

# Simulink Support for VEX Cortex

## BEST Robotics 2012

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NATIONAL CORPORATE PARTNER

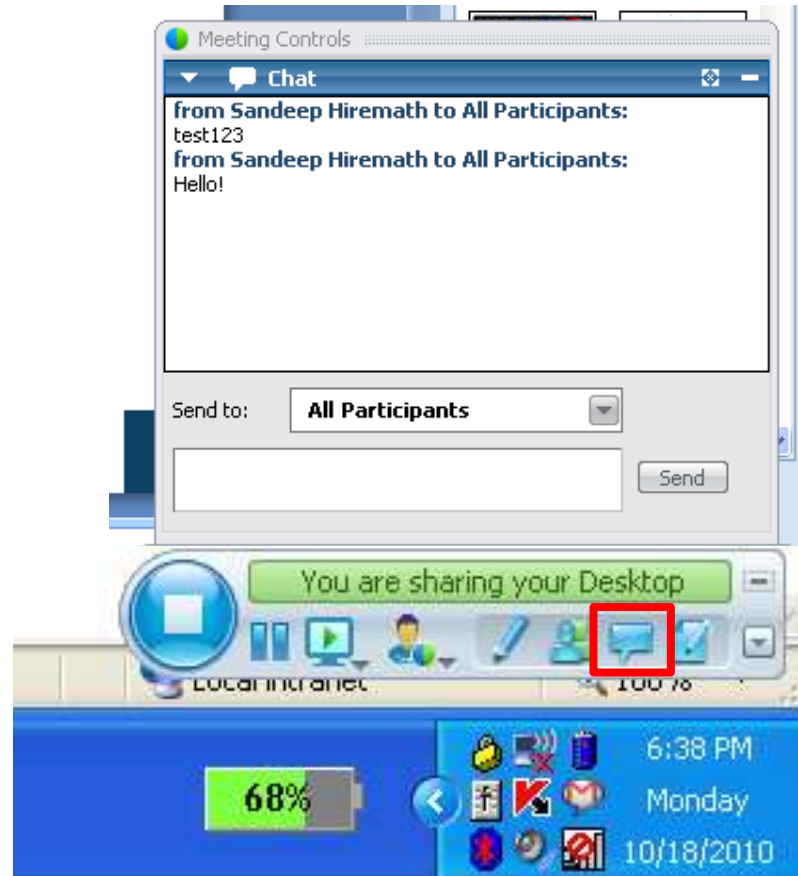


Boosting Engineering, Science & Technology.



