# Robotic Buoy

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Discipline: Mechatronics

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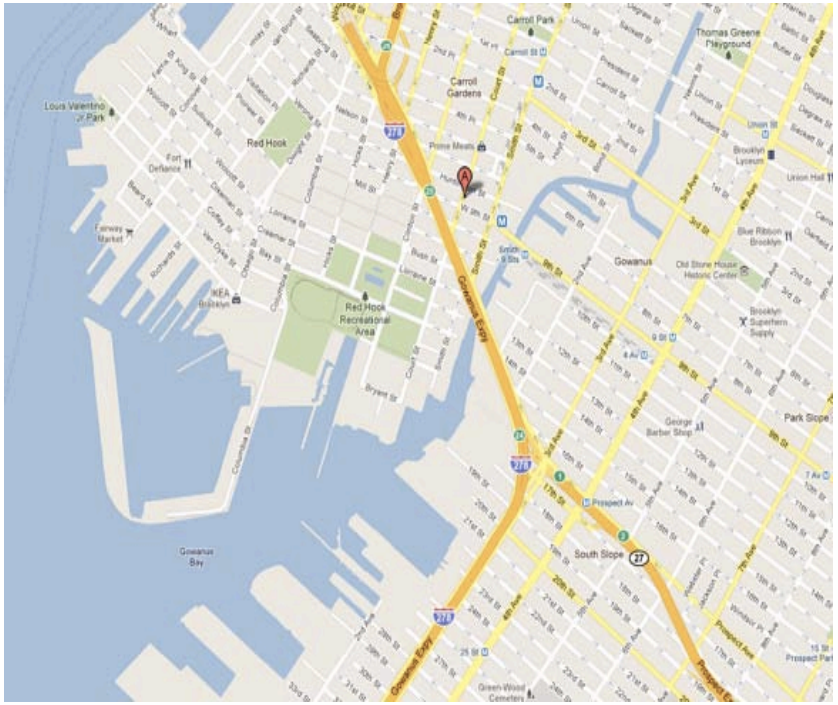
# The Gowanus Canal Time Line

1860's built
1906
1911 flushing tunnel system
1960s
1987 Red Hook WPCP
1999
2010 Superfund

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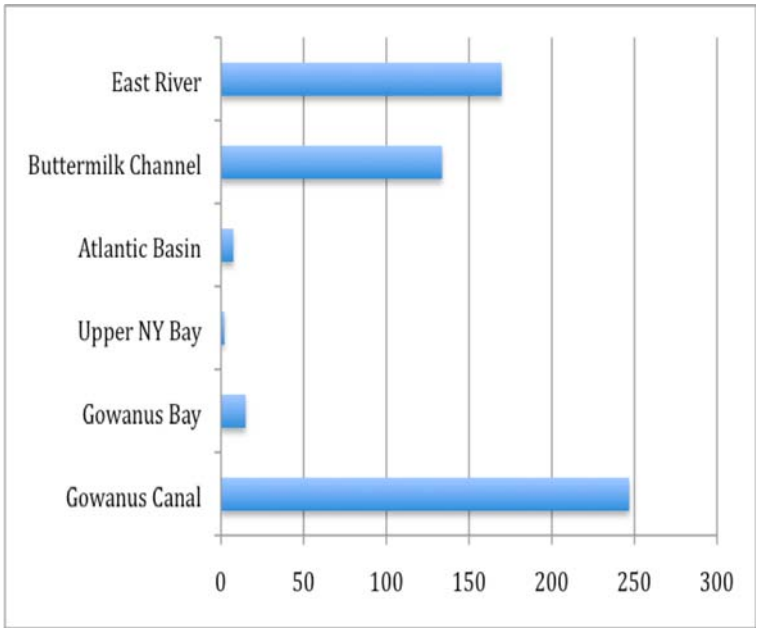
# Combined Sewage Overflow

