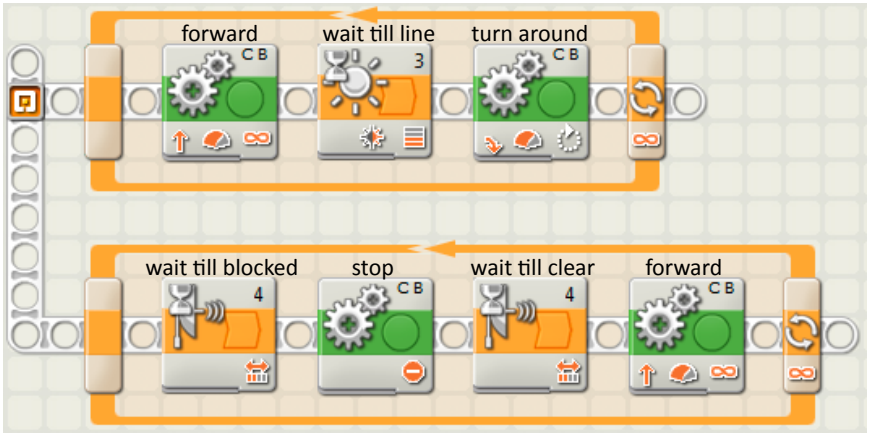
CSCI 1106
Lecture 11

Threads, Interference, and Other Topics

Announcements

- Today's Topics
  - Threads and Interference
  - Dealing with Interference
  - A home-made Wait block
  - Sensor blocks
  - Multiconditional Wait blocks
  - Project report reminder

The Multithreaded Approach



Interfering Threads

- Question: What happens if multiple threads try to control the motors at the same time?
- *Interference* occurs when a thread violates another thread's assumptions
  - E.g., Only it has control of the motors
- Or *interference* occurs when interaction between threads causes a program to misbehave
- Question: How do we prevent this?

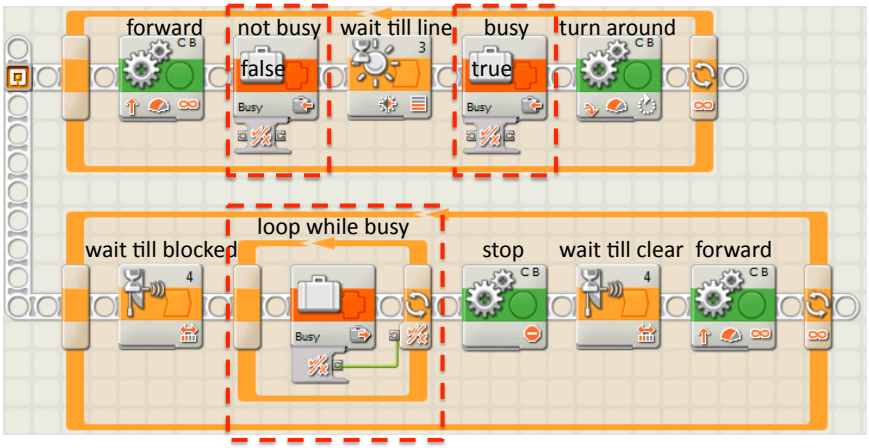
Preventing Interference

- Only one thread controls a given actuator
  - I.e., only one thread may control the motors
- Threads must coordinate their behaviours
  - E.g., both threads may control the motors but not at the same time
- How do threads coordinate?

Coordinating with Variables

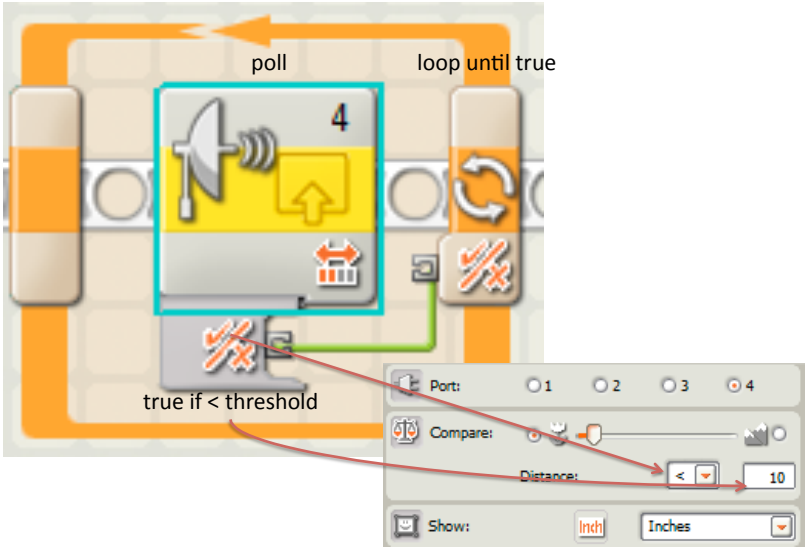
- Recall:
  - Variables are used to store program state
    - Numbers, text, logical values
  - Variables are visible by all threads
- Idea:
  - Use a logical variable to indicate when it is safe to manipulate the motors
    - Create a logical variable called *busy*
    - If *busy* is true, the motors are being used by another thread
    - If *busy* is false, the it is safe to access the motors
  - The hard part is figuring out how to do this

A Solution to Interference



Example of a home-made Wait block!