# WebEx

- Chat

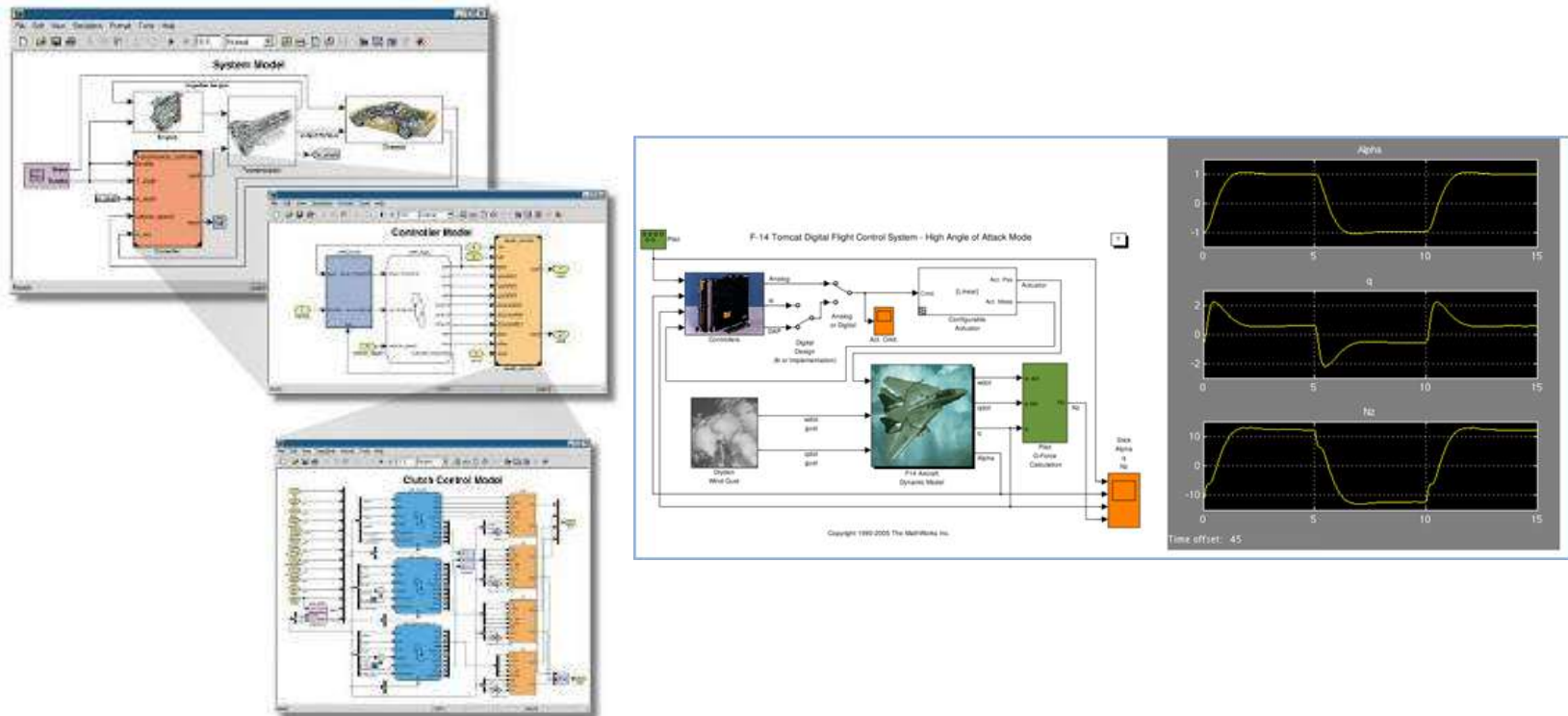


# Outline

- Intro to Simulink
- Simulink software support for VEX
  - Launching and Navigating through the software
  - Creating a simple robot program
  - Simulating and Debugging robot programs
  - Advanced Programming
- Access to the software
- Software Installation
- More Training Resources

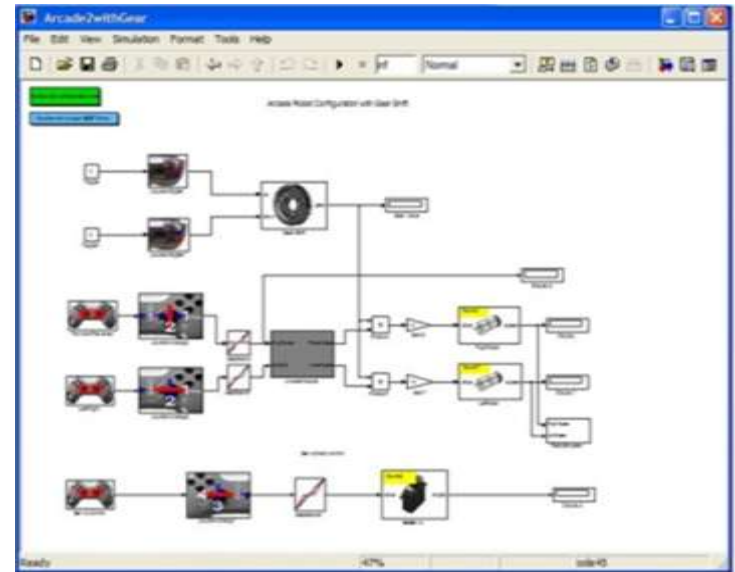
# What is Simulink?

Simulink is a software package for modeling, simulating, and testing the BEST robot program.



# Why Simulink?

- Simple Programming Interface
  - Easy to use interface
  - Graphical drag and drop
- More Efficient Design Flow
  - Parallel development
  - No waiting for robot to be built
- Simulation and Debug
  - Test your program without hardware
  - What-if scenarios are easy
- Advanced Programming also
  - Stateflow
  - Embedded MATLAB code