- ✧ Older cities use one pipe for all their sewage and runoff
- ✧ When it rains there is an overflow
- ✧ There are 14 CSO entry points into the Gowanus Canal

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# Gowanus Canal Water

- ✧ Dissolved Oxygen (DO)
- ✧ ph level
- ✧ temperature

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# Gowanus Canal Sediment

**TABLE 1**
**New York State Guidelines for Effects of Metals on Marine Organisms and the Concentration of Metals in the Sediments of Four Waterways in the Port of New York/New Jersey**

| | Concentration (parts per million - dryweight) | | | | | |
|---|---|---|---|---|---|---|
| *Metal* | *Lowest Effect Level* | *Severe Effect Level* | *Gowanus Canal* | *Newark Bay* | *Arthur Kill* | *Newtown Creek* |
| Antimony | 2.0 | 25.0 | <21 | NA | NA | NA |
| Arsenic | 6.0 | 33.0 | 10 | 9-17 | 17-25 | 5-33 |
| Beryllium | NA | NA | 1 | NA | NA | NA |
| Cadmium | 0.6 | 9.0 | 11 | 1-2 | 1.5-3 | 1-20 |
| Chromium | 26.0 | 110.0 | 151 | 175 | 161 | 305 |
| Copper | 16.0 | 110.0 | 630 | 105-131 | 178-304 | 61-770 |
| Lead | 31.0 | 110.0 | 1343 | 109-136 | 111-261 | 68-554 |
| Mercury (total) | .15 | 1.3 | 3 | 2-3 | 2-4 | 1-3 |
| Nickel | 16.0 | 50.0 | 88 | 33-40 | 20-60 | 12-140 |
| Selenium | NA | NA | 2 | NA | NA | NA |
| Silver | 1.0 | 2.2 | 21 | 2-4 | 2-5 | 2-3 |
| Thallium | NA | NA | <42 | NA | NA | NA |
| Zinc | 120.0 | 270.0 | 1130 | 188-244 | 230-403 | 104-1260 |

*Sources:* *Audrey Massa — metal concentrations for Newark Bay, Arthur Kill, and Newtown Creek*
*Robert Smith — metal concentrations for the Gowanus Canal*
*N.Y.S. Department of Environmental Conservation — effect levels*

*NA=Not available*

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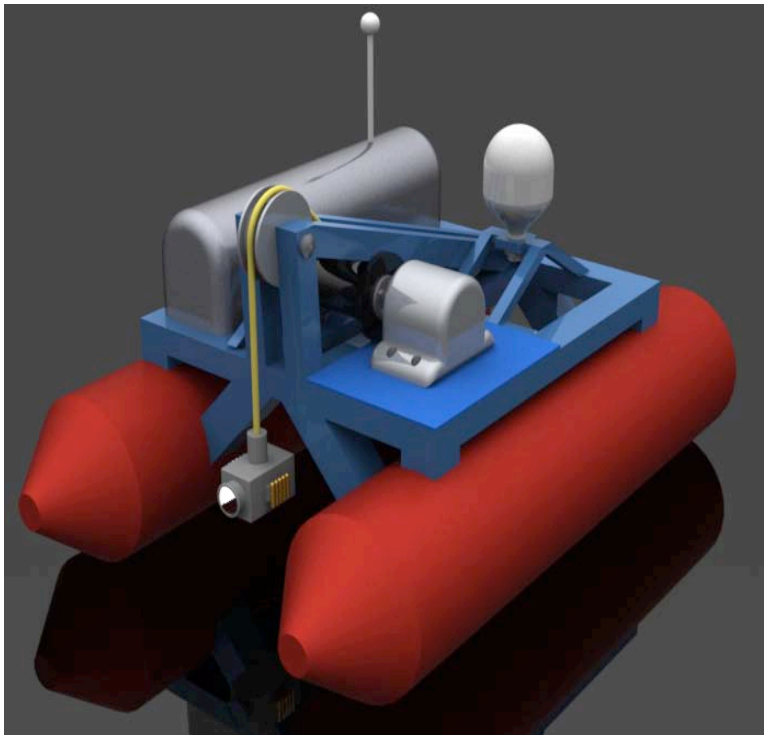
# The Gowanus Bot

