# Advanced NXT-G Programming

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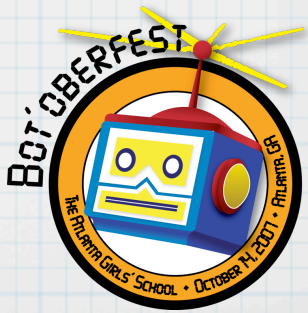
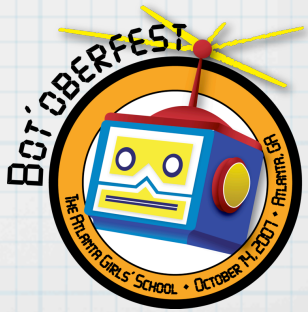
for MINDSTORMS® NXT



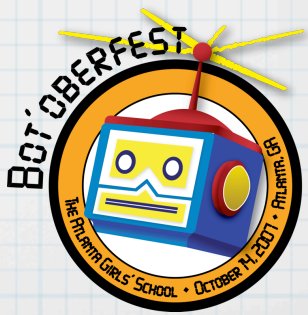
# Agenda

* Benefits of MINDSTORMS Software v1.1
* Complete Palette Overview
* Datahubs and Wiring
* Decision Making using Logic and Compare
* Variables
* Q & A



# Benefits of v1.1

* Vista & Intel-based Mac support
* Improved Performance on all OSes
* Smaller Compiled Files (.rxe) on the NXT
* Large Programs are easier to build
* Lots of small features & bugs fixed



# PC Software Stack

Programs

fll.rbt

Blocks | MyBlocks

MINDSTORMS.exe

MINDSTORMS Editor

MINDSTORMS Compiler

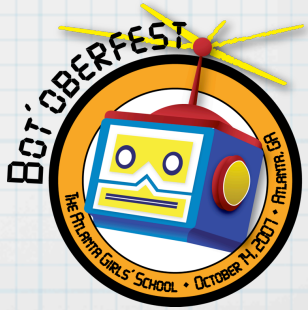
LabVIEW Engine

Fantom.dll

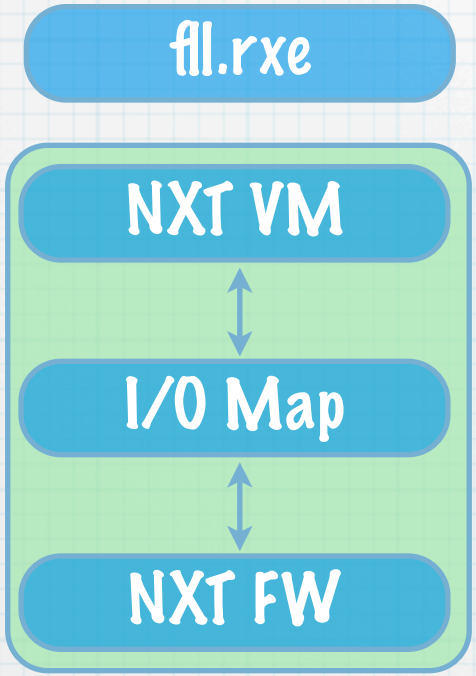
Fantom driver

VISA Engine

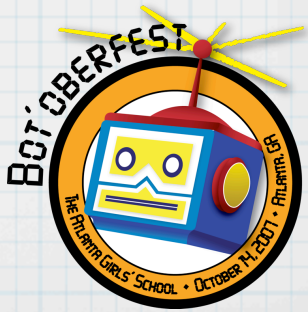
OS USB | OS Bluetooth



# NXT Software Stack

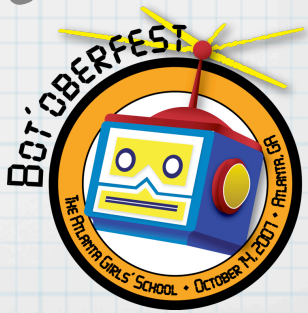



* rxe files are the executable version of the rbt
* NXT VM - Runs programs (now execute this block...)
* NXT FW - Handles low level details (such as reading a sensor or handling Bluetooth)
* I/O Map - Interface between them