# Lets Build!

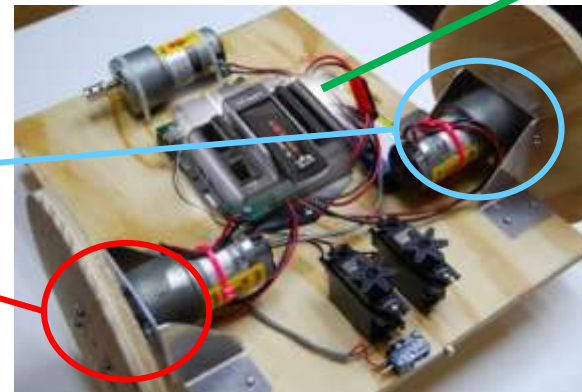
- Tank Robot Configuration
  - tank2.mdl (Example model)
  - 2 vertical axes control the 2 wheels



Joystick Control



Your Robot

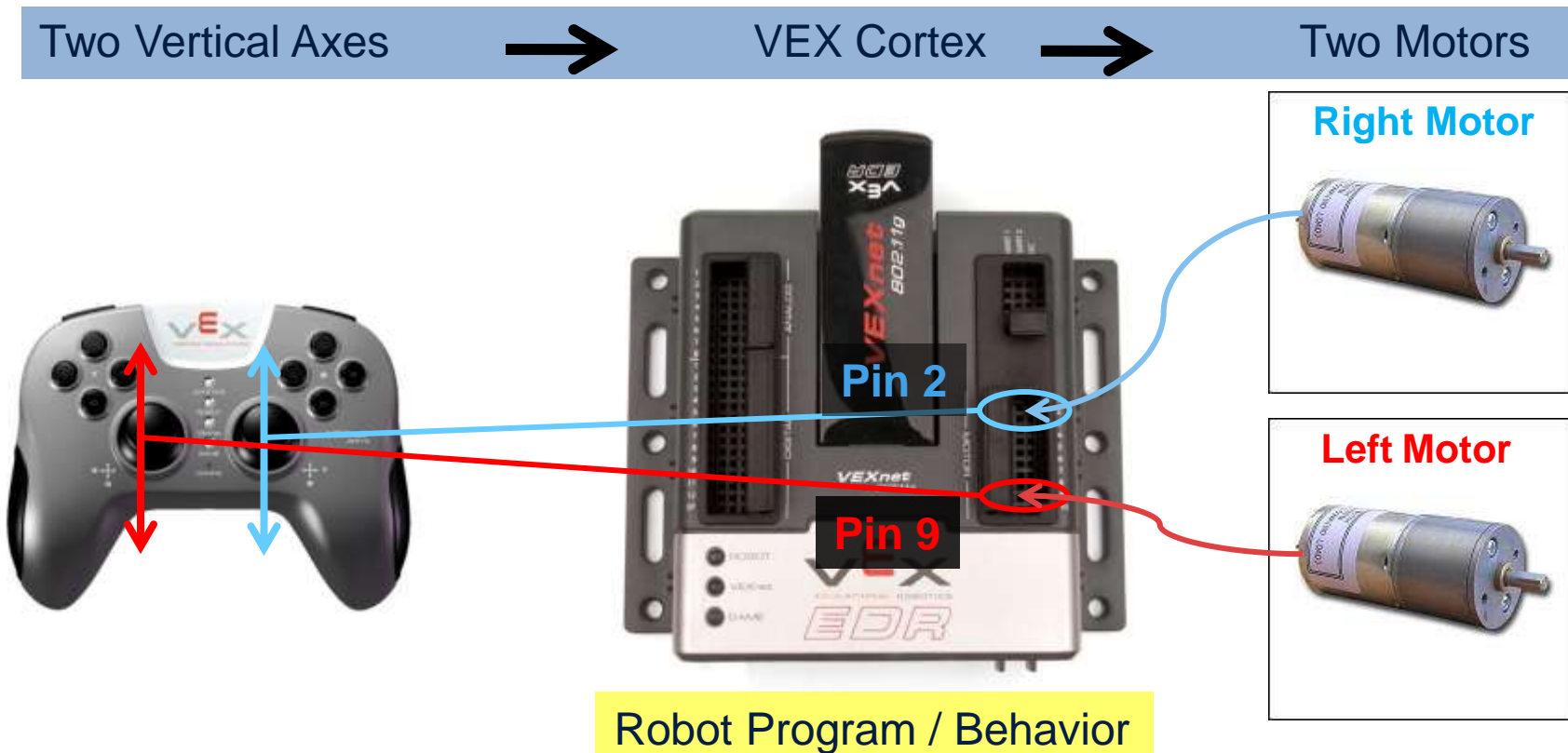


Robot Program / Behavior



# Lets Build!

- Tank Robot Configuration
  - tank2.mdl (Example model)