- ✧Robotic Buoy
- ✧Collect
- ✧Send
- ✧Graphic User Interface
- ✧Public education



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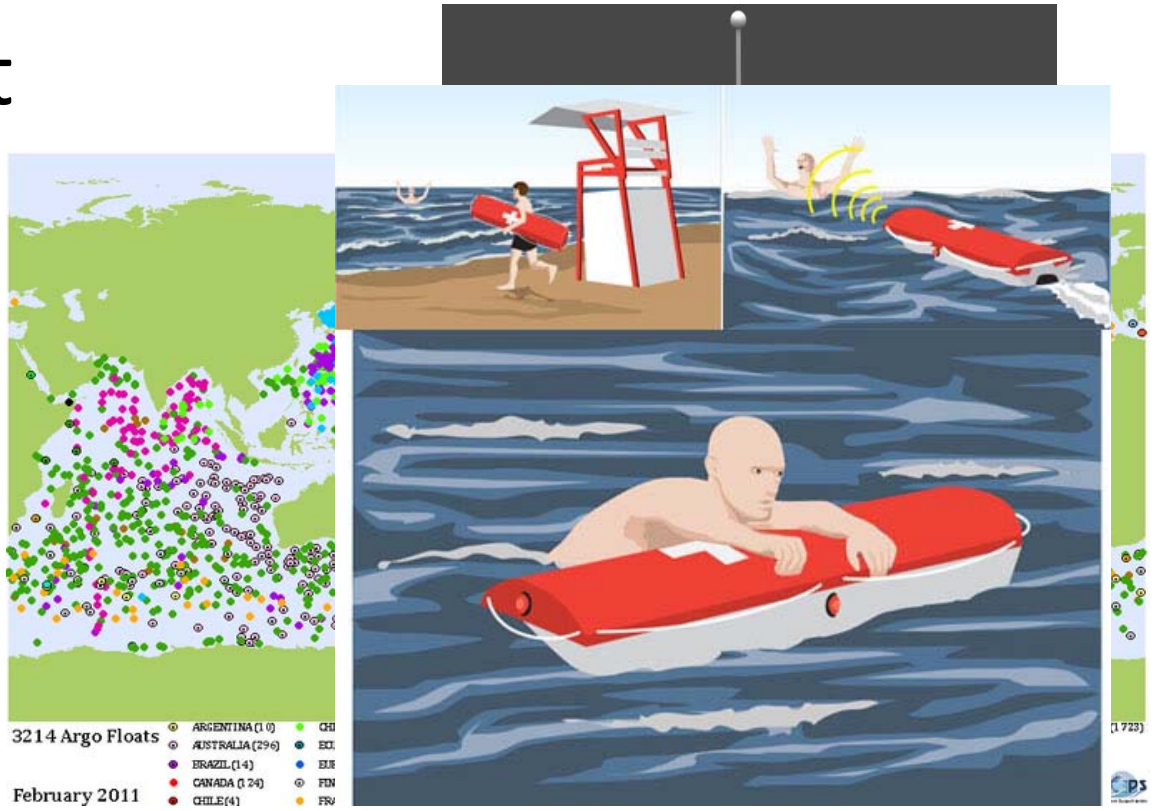
# Similar Projects

- ✧ Emily Robot
- ✧ ARGO
- ✧ Seaperch
- ✧ Globe.org

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# Robot Frame

- ✧ PVC piping for floatation
- ✧ 4 inch diameter
- ✧ ½ inch diameter
- ✧Plexiglas mount

