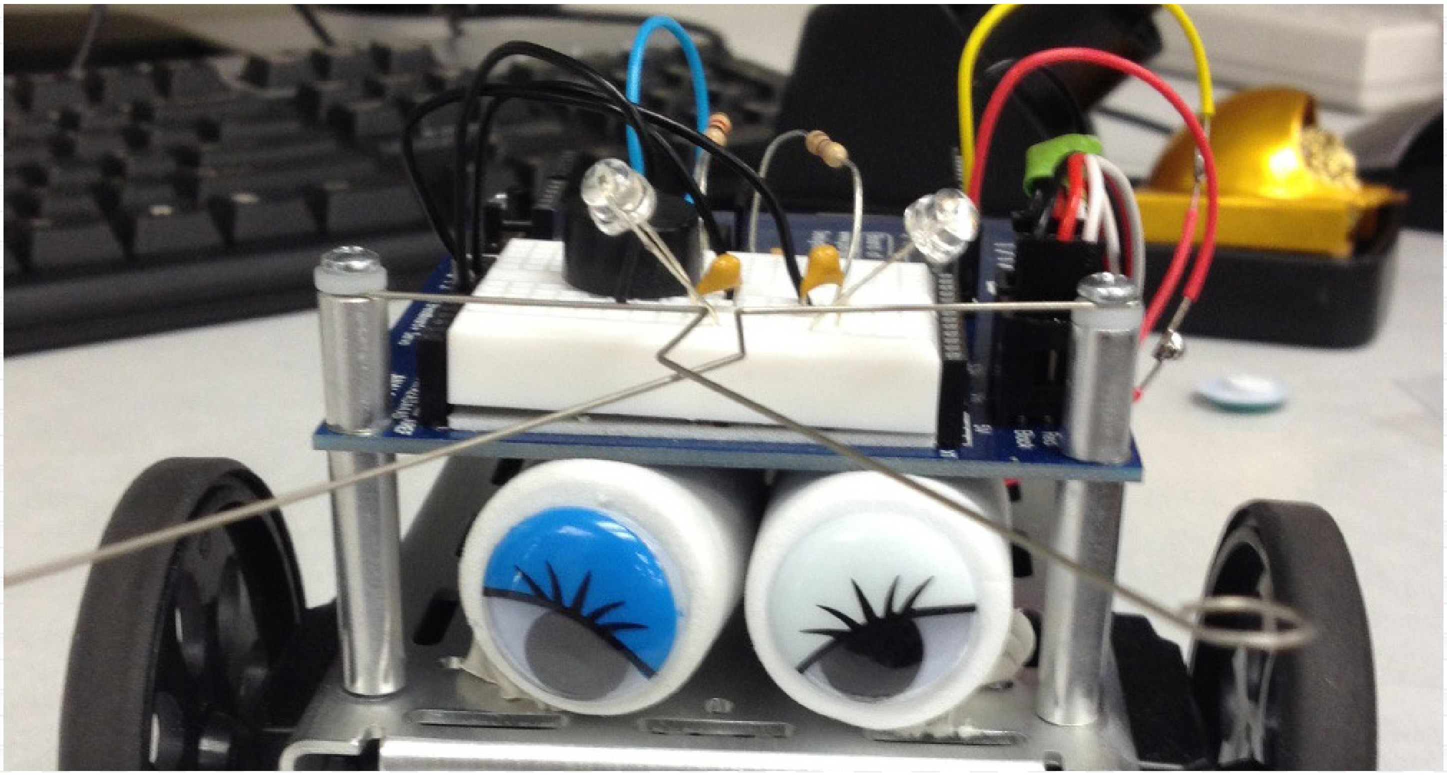
ROBOTICS LAB JOURNALS

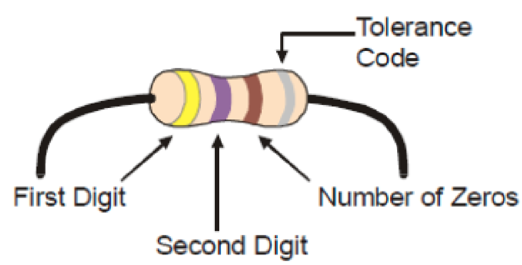


CHELSEA PATTEE | COGS8 | PROF. HUTCHINS | SPRING 2014

APRIL 9, 2014: LAB [BOE CH2.1-4]

