

Modellbasierte Entwicklung in der Messtechnik

Dr. Simon Ginsburg
The MathWorks GmbH



Agenda

- Einleitung und Übersicht
- Hardwareanbindung von The MathWorks Tools
- Was ist “Modellbasierte Entwicklung”
- Messtechnische Modellbildung mit MATLAB® und Simulink®
- Demonstrationen
- Zusammenfassung

Medrad Ensures Safety of MRI Vascular Injection Pump Using MathWorks™ Tools

Challenge

To design an MRI vascular injection pump that would administer safe levels of pharmaceuticals to patients

Solution

Use MathWorks™ tools to improve the pump's pressure-sensing technology

Results

- Design time reduced by several months
- Prestigious industry award received
- FDA approval achieved



The Medrad Spectris Solaris contrast injection system.

“MathWorks™ tools enabled us to understand the system-level interactions among the components, to model the physics, and to determine safety limits of the pump very efficiently and quickly.”

**John F. Kalafut
Medrad**

Allegro MicroSystems Reduces Anti-Lock Braking System Sensor Development Time

Challenge

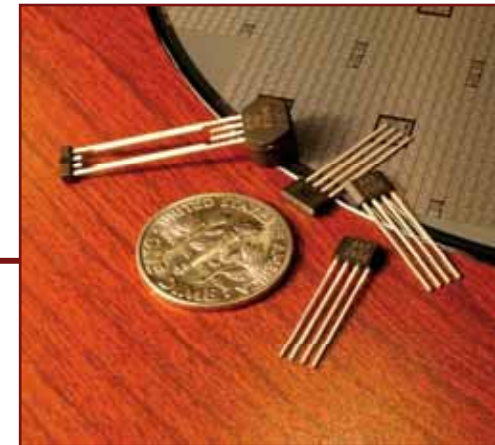
To accelerate the development of next-generation Hall-effect sensors for anti-lock braking systems

Solution

Use Simulink® and SimPowerSystems™ to quickly and accurately design and simulate electrical and logical models and simulate new sensor systems

Results

- Time-to-market shortened
- Risk of algorithm flaws reduced
- Tests developed before sensor manufacturing