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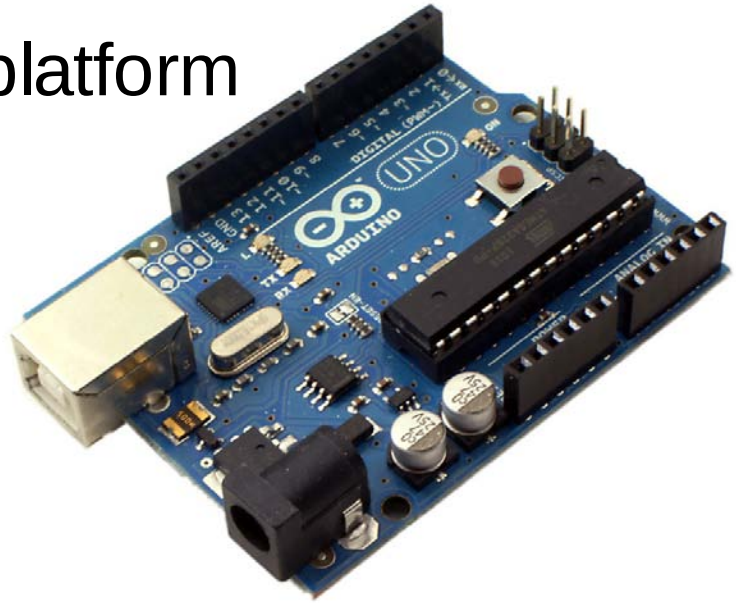
# Microcontroller

- ✧ Arduino UNO
- ✧ open source wiring platform
- ✧ shield design
- ✧ Inexpensive



# Programming: X-Code

```
-(void) moveLeft
{
    NSString * motorMove = [NSString stringWithFormat:@"HELLO#"];
    if (leftYN == YES)
    {
        motorMove = [NSString stringWithFormat:@"2#"];//send move left until send stop command
    }
    else
    {
        motorMove = [NSString stringWithFormat:@"2#"];//send move left while touched
    }
    NSString * address = @"192.168.1.172";
    UInt16 port = 9000;


    NSData * moveData = [motorMove dataUsingEncoding: NSUTF8StringEncoding];
    [socket sendData:moveData toHost:address port:port withTimeout:- 1 tag:1];

}
```

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# Programming: Arduino

```
SpiSerial.print("set ip gateway 192.168.1.152");
SpiSerial.print(byte(13));
delay(500);
SpiSerial.print("set ip netmask 255.255.255.0");
SpiSerial.print(byte(13));
delay(500);
SpiSerial.print("set ip address 192.168.1.152");
SpiSerial.print(byte(13));
delay(500);
SpiSerial.print("set ip local 9000");
SpiSerial.print(byte(13));
delay(500);
SpiSerial.print("set ip host 192.168.1.151");
SpiSerial.print(byte(13));
delay(500);
SpiSerial.print("set ip protocal 1");
SpiSerial.print(byte(13));
delay(500);
SpiSerial.print("set wlan channel 1");
SpiSerial.print(byte(13));
delay(500);
SpiSerial.print("set wlan ssid GowanusBot");
SpiSerial.print(byte(13));
delay(500);
```

```
Serial.println(message);
if (message == "1#"){ digitalWrite(8, HIGH);}
else if (message == "2#"){digitalWrite(3, HIGH);}
else if (message == "5#"){digitalWrite(8, LOW);}
else {digitalWrite(3, LOW);}
```