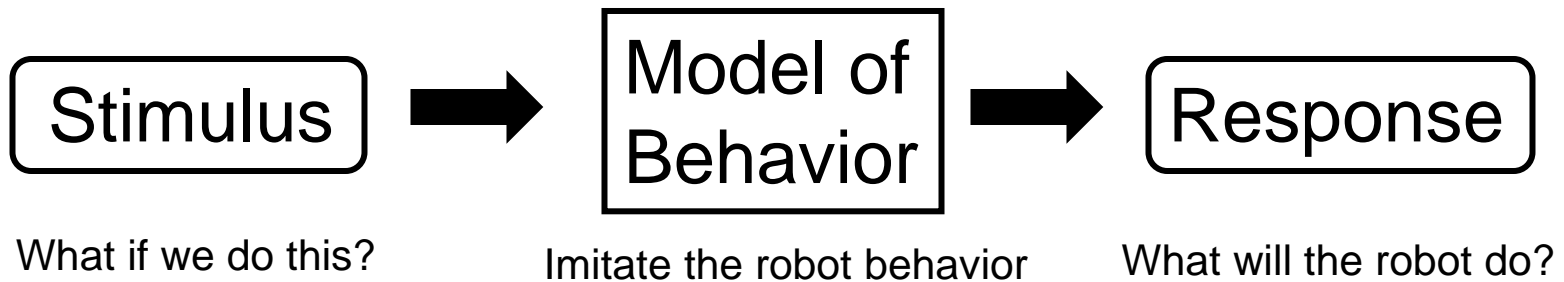
## New terms

- **Simulink model** – robot program
- **Block** – command or function
- **Library** – group of blocks or commands
- **Generate code** - Auto generate C code from the Simulink model
- **Run a Simulink model** – ‘Simulate’ a program on PC