Working through activity our group became familiar with the Board of Education Shield. Once the pins were lined up so that a gap was left in the sockets, we were able to move onto activity 2 where we built our first circuit! I have never worked with circuits before this class, but I have learned about resisters, current, and electricity in other applications. Applying this in a hands-on activity was not only helpful in gaining a better understanding, but it was also fun.

I learned how to read resistor values by their colored stripes, which is going to be difficult to remember. The first two colors represent the digits of the ohm value, and the third stripe represents the number of zeros. Every resistor either has a fourth gold or silver stripe (or no stripe) to indicate tolerance. This was helpful in figuring out which way to orient the resistor when reading the value. After connecting the LED pins and wire to the board, I had successfully built my first circuit! I also learned that LEDs have subtle features that indicate whether the pin is a cathode (+) or an anode (-), something that matters when you want the LED to work properly. The pins are typically two different sizes, the shorter being the anode, but there is another way to tell. Professor Hutchins brought up the point that this is not always the best indicator, since people sometimes clip them. Therefore, it is more useful to look for the flat side of the LED case, signaling the (-) side.

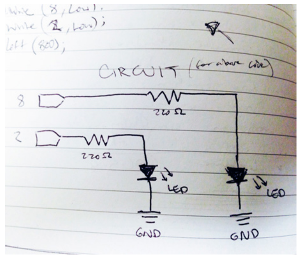


Resistor Color Code Values

Digit	0	1	2	3	4	5	6	7	8	9
Color	black	brown	red	orange	yellow	green	blue	violet	gray	white

APRIL 10, 2014: LECTURE

*see book for lecture notes



We changed the resistors from 4700 ohms to 220 ohms, which made the blinking LED light brighter. The decrease in resistance allows for a brighter emission of light. When only one LED was programmed to light up, both of the LEDs lit up. I learned that if the resistors are touching, they share current and will both activate. Now when building circuits I am more careful of the positioning of wires. I also learned that a servomotor would stay still when sent a signal with 1.5 ms pulse. This is denoted with writeMicroseconds(1500), where the value is the pulse time. 1.7 ms (1700) will rotate the servomotor full-speed-counterclockwise, and 1.3 ms (1300) will rotate the servo full-speed clockwise.

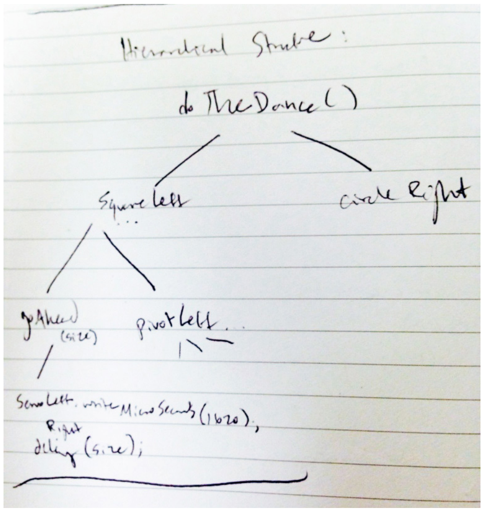
APRIL 16, 2014: LAB [BOE CH 3.1-3]

Although we were supposed to begin activities from chapter 3, we were finishing up activity 6 from chapter 3 in the BOE book. We worked with our groups and Servo bots to calibrate the wheels. The motor had to be adjusted to the precise spot where it would stay still when sent a signal of 1500 (1.5 ms). This was difficult at first, but with some practice and fine motor skills, we were beginning to get the hang of it. After calibrating the motors, we were ready to take our bot for a spin! When both the right and left motors were sent signals of 1400, the bot spun in a circle. With 1300 on the left and 1700 on the right, the bot moved backwards. Can it go in a bigger circle, we wondered? Left at 1300 and Right at 1400 with a delay of 1000 made the bot move in a circle. Using the same values and changing only the delay to 2000 made it move in one big circle, then a little one.