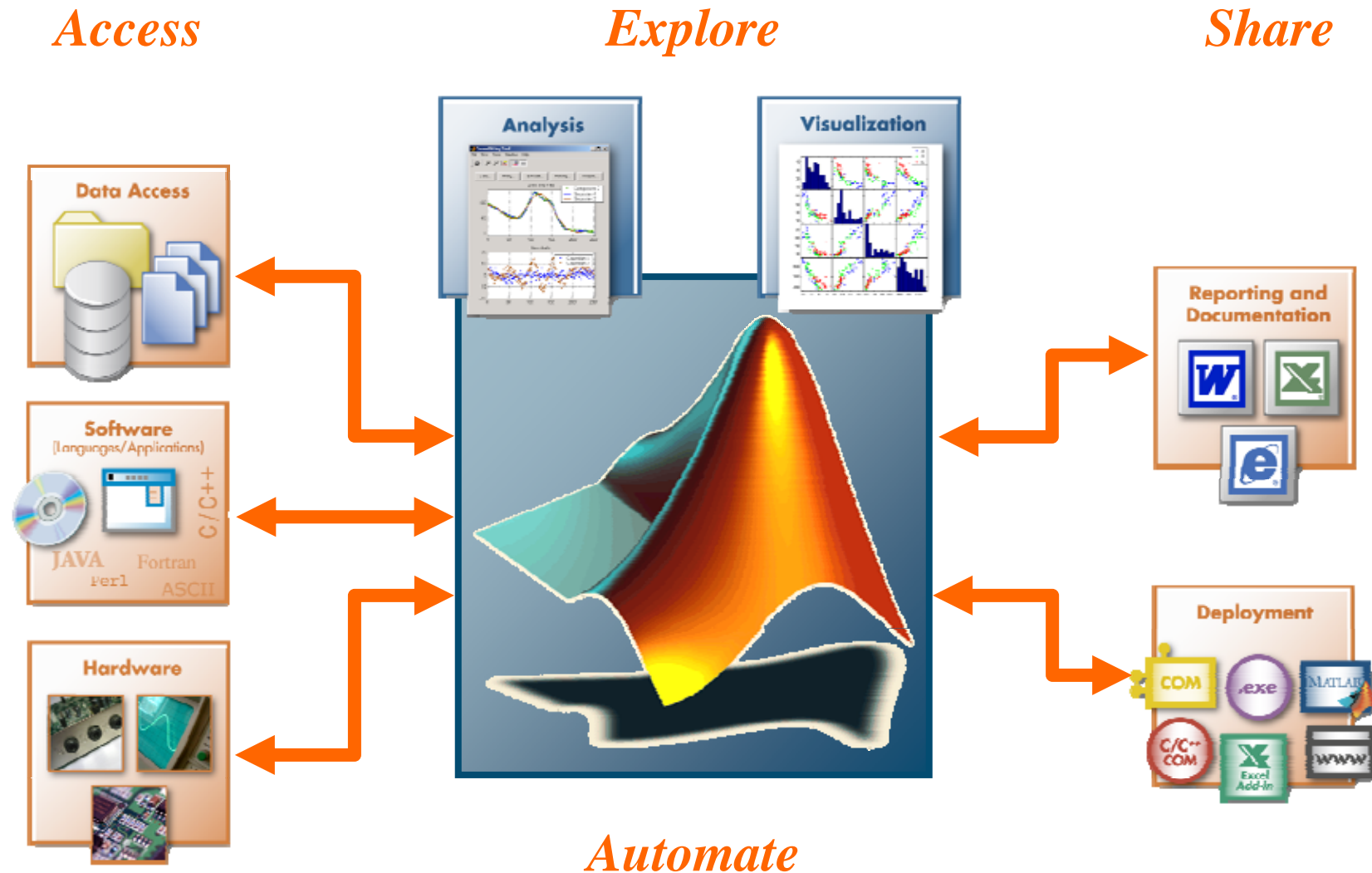


Anti-lock braking system sensors.

“Using MathWorks™ tools, we identified the best algorithm choice. Because the model ran much faster than our circuit simulator, we caught implementation errors much quicker and shortened our time to market.”

**Cory Voisine
Allegro MicroSystems**

MATLAB for Data Analysis



MATLAB Connects to Your Hardware Devices

Instrument Control Toolbox

Instruments and RS-232 serial devices



Data Acquisition Toolbox

Plug-in data acquisition devices and sound cards

Image Acquisition Toolbox

Image capture devices



Vehicle Network Toolbox

Vector CAN bus interface devices

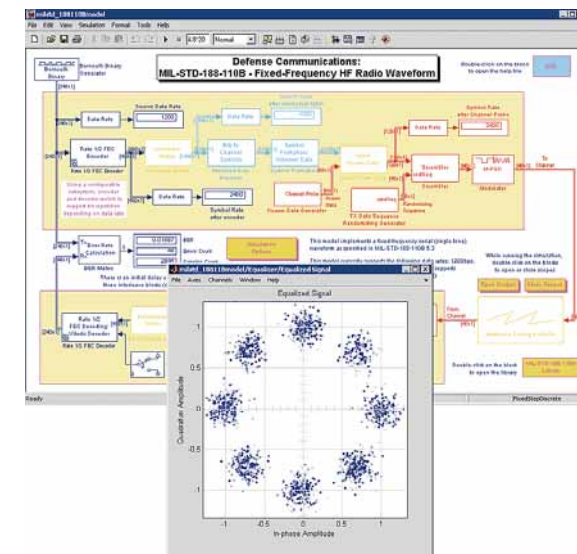
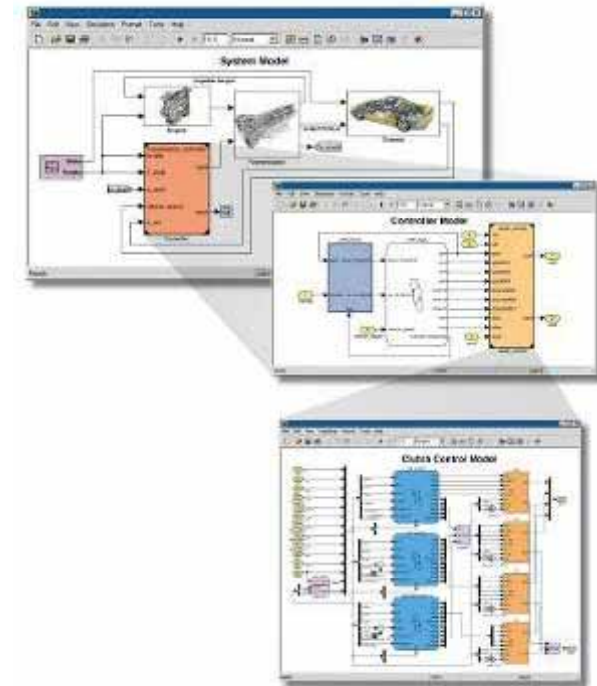
MATLAB