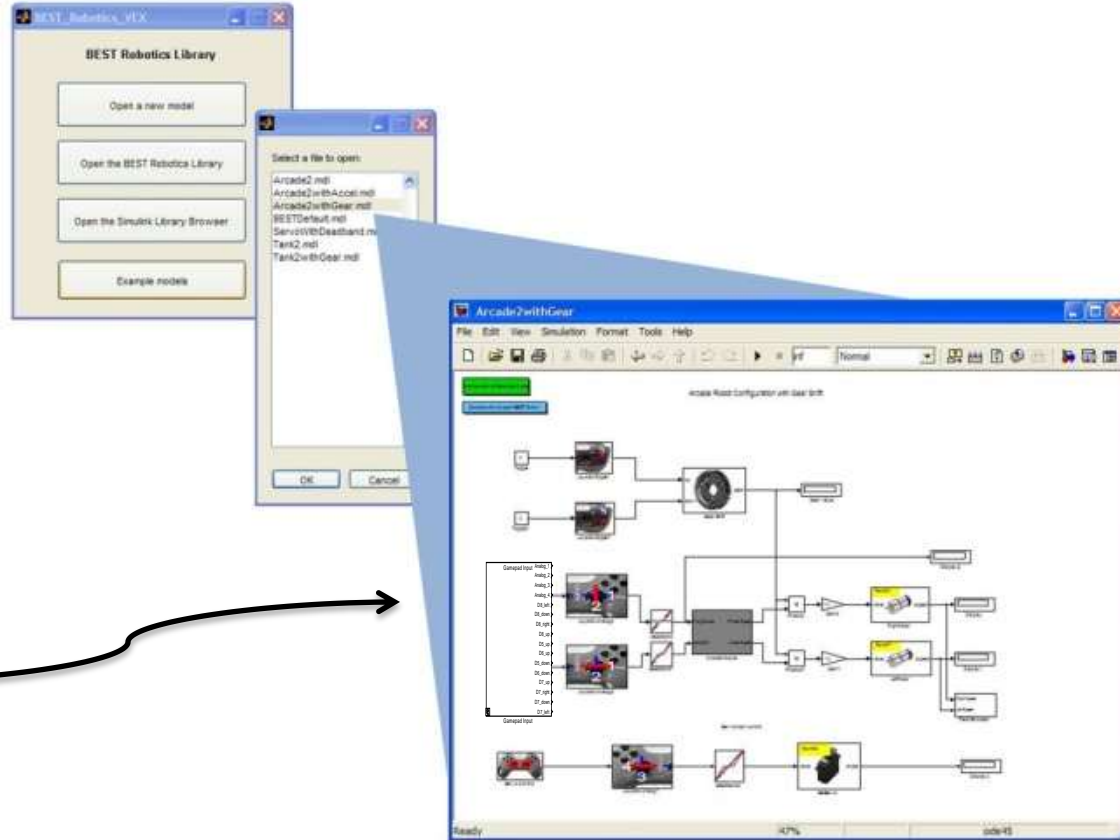


# What is Simulation?

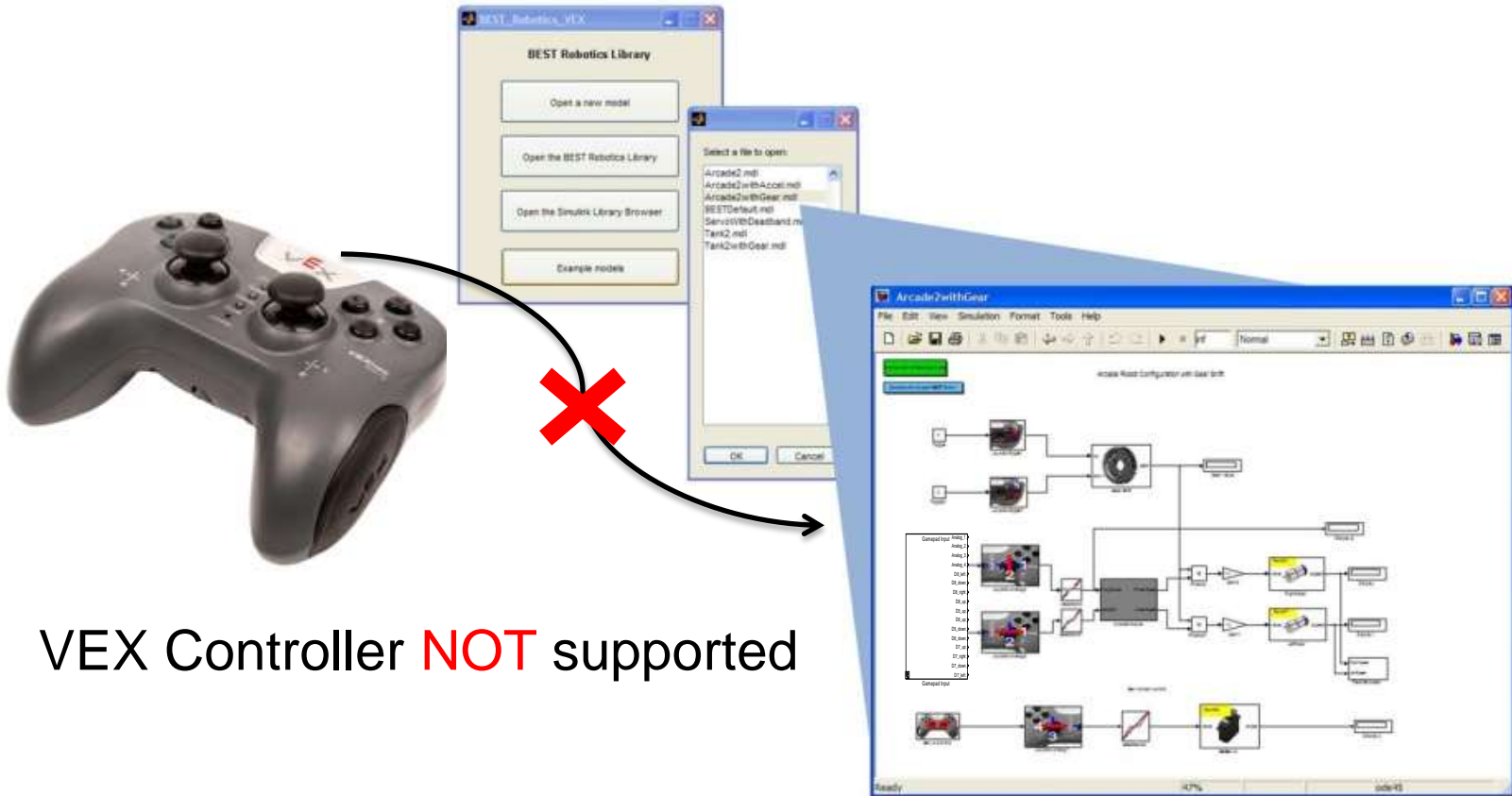
**Simulation** is the imitation of some real thing, state of affairs, or process.