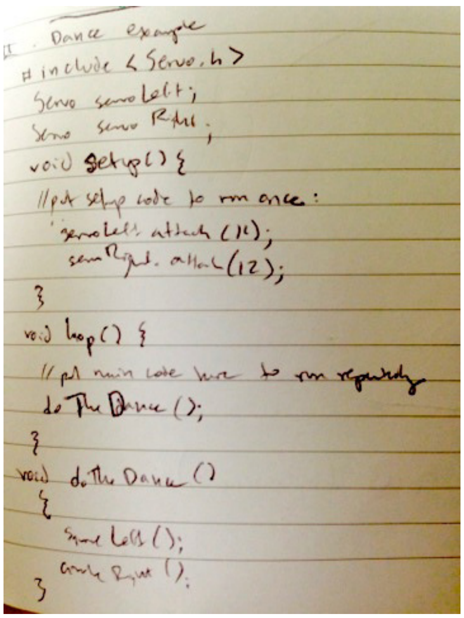
APRIL 22, 2014: LECTURE

*see book for lecture notes

#TIP: to start BOE bot, hold the reset button while setting the power switch to 2 #



Ultimately, the goal is to program the robot to do a dance. A look into the hierarchical structure of the program was helpful in conceptualizing the task.



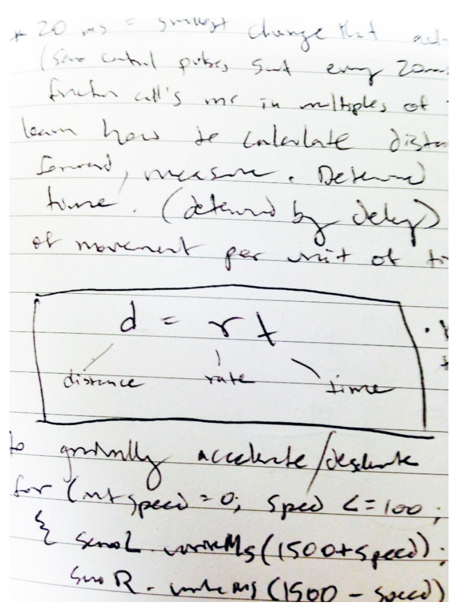
We must figure out the combination of microseconds (speed) and duration (delay) for certain movements. 20 ms is the smallest change that actually makes a difference. The Servo control pulses are sent every 20 ms, so adjusting the delay function calls ms in multiples of 20. In calculating distance, we make the bot move forward and measure in order to determine distance traveled over specified time (determined by delay). We must know the rate of movement per unit of time

#TIP: To gradually accelerate and decelerate, look at pg 89 in BOE book.#

APRIL 23, 2014: LAB [CH4.1-4]