# NXT Execution Flow

* Read sensor values and place in I/O Map
* Hand control over to the VM
* VM executes part of the rxe file
  * May read sensor values from I/O map
  * May update I/O map to tell motors to run
* Motors look at the I/O map to determine what to do
* Repeat



# Complete Palette

* Common
* Action
* Sensor
* Flow
* Data
* Advanced

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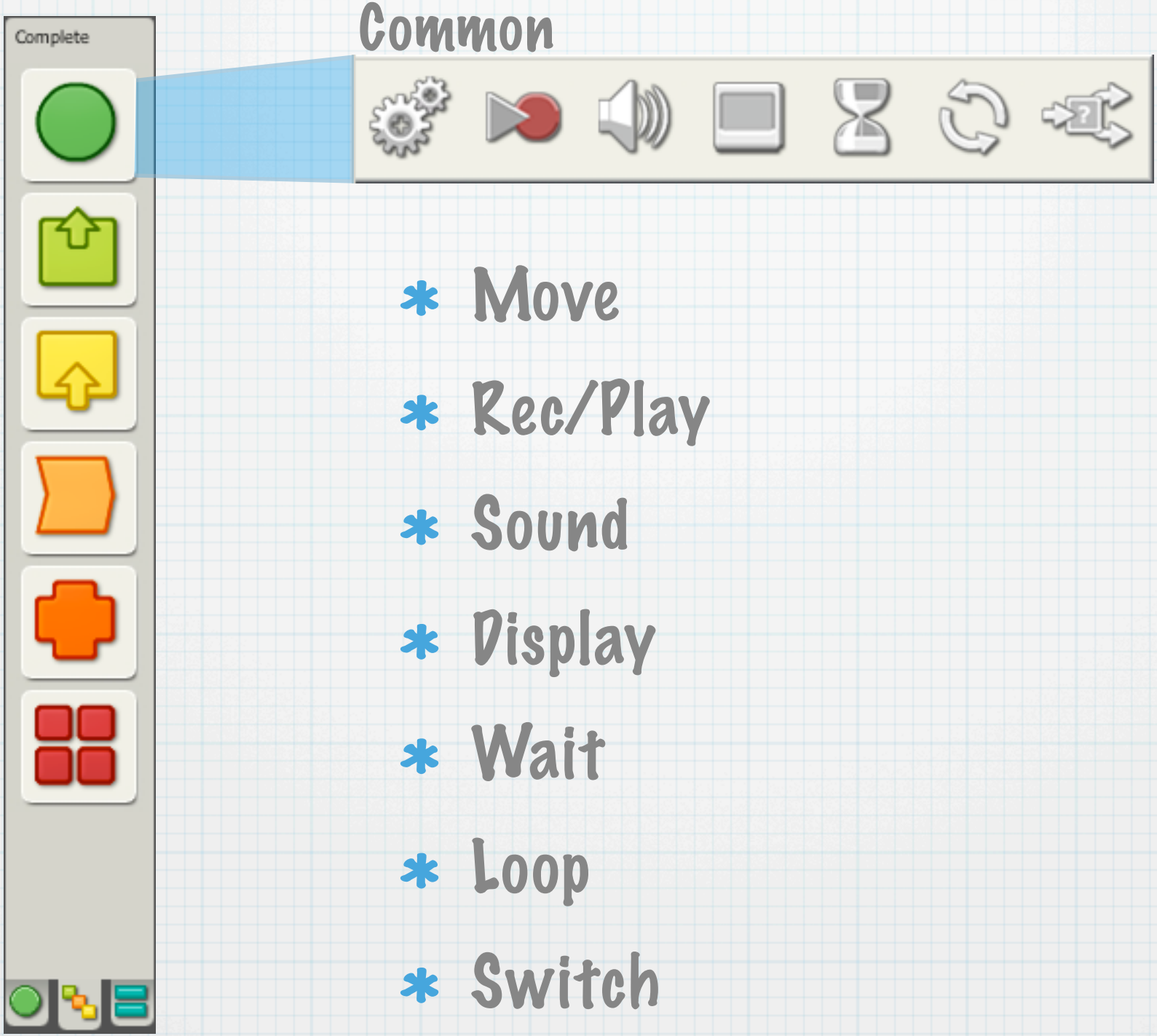