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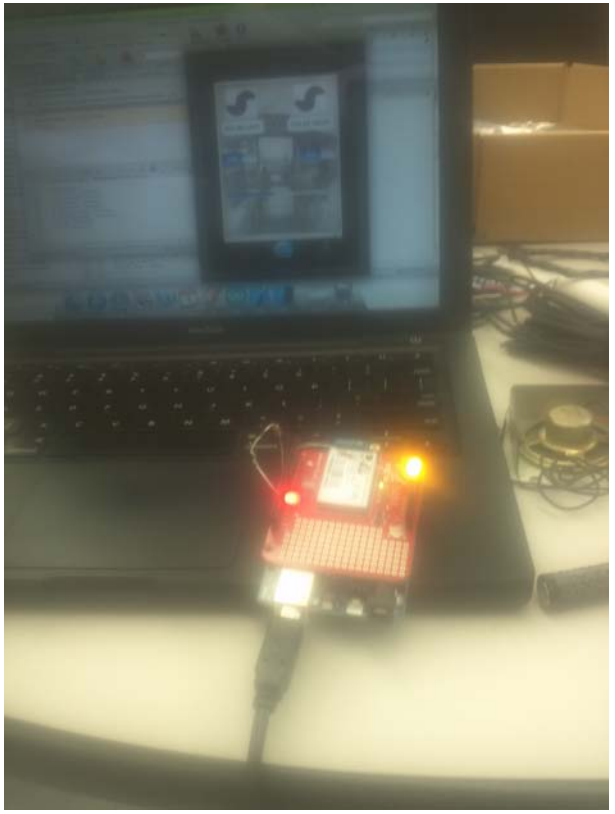
# Wireless Communication

- ✧ WiFly Shield
- ✧ Cellular Shield
- ✧ UBD Protocol
- ✧ GUI sends commands
- ✧ Arduino makes decisions



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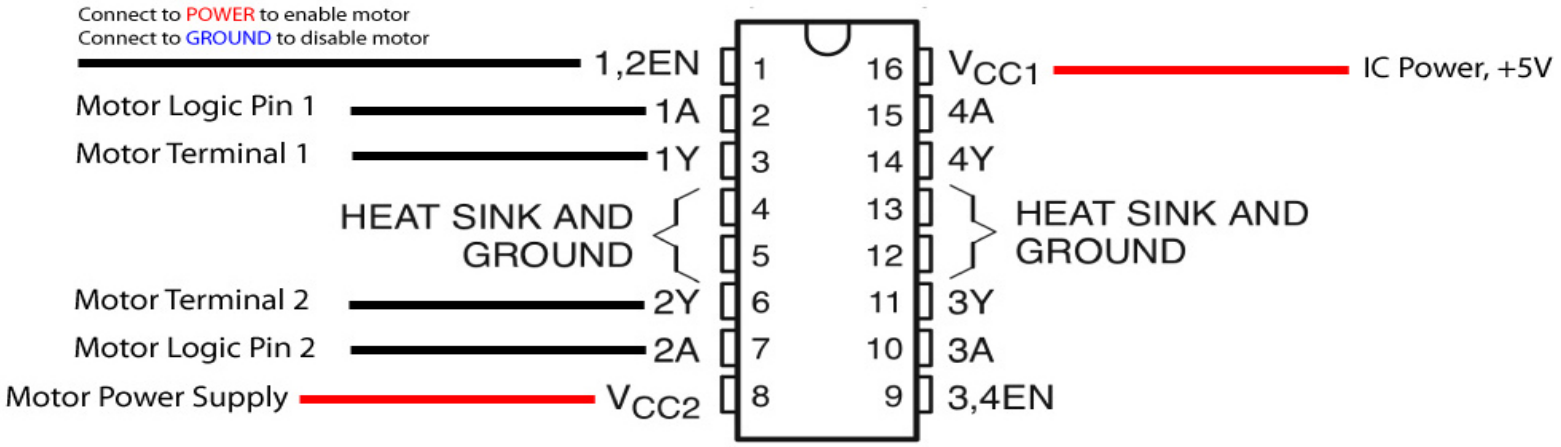
# Motor Design

- ✧ Device Controller
- ✧ H-Bridge
- ✧ SN754410

# H Bridge

## L293NE or SN754410




| EN | 1A | 2A | FUNCTION |
|---|---|---|---|
| H | L | H | Turn right |
| H | H | L | Turn left |
| H | L | L | Fast motor stop |
| H | H | H | Fast motor stop |
| L | X | X | Fast motor stop |