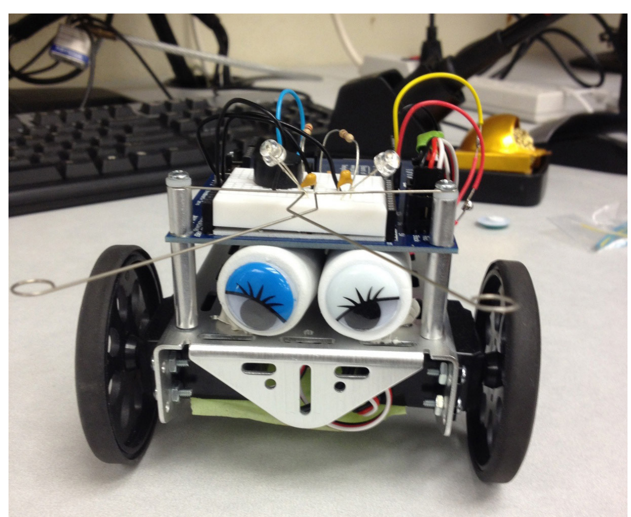
Pin11 L	Pin 12 R	Description	Behavior
1700	1300	Left counterclockise, right clockwise	moves forward, straight line
1300	1700	Left clockwise, right counterclockwise	moves backward, straight line
1700	1700	Left counterclockise, right counterclockwise	moves in small clockwise circle
1300	1300	Left clockwise, right clockwise	moves in a counterclockwise circle
1500	1700	left still, right counterclockwise	moves in a big clockwise circle
1300	1500	left clockwise, right still	moves in a big counterclockwise circle
1500	1500	Both servos should stay still	stationary
1520	1480	left counterclockwise slowest, right clockwise slowest	creeps forward slowly, veers slightly to the right.
1540	1460	left counterclockwise slow, right clockwise slow	seems to go forward slightly faster than previous
1700	1450	left counterclockwise, right clockwise slower	very large clockwise circle
1550	1300	left counterclockwise (slow), right clockwise full speed	very large counterclockwise circle

Our group completed activity 1, making the robot move forward for three seconds. We made it beep before moving forward. We changed delay and as a result the bot changed direction. Does delay on beep change the beep duration? After trying this, it does not seem to. Our first test was to see how far the bot pivots left over the duration of 1 second. It appears to turn about 150˚. At 1200 ms it turns about 190˚. Apparently the third time is the charm, since the third test achieved a movement of 180˚. We found that 1100ms is the time it takes for the bot to turn left 180˚. There are some inconsistencies, since 180˚ turn occurs between 1100ms and 1200ms possibly due to the debris on the surface navigated by the bot. We should bring a protractor and a ruler to the next class in order to accurately measure the angle of rotation and distance traveled. Tomorrow we will discuss arrays.



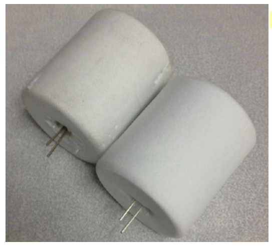
APRIL 24, 2014: LECTURE

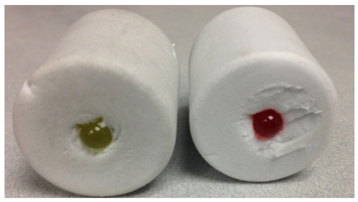
*look at journal for lecture notes



APRIL 28, 2014: AT HOME

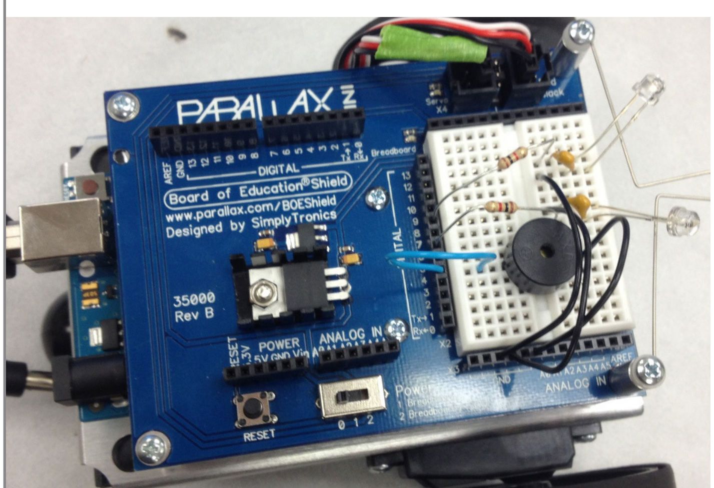
I was able to check out the BOE bot and take it home for further experimentation. During this time, I completed the activity and chart that investigates combinations of speed and resulting action. I uploaded the table to my group's Google drive folder. I also placed googly eyes on the bot, to give it character. After group approval, Prof. Hutchins suggested we try inserting the LEDs into the eyes and have them emit light. I love the idea, and can't wait to see this in action.