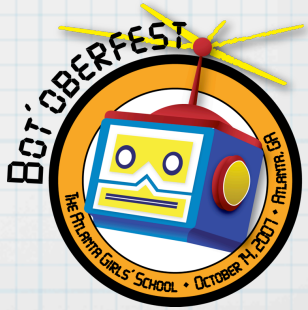

* Move
* Rec/Play
* Sound
* Display
* Wait
* Loop
* Switch

# Move

* Good for multiple motor operations.
* NXT FW synchronizes the motors
* Less susceptible to battery levels with turns

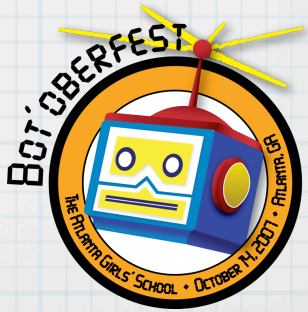
# Action

* Motor
* Sound
* Display
* Send Message
* Motor*
* Lamp*

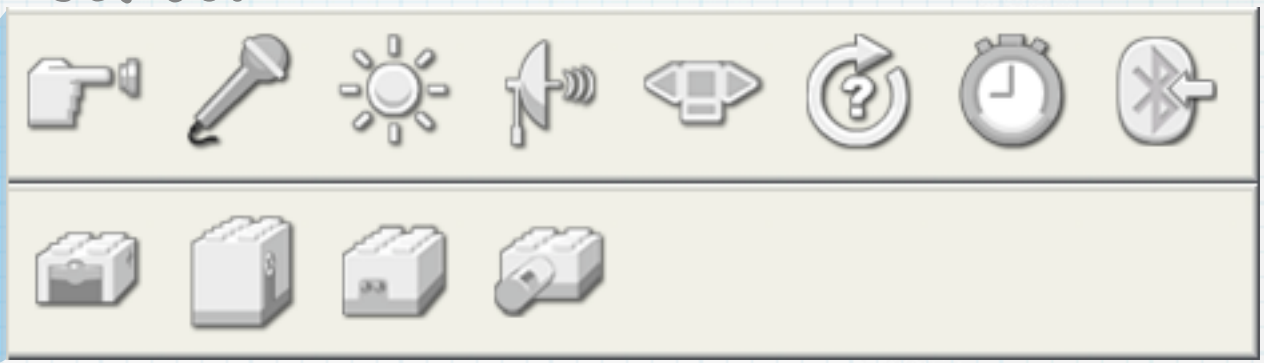


# Motor

* Good for single motor operations.
* Allows for fine grain control
  * Ramping
  * Motor Power
* When should I use move with 1 motor?



## Sensor

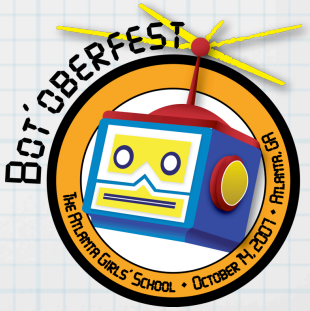


* Touch
* Sound
* Light
* Ultrasonic
* NXT Buttons
* Rotation
* Timer
* Receive Message

* Touch*
* Rotation*
* Light*
* Temperature*

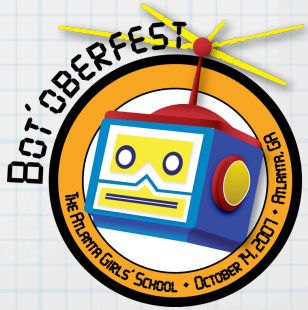
# Data

* Logic
* Math
* Compare
* In Range
* Random
* Variable



# Datahubs and Wires

* 4 Data Wires
  - Number
  - Logic
  - Text
  - Broken
* 2 Types of Hubs
  - Input/Pass-through
  - Output Only