A Home-Made Wait Block

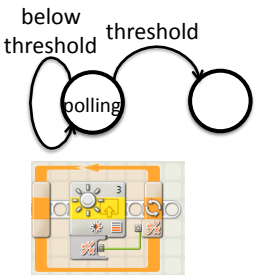


Why Do We Need Sensor Blocks?

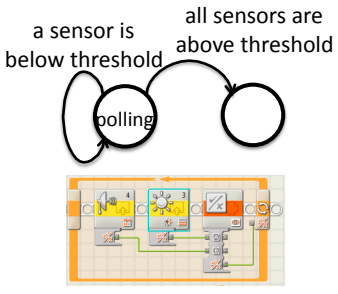
- View the measurements that a sensor is reporting when debugging a program
- Keep track of previous measurements to compare against future measurements
  - E.g., Finding a minimum/maximum measurement
- Create multiconditional Wait blocks

Multiconditional Wait Blocks

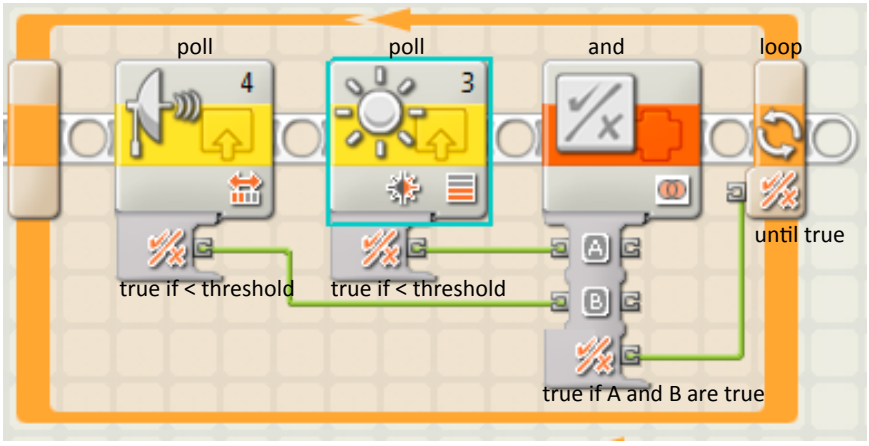
- A Wait block polls a sensor until a threshold is reached



- Idea: Combine measurements from multiple sensors

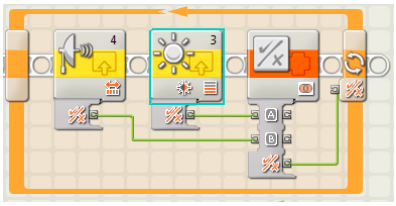


A Multiconditional Wait Block



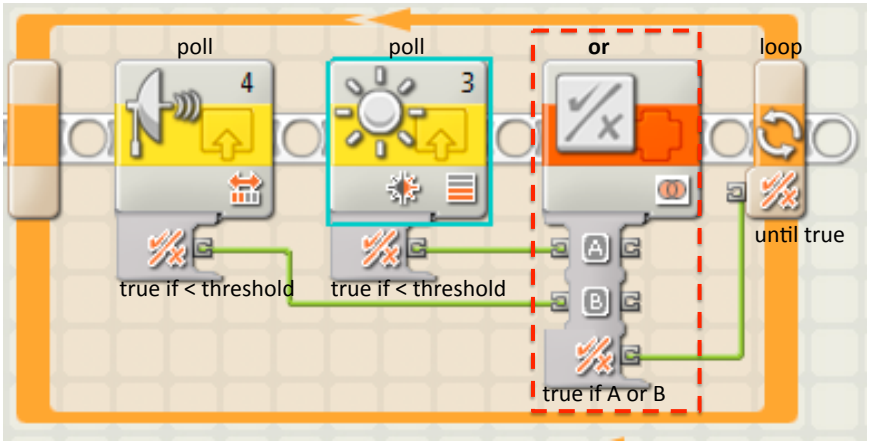
More Than Sensors

- Idea: Can use more then sensors in such a construct
  - Variables
  - Timers
  - Rotation sensors



- Question: How would this construct change if you wanted to break out of the loop if *either* of the sensors is above threshold?

Another Multiconditional Wait Block



Project Report Reminder

- Report is aimed at peers, TAs, & instructor
- Please use the provided template
- Due Monday, October 22, 8:35am (in class)
- One submission per group
- The report **must** be submitted in
  - Hard (paper) copy (in class)
  - Soft (electronic) copy on the moodle site
- Grade rubric available in project specification
- **No late submissions**