Interfaces for communicating with everything



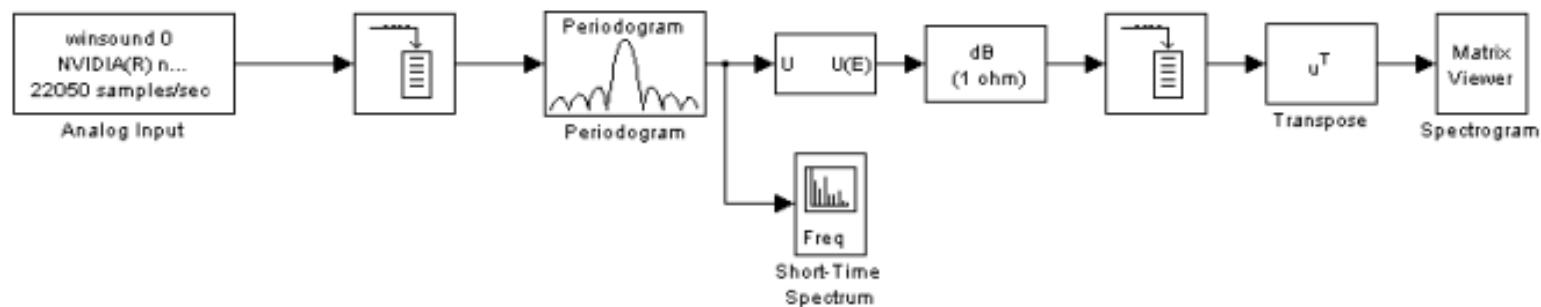
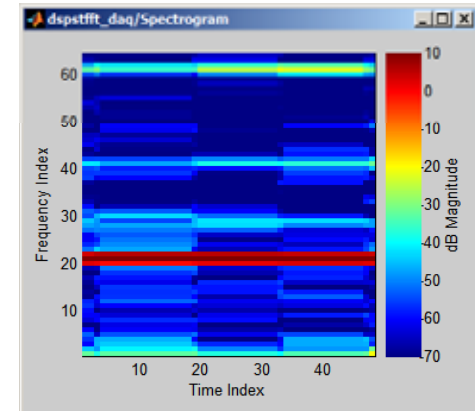
Introduction to Simulink®

- Block-diagram environment
- Model, simulate, and analyze multidomain systems
- Platform for Model-Based Design