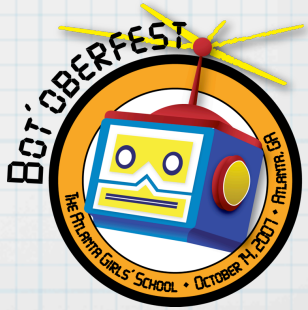


# Wiring

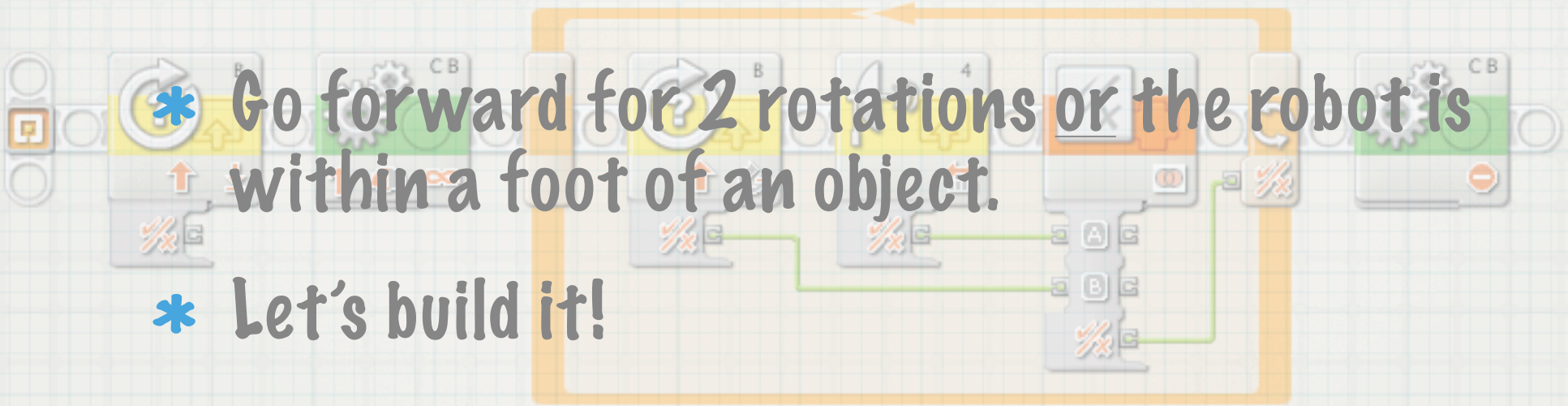
* You can move wires, but they don't look selected.
* Undo is your friend.
* To find and fix all broken wires
  * Go to forums.nxtasy.org
  * Search for "broken wire"

http://forums.nxtasy.org/index.php?showtopic=444&hl=broken%20wires&st=0

**Warning:**
**You are getting to the edge of the software. The editor isn't always cooperative.**



# Decision using Logic



* Go forward for 2 rotations or the robot is within a foot of an object.
* Let's build it!

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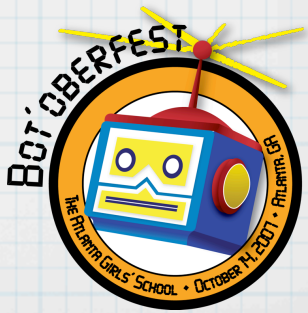
# Decision using Switch

Print "above" to the display if either the sound or light sensor exceeds 50. Otherwise, print "below".

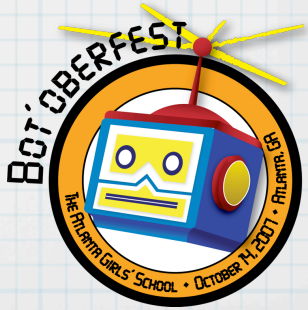
Let's take a look.



