# Introduction to Game Programming and Robotics

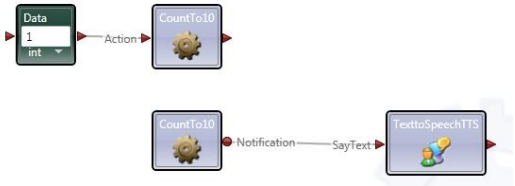
Unit # 3

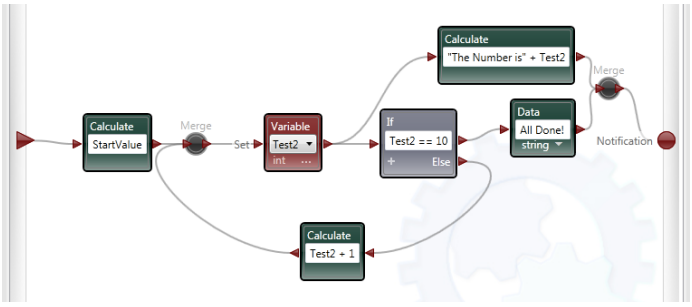


## Acknowledgement


- Most of the example/material presented in this paper is taken from tutorials provided by Microsoft or from the book “Robot Development using Microsoft Robotics Developer Studio” by Kang, Chang, Gu and Chi.

# Sixth VPL Program (Creating an Activity)

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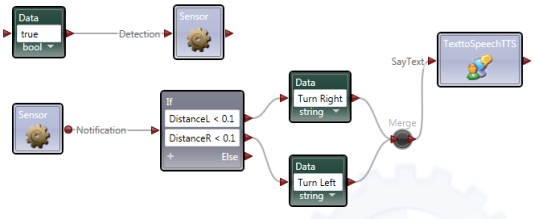
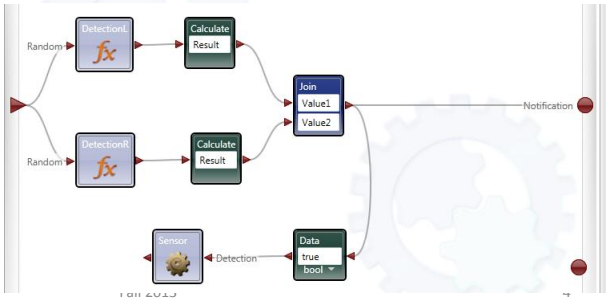
# Seventh VPL Program (Virtual Sensor)

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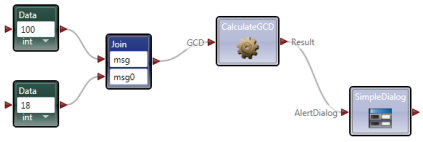
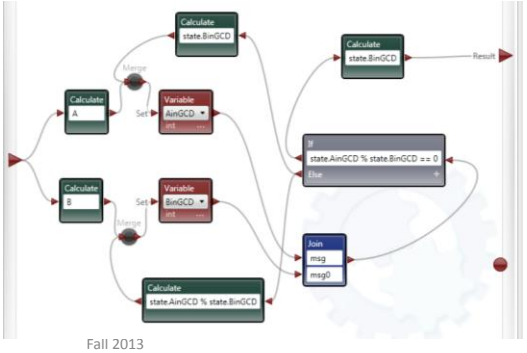
# Eighth VPL Program
# Greatest Common Divisor






# Lab Exercises

- Sum of Numbers
- Lowest Common Multiplier
- Prime Number
- Greatest Common Divisor as Separate Activity

# Lego Mindstorms NXT

- The Mindstorms NXT has three servo motors and one light, sound, distance and touch sensor.
- It support for 4 without using a sensor multiplexor.
- Lego Mindstorms may be used to build a model of an embedded system with computer-controlled electromechanical parts.
- Many kinds of real-life embedded systems, from elevator controllers to industrial robots, may be modelled using Mindstorms.



# Robot Building Exercise (Lego Mindstorms NXT)

# Visual Simulation Environment

- Simulation refers to the use of a computer's computational capabilities to build a virtual world corresponding to the physical environment.
- For a robot control system developer, computer simulation technology not only allows the design and validation of algorithms but also enables testing of interactions between robots and their environment as well as their capabilities to respond to various situations.



# Visual Simulation Environment (Cont'd)

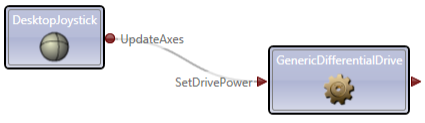
- One of the functions provided by MRDS is the Visual Simulation Environment (VSE).
- In VSE, all of the robot's body (such as the arms and sensor components), the surface on which the robot moves, the landscape observed, and the static objects connected (e.g., tables, chairs, walls, or columns in a home or hardware devices in a factory) can be constructed easily.
- Through VSE, the robot control system programmer does not require actual robot hardware or physically constructed objects in the robot's surrounding environment to test concepts or algorithms.

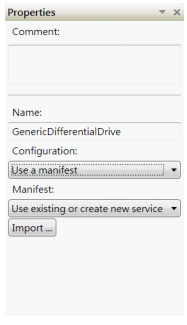
# Advantage of VSE

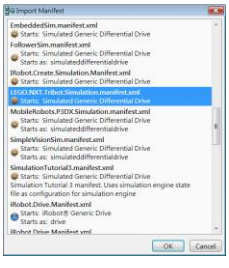
- It can reduce the hardware costs for the robot development phase. Designers can even gain experience with functionalities of existing commercial robots and can custom design unique robot components.
- The possibility to experiment enables designers to test various ideas freely while avoiding the risk of destroying hardware setups.
- With respect to robot education, VSE can quickly provide students, who might be lacking in knowledge of hardware, a rapid development platform, serving the purpose of promotion and training.

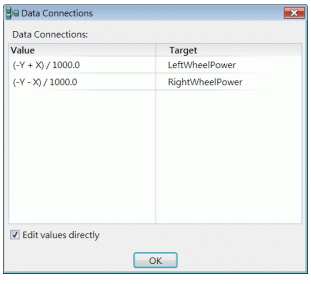


# Simulated Robot Program 1



# Differential Drive

- Many robots use what is called a "Differential Drive" which has two wheels that can be driven independently.
- Although most Differential Drives have two driven wheels, there is often a third passive wheel, called a *castor* or *jockey wheel*, which is just for balance.
- The reason this configuration is popular is that it allows the robot to rotate on the spot. It can therefore drive in any direction after making a tight turn that takes a space no larger than the robot.



# Differential Drive (Cont'd)

- RDS defines a *generic contract* for a Differential Drive that specifies the programming interface for controlling a drive regardless of the type of robot that you are using (which is why it is called *generic*).
- The **SetDrivePower** operation sets the power to each of the drive's wheels.

# Simulated Robot Program 1 (Cont'd)