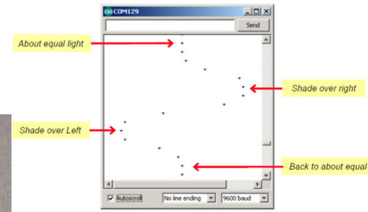




APRIL 30, 2014: LAB

After messing around with the piezo speakers and generating a melody, we were curious to see if we could produce a harmony using two speakers. Our group learned about the master writer and slave receiver through an Arduino tutorial and the guidance of Prof. Hutchins. The program should have the Master start the slave, and play notes. The Slave should wait for the start command from the Master, and then play notes. While we could not get them to talk to each other, we were able to program them individually and start the speakers simultaneously by holding the reset button on both and coordinating release.





MAY 7, 2014: LAB

**absent, we completed activity 4 ch 5

MAY 14, 2014: LAB

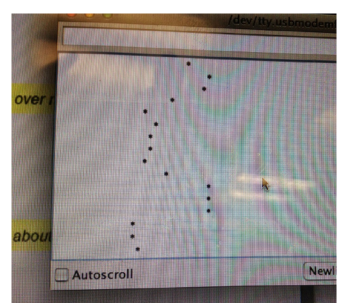
Worked on chapter 6, activity 1 using phototransistors, jumper wires, and 2K resistor (colored red brown red). Followed steps in activity one, got the photo resistor to sense light. This was tested by shading the sensor as well as by shining the iPhone flashlight. The readings jumped to 1.4 (which was the highest). Another group burned out their resistor using the iPhone flashlight, but it was because they held the light above the sensor for an extended period of time. We were also able to get the servo motor to stop when light over 3.5 was sensed (volts (A3) > 3.5), the highest output sensed was 4.9volts. This is when the bot stopped. We tried changing the resistor to alter light sensitivity. A larger resistor (high ohms) creates a higher sensitivity to light (highest voltage output). At first we used red brown red resistor (2k ohms), and then tried the yellow violet red resistor (4.7 k ohms). Although the sensitivity changed, the output was not significantly different because output was of time rather than voltage, and sensitivity does not effect time.