# Complex Decision

* If the light sensor intensity is between
  * 0-25: play a low tone
  * 26-75: play a middle tone
  * 76-100: play a high tone
* Also, output the region to the display

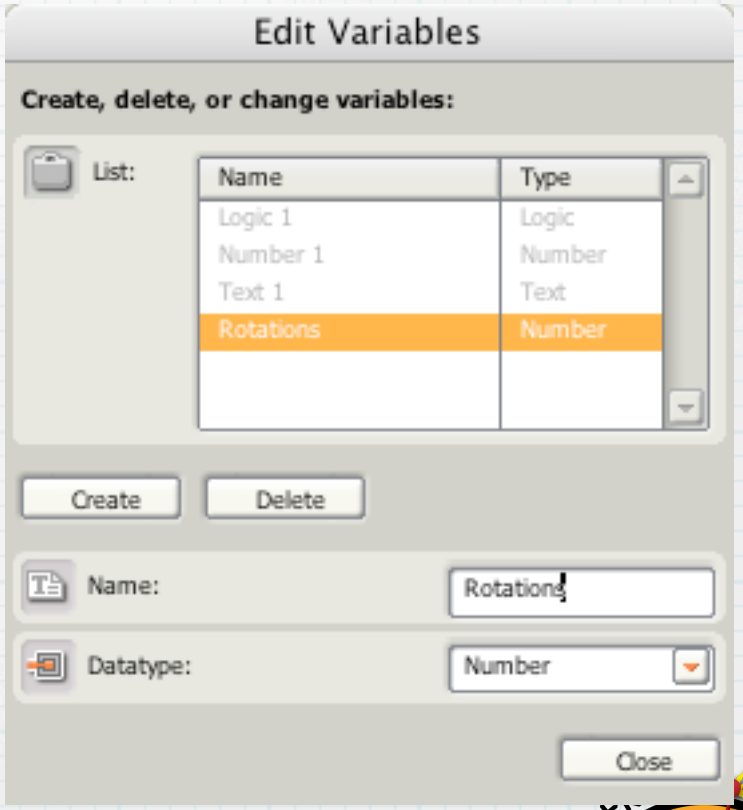
Let's take a look at this program.



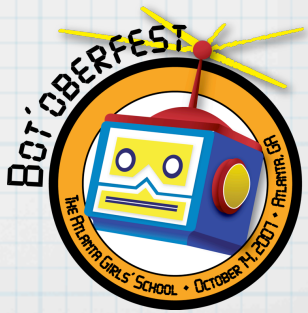
# Variables

- Create in each program & My Block that needs access
- Good for
  - Counting
  - Saving Rotations
  - Passing data to one or more MyBlocks

Edit:Define Variables...