L = low, H = high, X = don't care

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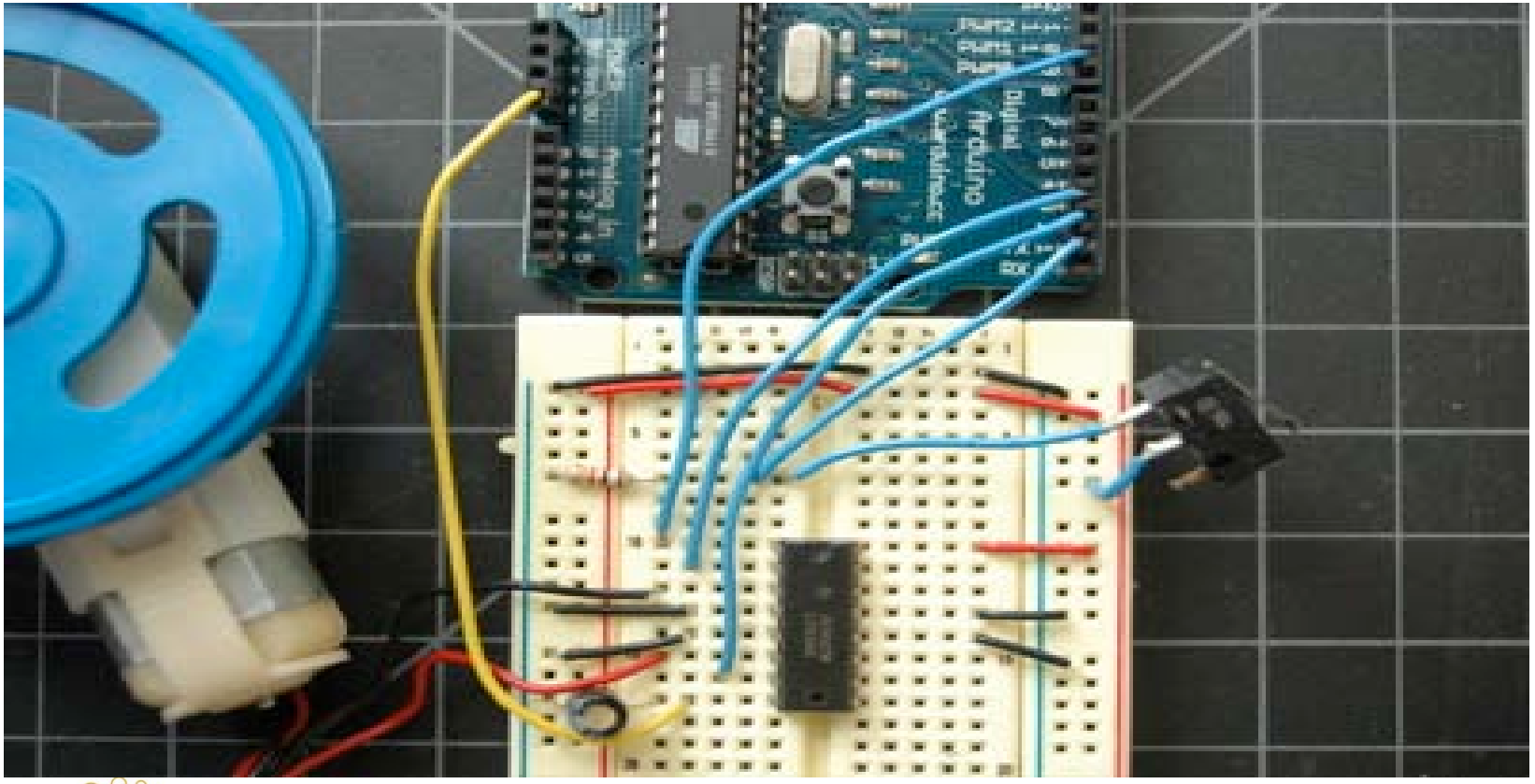
# H Bridge

