

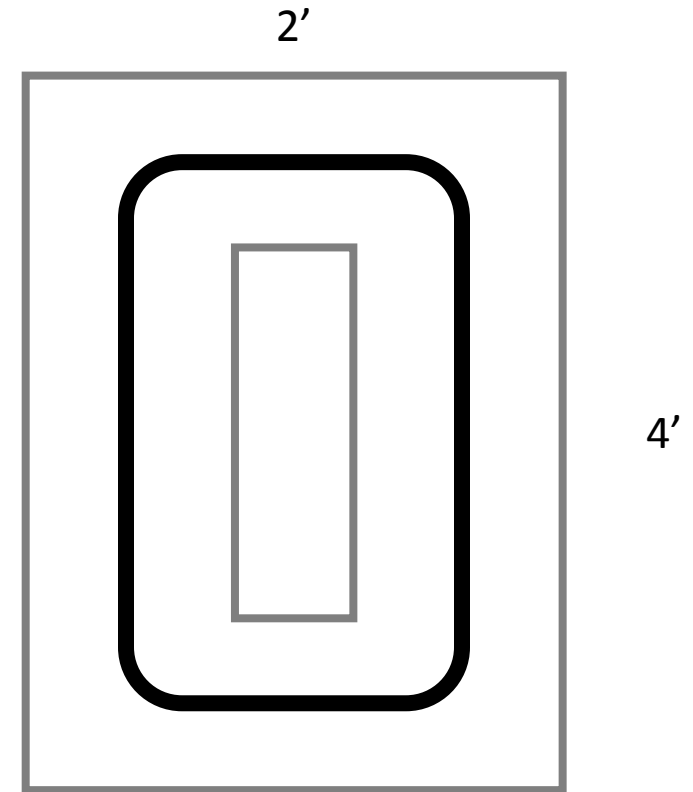
ITE: Robotics Design Project

This Week

- Build and Program a LEGO Mindstorms Robot
 - Monday: Build and Movement
 - Tuesday: Programming and some sensors
 - Wednesday: Some sensors and Competition prep
 - Thursday: Competition prep
 - Friday: Competition
- Work in teams of four
- Competition and presentation at end of the week
- Resource site: apnorton.com/ite-camp/

Competition: Robot Races

- 2' by 4' track
 - Electrical tape center line
 - 1.75" border walls
- The robot has two minutes to make as many laps as possible.
- Once started, you may not interact with the robot



Monday

- Divide into groups
- Build a “stock” robot
- If time remains, write a program using the (online) handout
- Clean up at 1:45pm

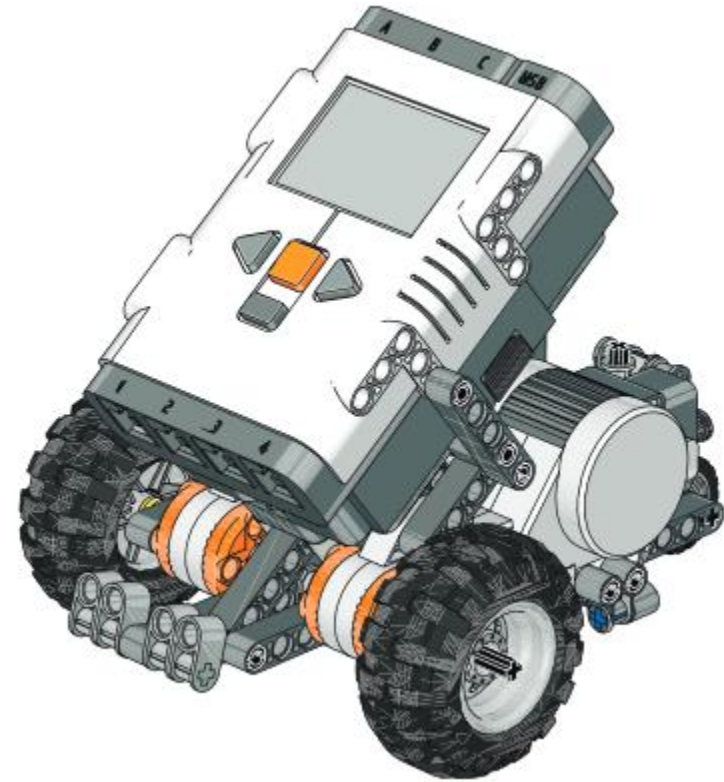


Image source: [CMU Robotics Academy](#)

Team Up!

- Teams of 4 or 5
- When this is done, send up one person to get robot/computer, and start building!