# Count Claps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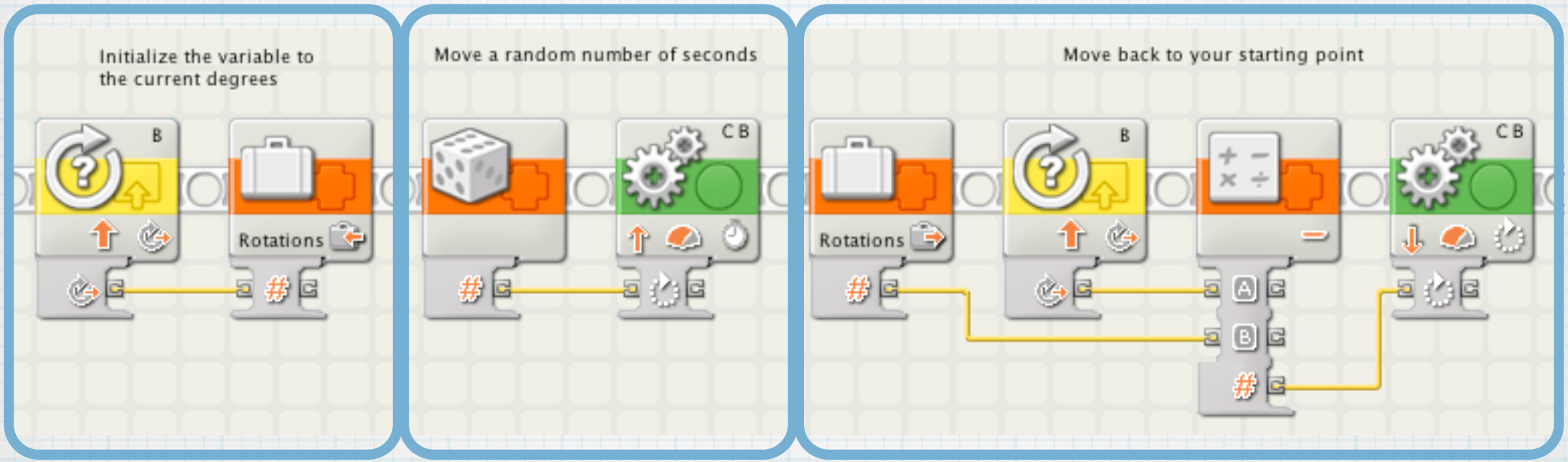
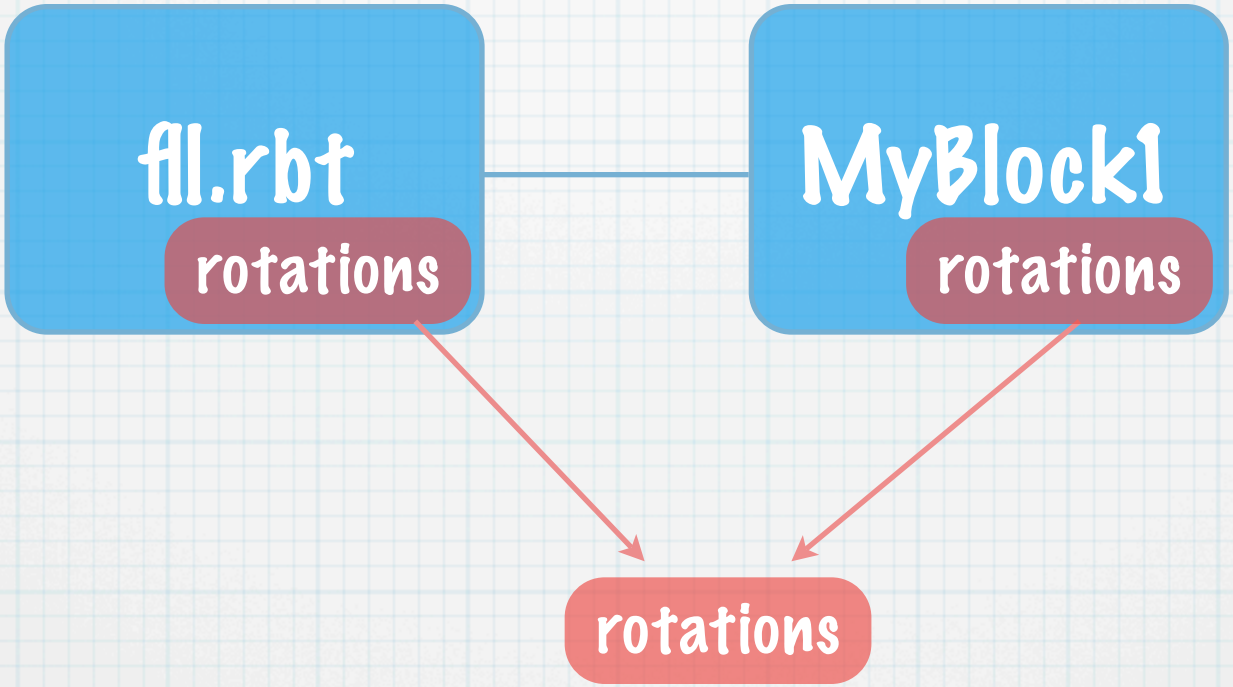
# Store Rotations



