- 企業について
- 学生イベント

Racing Lounge Resources

- 連絡先

  racinglounge@mathworks.com

  facebook.com/groups/RacingLounge

- **MATLAB and Simulink Racing Lounge**
  mathworks.com/RacingLounge
- **Software Offer for Competition teams**
  mathworks.com/academia/student-competitions
- **Racing Lounge Blog**
  http://blogs.mathworks.com/racing-lounge

Thank you for watching

Q + A