Build Robot

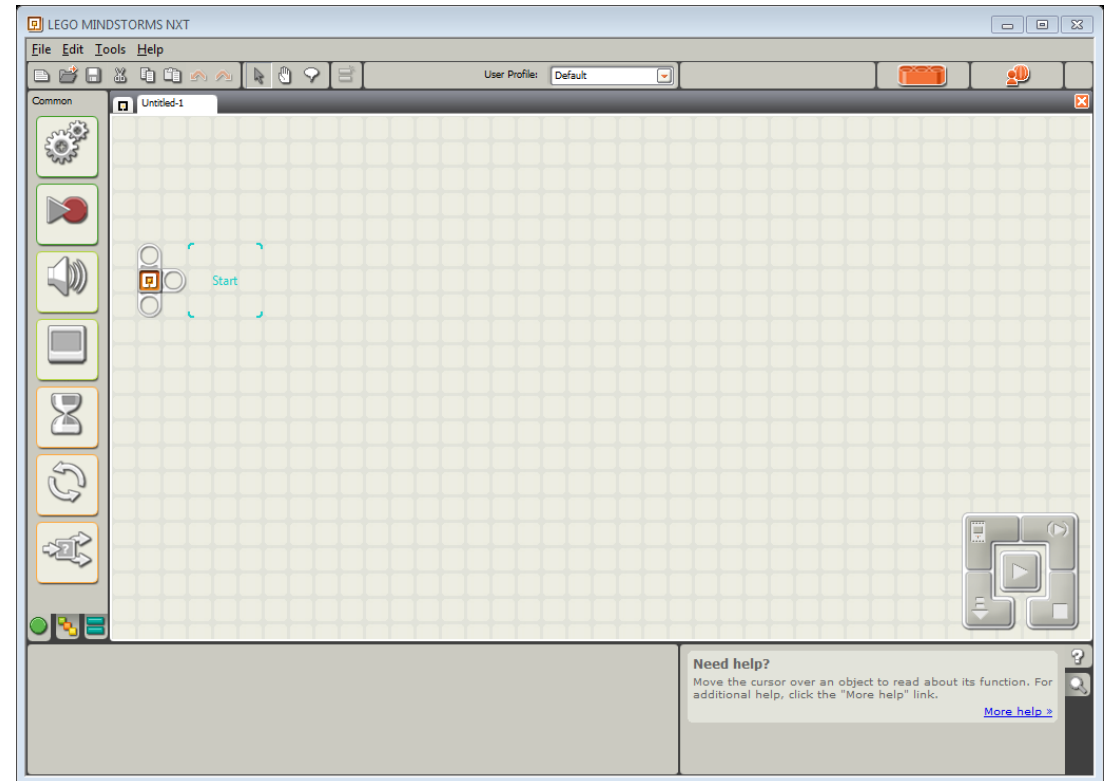
- Instructions are linked at apnorton.github.io/ite-camp/
- When you're done with the robot base, you can either:
 - Build the sensor attachments (i.e. keep going)
 - Write a program (see link above)
 - ... or both, of course. 😊

See You Tomorrow!

- Please clean up before you leave.

Tuesday

- Introduction to Programming
- Sensors
- Mini challenges
- Start work on the competition



What is a Program?

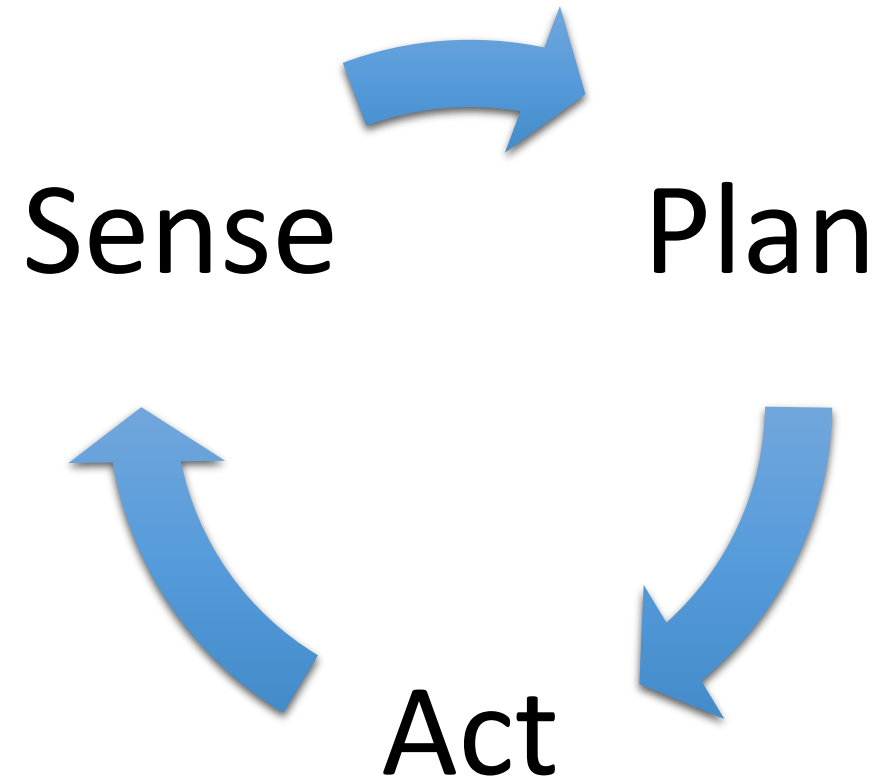
- List of (very detailed) instructions
- Written in a *programming language*
- Our Language: NXT-G
 - This is a graphical language
 - Each instruction is represented by a “block”
 - Blocks are executed from left to right
- Demo