# Variable Scope




Variables with the same name are shared globally when a program is running

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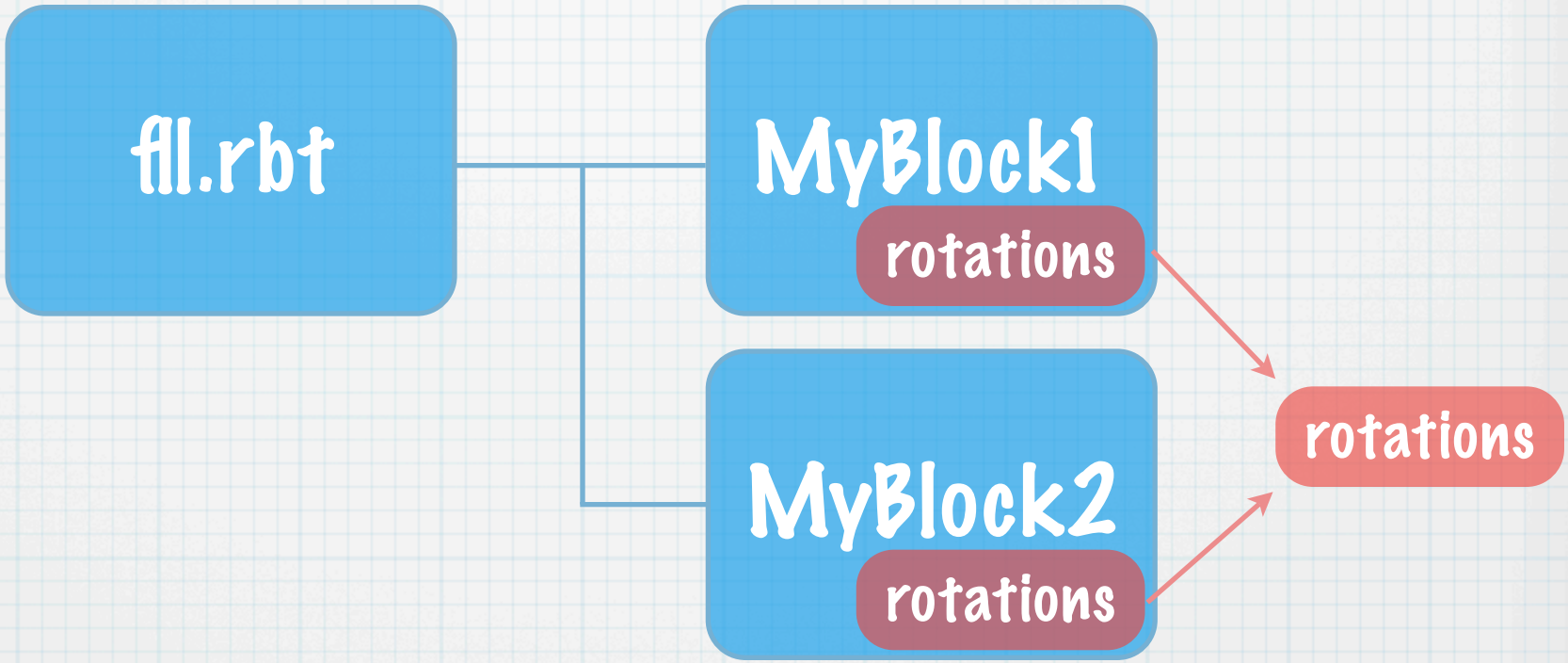
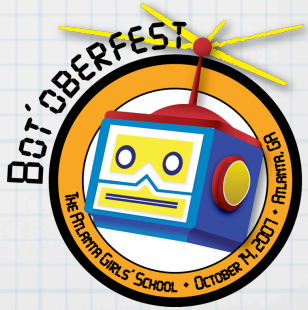
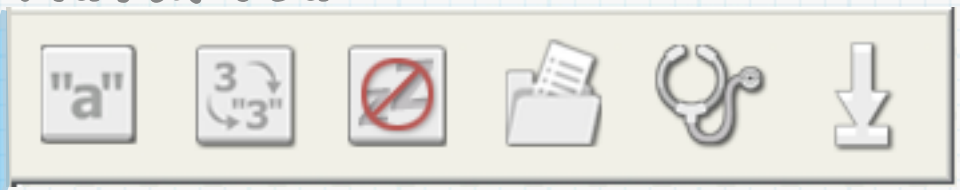
# Variable Scope