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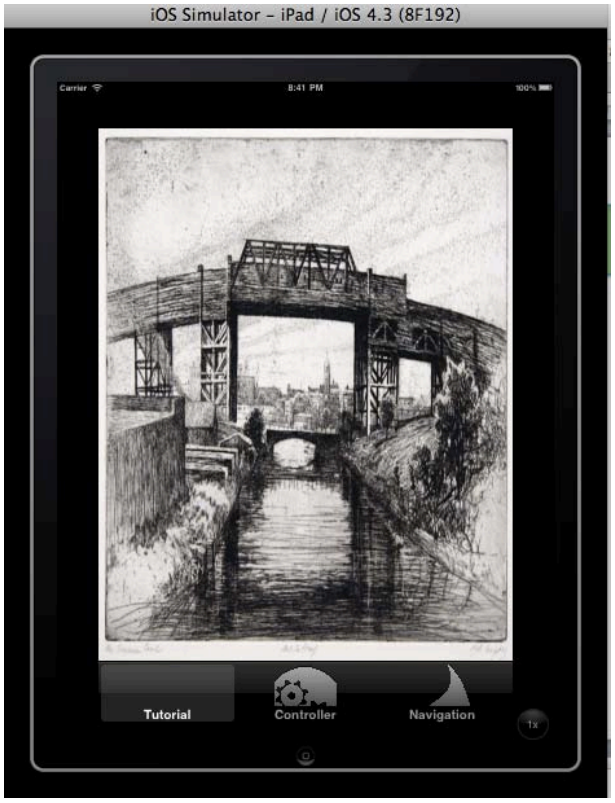
# Graphic User Interface





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# Sensors

- ✧ Camera
- ✧ Temperature Sensor
- ✧ Dissolved Oxygen
- ✧ ph sensor
- ✧ sediment sensor (anchor)

# Check List

- ✧ I-Device App
- ✧ Robot Frame
- ✧ Moving Robot
- ✧ Sensors
- ✧ Sending Video

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# Beyond Six Weeks

- ✧ Education App
- ✧ kits that students build (seaperch)
- ✧ database

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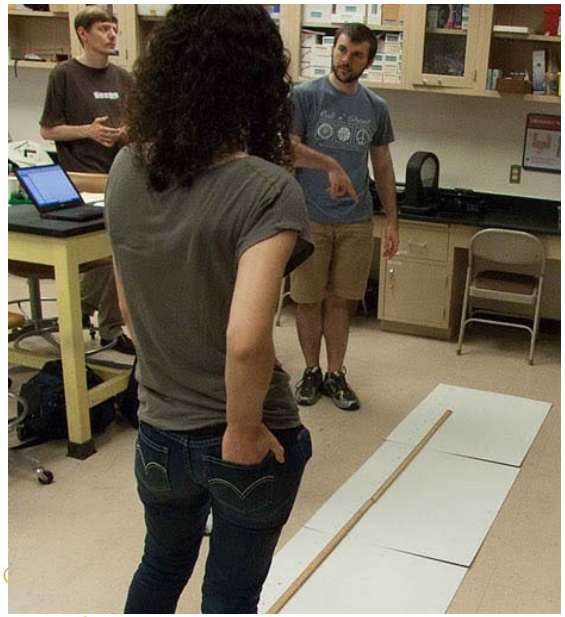
# Lesson