Sensor Types

- Touch
 - Detects when orange tip is depressed
- Light
 - Measures reflected light intensity
 - Bright -> 100%
 - Dark -> 0%
- Ultrasonic
 - Measures distance using sound
 - Like SONAR

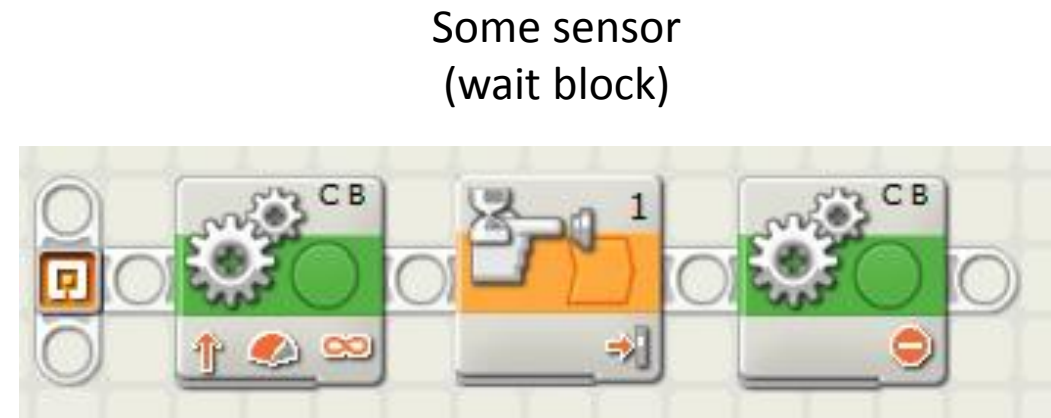


Feedback Cycle



Move-Wait-Stop Design Pattern

- Use any time you say “move until [sensor value]”
- The “stop” is important—robots do *exactly* what you tell them!



Duration: Unlimited

Direction: Stop

Lab Time: Programming

- We have the competition tables!
 - One in front of room
 - One outside in hallway
 - Both have tape now!
- See handout on website (apnorton.github.io/ite-camp/)
- Ask if you have any questions

See you tomorrow!

- Save any programs you wish to keep remotely (Google Drive, Dropbox, etc.)
- Please clean up before you leave.

Wednesday

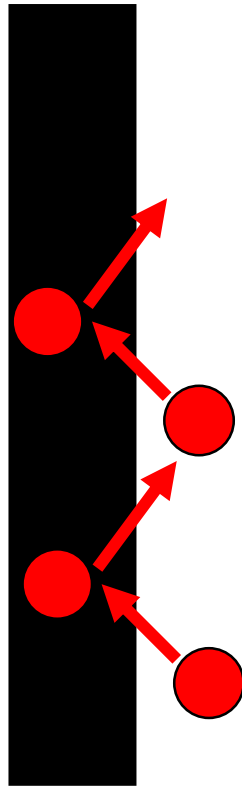
- Remember: Your goal is to *go fast in a controlled manner*. Balancing speed and accuracy is more of an art than a science at this point.
- Some thoughts
 - Gears can really help, but might be difficult to get to work quickly.
 - Line following tends to be slow but *very* accurate (there are exceptions to both of these)
 - Simple solutions are often superior
- We have two competition tables
 - One outside in the hall
 - One at front of room
- I have a tape measure if you need it

Light sensor problems?

- If your light sensor can't tell the difference between light and dark, try calibrating.
 - A tutorial can be found on <http://apnorton.github.io/ite-camp/>

Clean up!

Line following



Thursday

- Presentations
 - Don't sweat it... even though it is like 1000 degrees outside.
 - ~5 minutes or less
- Design Choices
 - What modifications you made
 - Why you made those choices
 - Interesting notes/things you learned
- See Andrew's questions online
 - <http://apnorton.github.io/ite-camp/>

Friday

- 10 minutes per team
 - 5 minutes to run your robot around the board
(2 minutes per run)
 - 5 minutes for a presentation
- Teams who have members that need to leave early will go first