To avoid problems like this, use
MyBlock1 _rotations & MyBlock2_rotations



## Advanced




* Text
* Number to Text
* Keep Alive
* File Access
* Calibrate
* Reset Motor

Great Debugging Tools

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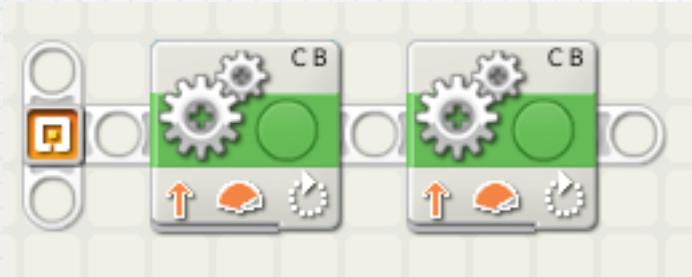
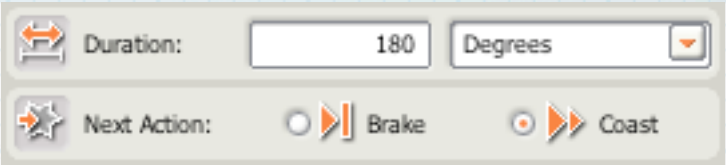
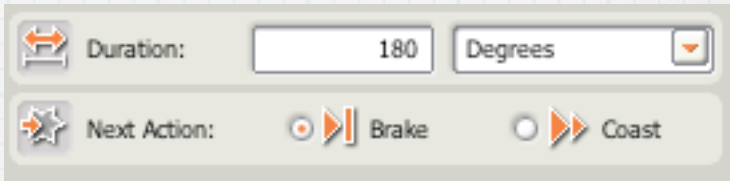
# Without Reset Motors



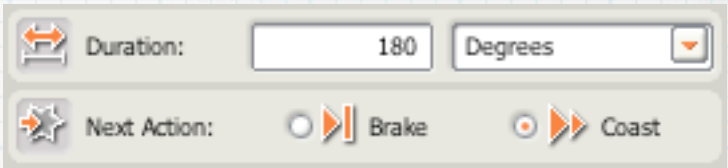



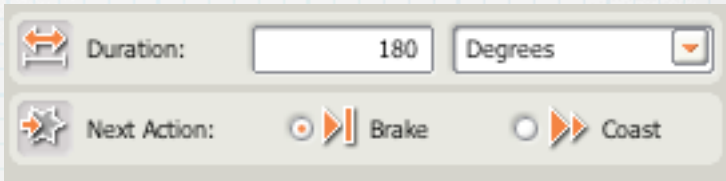



Total
360

180 → coast → 180-coast

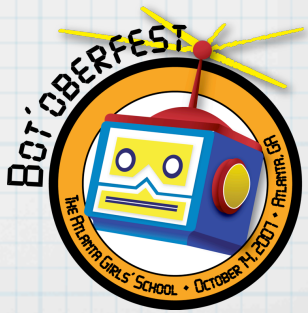
# With Reset Motors



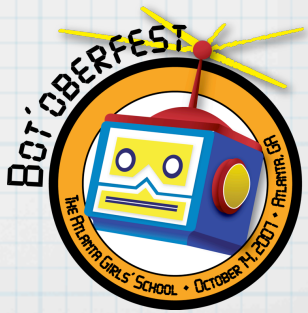
Total
360 + coast

180 coast 180



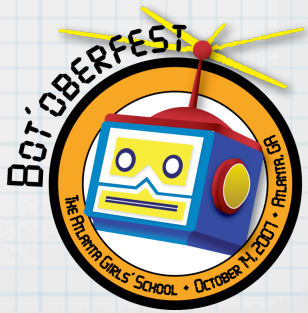
# Favorites

* thenxtstep.blogspot.com
* LEGOEngineering.com - click Podcasts
* forums.nxtasy.org
* thefieldhousehold.com/Web/NXT.html

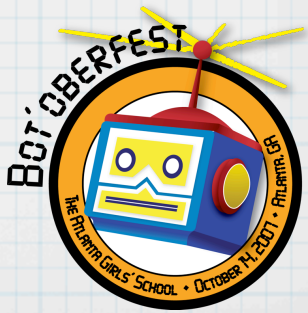


# Personal

* NXThelp@thefieldhousehold.com
* Just moved to Marietta



# Q & A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