- ✧ Physics Modeling
- ✧ NXT Robot

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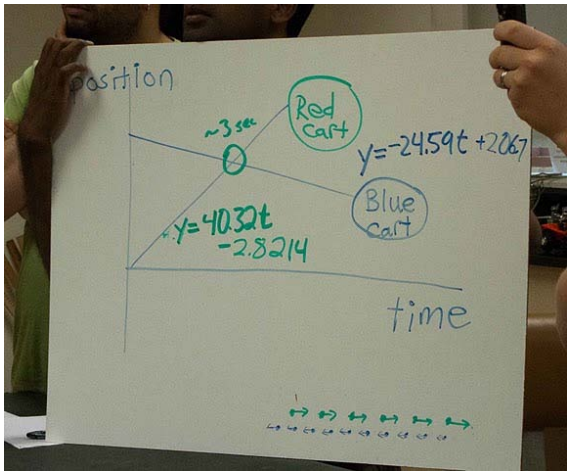
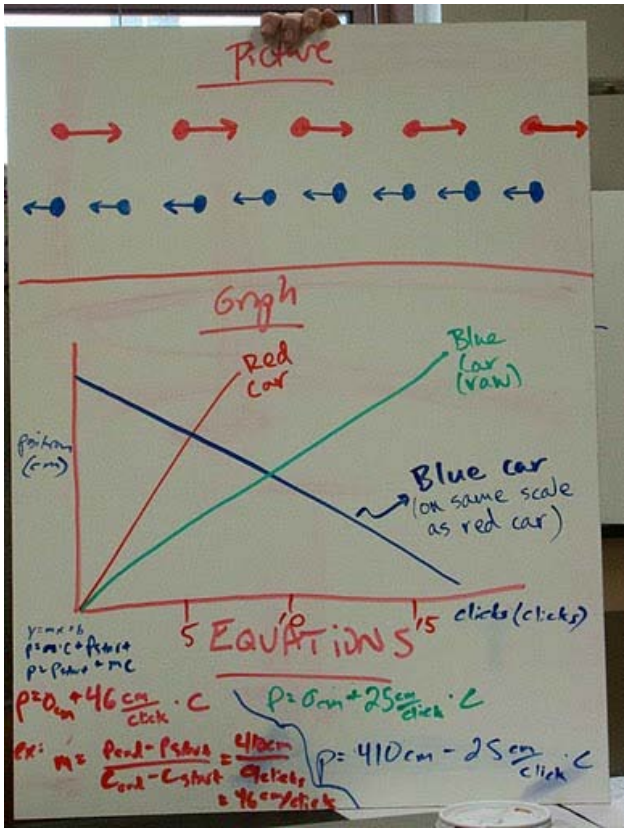
# Lesson

- ✧ Graph
- ✧ Share

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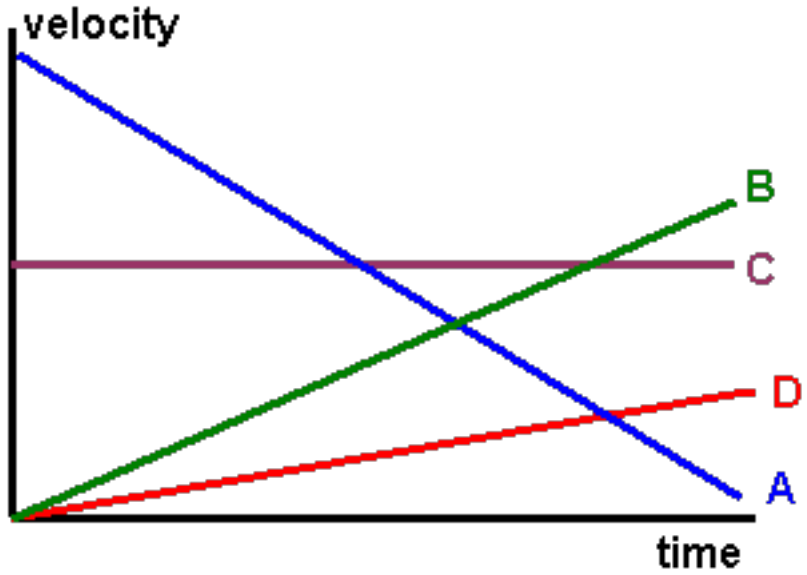
# Lesson

✧ Students Program

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