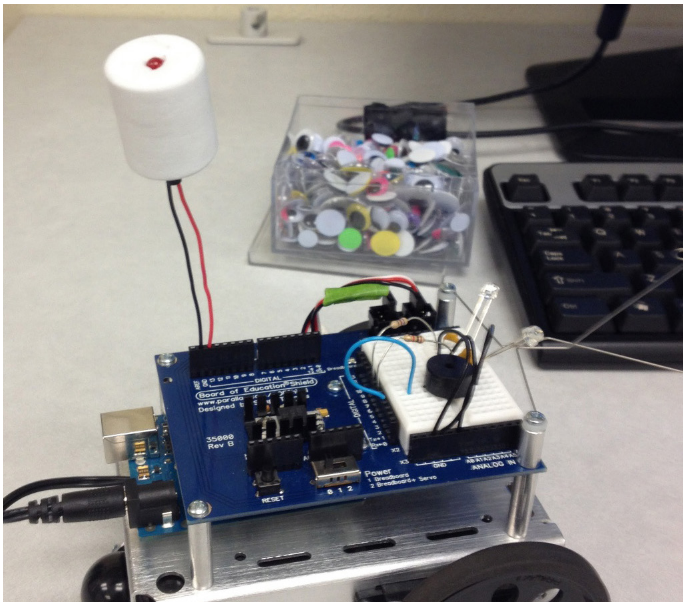
MAY 15, 2014: LECTURE

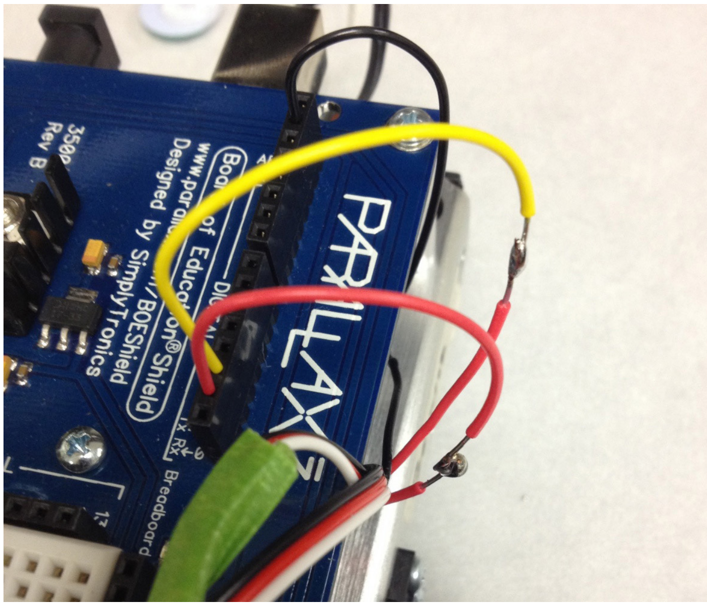
Went over quiz 3 answers.

Tip 1: Arduino's MAP function: useful for mapping a value in one range of integers to equivalent value in some other range.

Tip 2: LEDs and phototransistors care about polarity (+/- matter), whereas capacitors and resistors do not care about polarity.







Experimented with charge transfer current: Arduino defines rate at which capacitor loses charge through phototransistor by measuring how long it takes the capacitor's voltage to decay. Decay time corresponds to how wide open the valve is. More light = faster decay. Similarly, less light = slower decay. We had some time for lab, and walked through the BOE manual to learn how to display light sensor values.

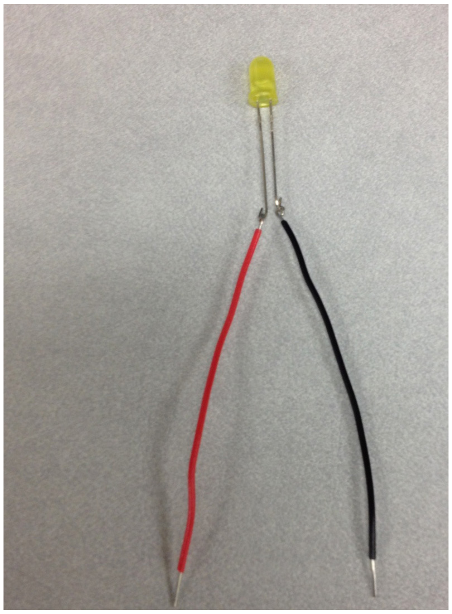
MAY 16, 2014: OFFICE HOURS

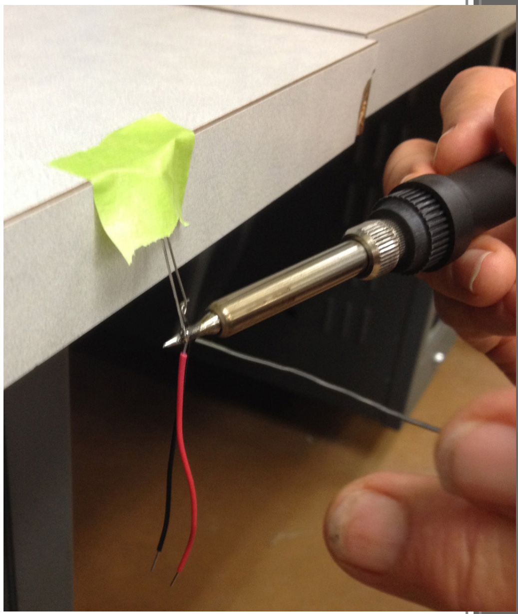
Professor Hutchins and I soldered wires to the LEDs that were nested within the robot "eyes" and attached them to pins and ground so they would light up, giving the robot life! At first we were able to make them blink, but they would not function properly when a program was loaded to the BOE bot. We later figured out there was a small mistake in the code: we didn't declare pinMode in the setup. I was so excited to both learn how to properly solder as well as create functional add-ons to my robot!!