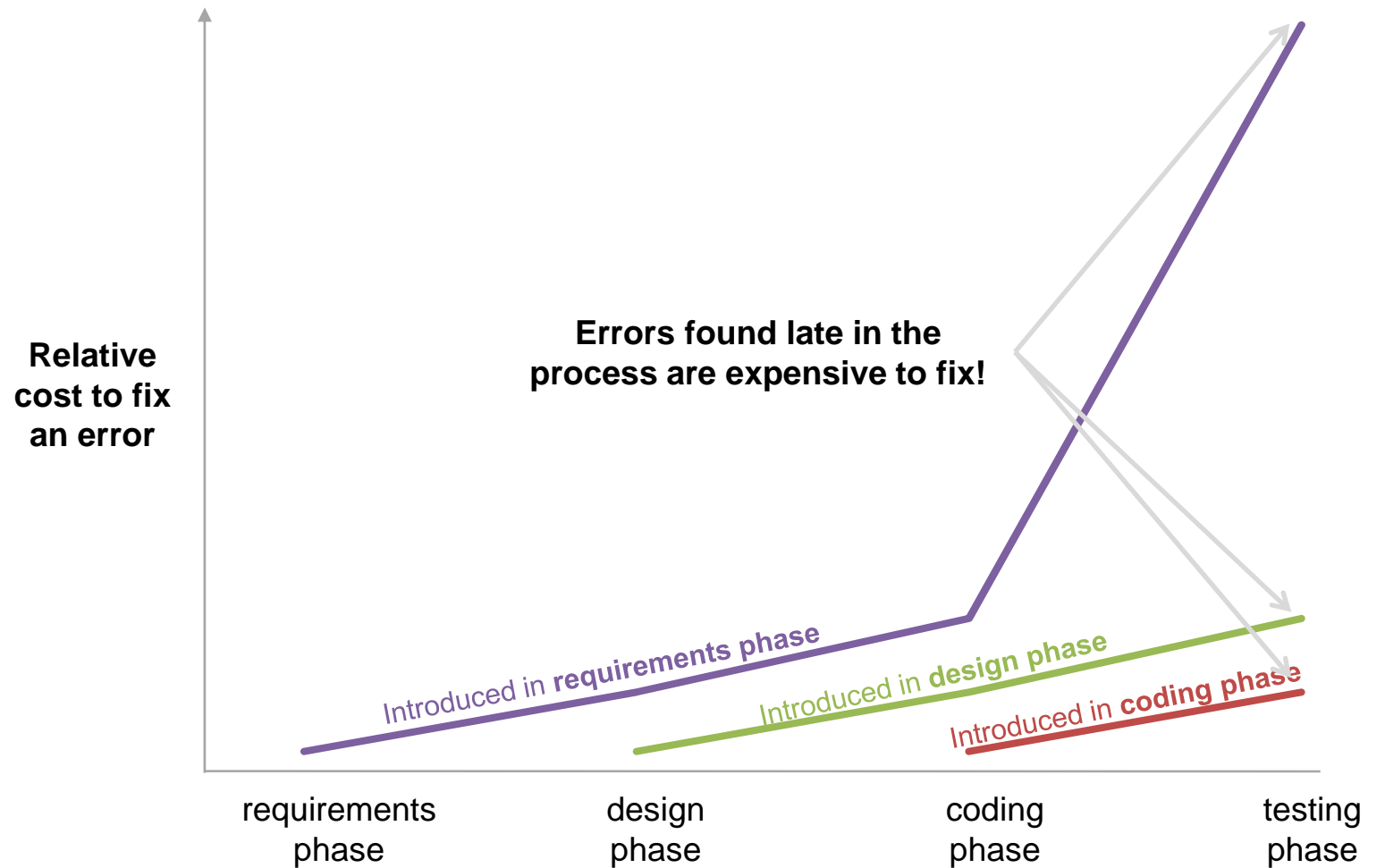


Using Data Acquisition Toolbox with Simulink

- Acquire live or measured data directly into Simulink[®] models from data acquisition devices
- Directly evaluate your Simulink algorithms against real-world data



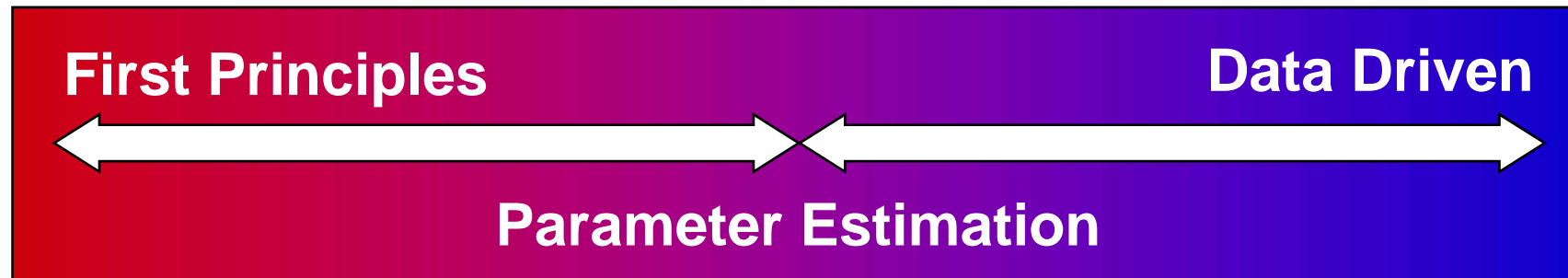
Finding Errors Early is Important



Source: Return on Investment for Independent Verification & Validation, NASA, 2004.

Modeling: *understanding your design problem*

- **Data Driven methods: *the existing system***
- **‘First Principles’ modeling: *the new design***
- **Parameter Estimation: *the first prototype***



The Value of Model-Based Design

Innovation

- Explore unique features through rapid design iterations
- Conduct cost-effective design trade-off studies

Quality

- Prevent errors from reaching the hardware stage of the design process
- Reduce rework

Cost

- Reduce expensive physical prototypes
- Reduce testing costs

Time-to-Market

- Get it right the first time
- Accelerate the development process