# Gamepad Input to program

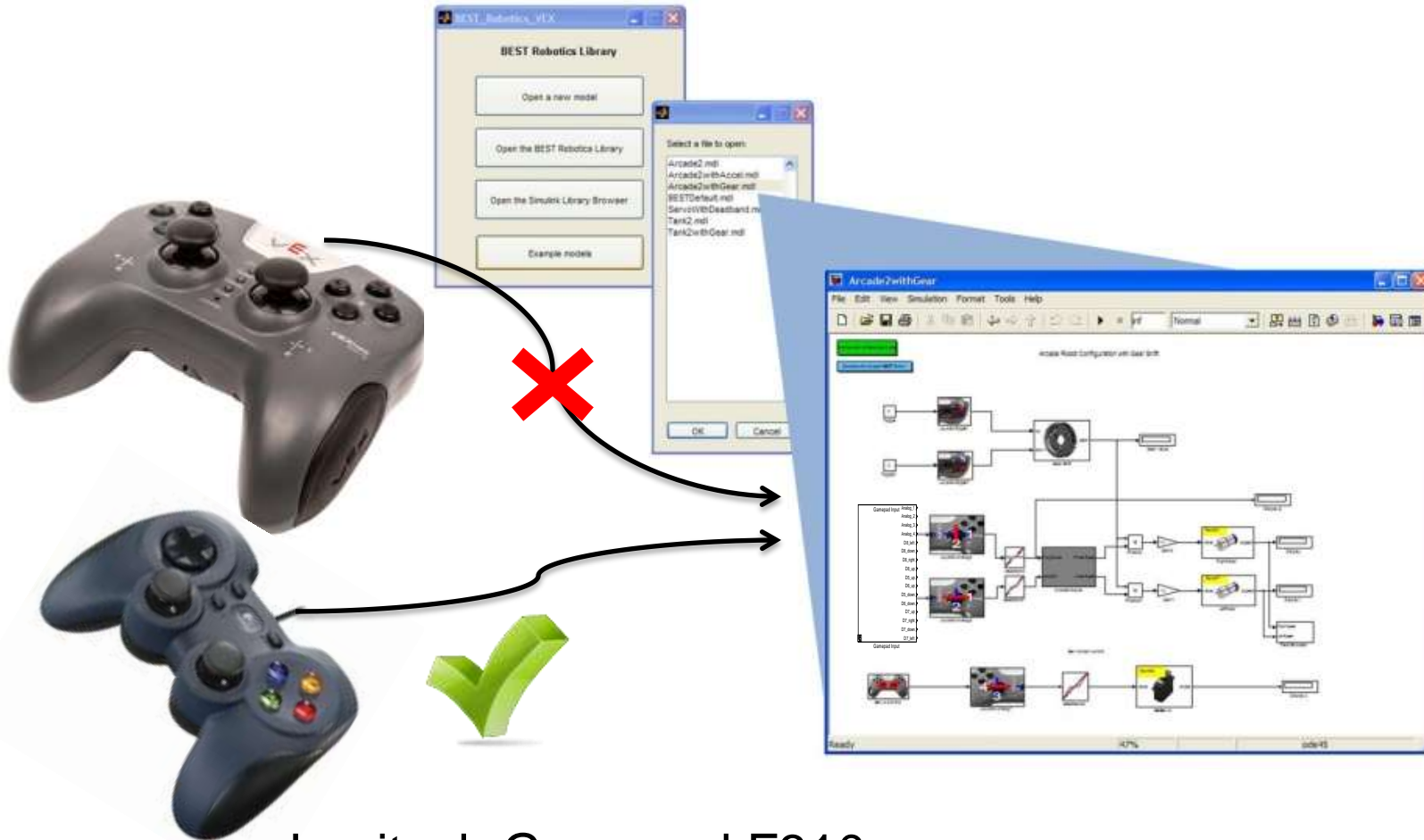


# Gamepad Input to Simulink



VEX Controller **NOT** supported

# Gamepad Input to Simulink



Logitech Gamepad F310

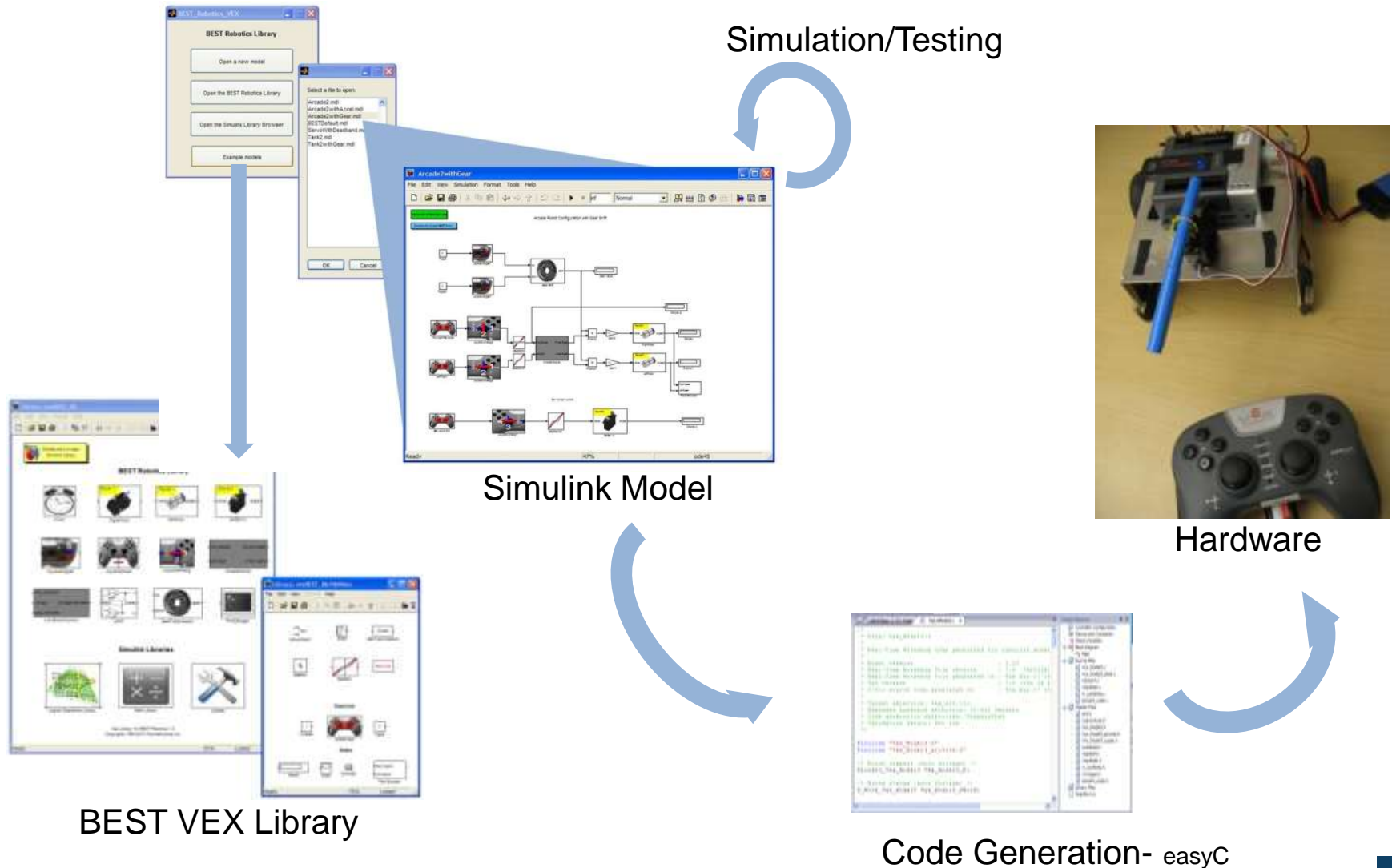
# Gamepad Input to Simulink

The image illustrates the process of connecting a gamepad to a Simulink model. It features three gamepads: a grey Xbox controller (marked with a red 'X'), a blue PlayStation controller (marked with a green checkmark), and a white Xbox controller (marked with a green checkmark). Arrows from the blue and white controllers point towards a Simulink model window titled 'Arcade2withGear', which displays a complex block diagram of a robot's control system. In the background, two Simulink dialog boxes are visible: 'BEST Robotics Library' and 'Select a file to open'.