#TIP: make sure pins are declared with pinMode or else the program will not know from which pin to send/read data.#

MAY 20, 2014: LECTURE

In-depth overview of P (proportional), PI, (proportional integrative) and PID (proportional integrative derivative)control.
**Look at book for notes.





MAY 22, 2014: FIELDTRIP!

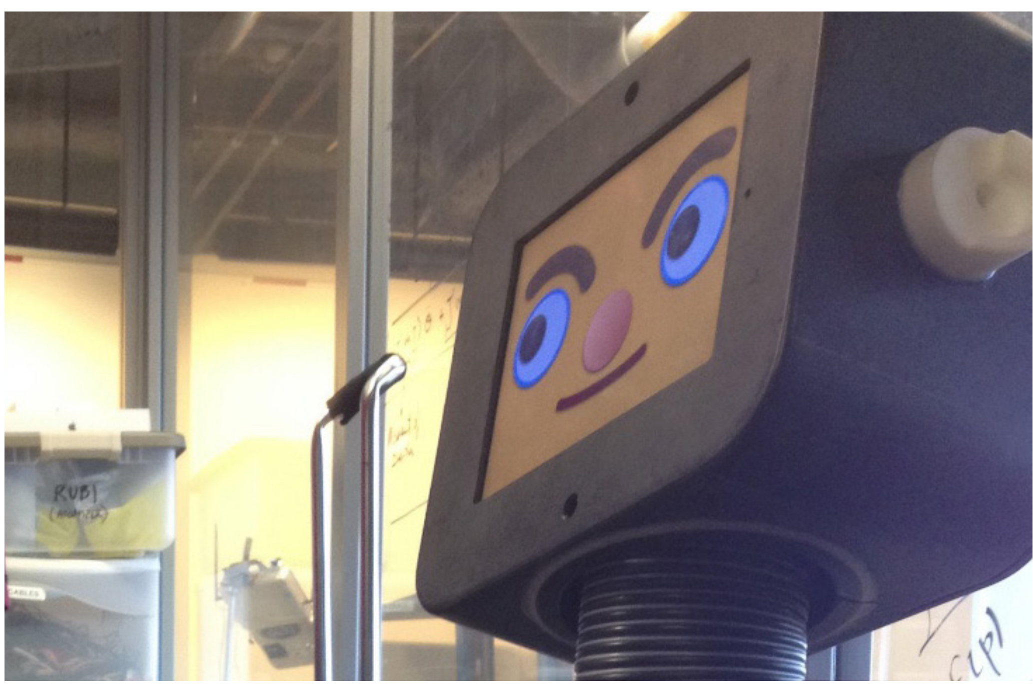
Went to CalIT2 to see RUBI the robot. Prof. Forster lead us through the project, giving an overview of past, current, and future models of RUBI. I am interested in being involved and have contacted her to set up a meeting.

MAY 28, 2014: LAB

**final: multiple choice and short answer!!!

worked on chapter 6, activity 4. We had trouble with the brown black red = 1k, changing from 2k to 1k resistor. Should cut sensitivity in half. Seems to function properly. Now trying larger resistor: brown black orange 10k resistor. Now it is 10x as sensitive to light, and turns easily when light is in a somewhat near range. Optimal seems to be in between 2k-5k, most likely closer to 2k….10 was way to sensitive.

Started chapter 7 activity 1
LED: long positive, short negative

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HERE