Xbox Controller!!

(shiremat@mathworks.com)

# Workflow Summary


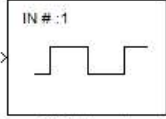
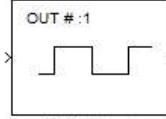
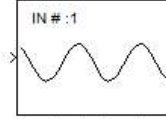







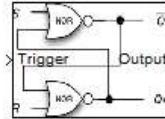
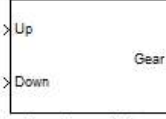
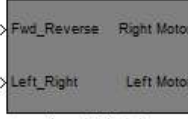




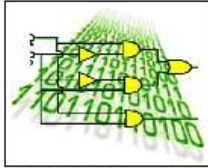


# Overview - BEST Library

Double-click to open  
Simulink Library

## BEST Robotics Library

 Clock	 IN #:1 DigitalInput	 OUT #:1 DigitalOutput	 IN #:1 AnalogInput	 PrintToScreen
 JoystickDigital	 JoystickAccel	 JoystickAnalog	 Port #:1 value speed SetMotor	 Port #:1 value angle SetServo
 Positive Limit Signal Joystick In Joystick Out Negative Limit Signal LimitSwitchControl	 Trigger Output Latch	 Up Gear Down GearTransmission	 Fwd_Reverse Right Motor Left_Right Left Motor ArcadeModule	

## Simulink Libraries

 Logical Operations Library	 Math Library	 Utilities
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# Advanced Programming

- Stateflow
  - Demo:
    - Tank2withGear.mdl
    - Aracde2withGear.mdl
  - Blocks:
    - Latch
    - Gear Transmission
- Using Embedded MATLAB function block **New!!**
  - Demo:
    - Teank2withGear\_EML.mdl
  - Blocks:
    - Utilities library -> MATLAB Function

## Access to software

- **Contact your Hub Directors for DVDs**
- 2 DVDs per team
- Each team has 10 installations
- Label has a URL – Installation instructions
- No online download available
- **No Paperwork**
- **1-year access**



# Installation

- **Label** on the DVD has a [web address \(URL\)](#) and installation/activation keys
- Go to the URL on your PC and **FOLLOW** the instructions there to install the software
- 2 steps = 2 installers (install both as per instructions)
- System Requirements:
  - Windows XP or later version (Vista, 7)
  - Could be 32-bit or 64-bit machines
  - Need 'easy C' to download the program to VEX hardware (easyC Cortex V4)





# Training Resources

- Weekly WebEx training – Info on BRI home page
- Video Tutorials available
  - [www.bestinc.org](http://www.bestinc.org) > Participants > Resources
- Custom training for teams
- Contact
  - [bestrobotics@mathworks.com](mailto:bestrobotics@mathworks.com)





The screenshot shows a web page titled "Training Resources" with two tabs: "Getting Started" and "Training Resources". The "Training Resources" tab is active. The page content is as follows:

**Tutorials**  
A complete video-based tutorial is available to demonstrate the use of Simulink for BEST Robotics with the VEX Cortex platform. View the videos in sequence to gain maximum benefit.

-  **1. Installing the BEST Robotics Library for Simulink** 4:40  
Set up MATLAB and Simulink to work with BEST Robotics.
-  **2. Quick Introduction to Simulink** 27:15  
An introduction to the tools you will be using to develop your robot's software.
-  **3. Building your first model with the BEST Robotics Library for Simulink** 9:42  
Develop software for your robot.
-  **4. Simulating and Deploying the model to your robot** 14:55  
Test your software before download. Then, download your software to your robot and execute it.

The two videos below are available to introduce to you an event-based modeling product called Stateflow and show some of the basic features and capabilities. Please note that blocks such as Gear Transmission and Latch in the BEST Robotics Library are built using Stateflow. View these videos to learn about some of the foundational elements of Stateflow in order to build your own Stateflow charts.

-  **1. Stateflow Overview** 11:23  
Brief overview of Stateflow and its features.
-  **2. Getting Started with Stateflow** 25:37  
Introduction to foundational elements of Stateflow: states and transitions.

**Thank you!**



