Lab Notebook

ENGT120-50C

Engineering Concept in Technology

Summer 2015

Mari Martin

7/29/15

CONTENTS

Lab 1

RESISTOR

Experiment Date: 6/10/2015

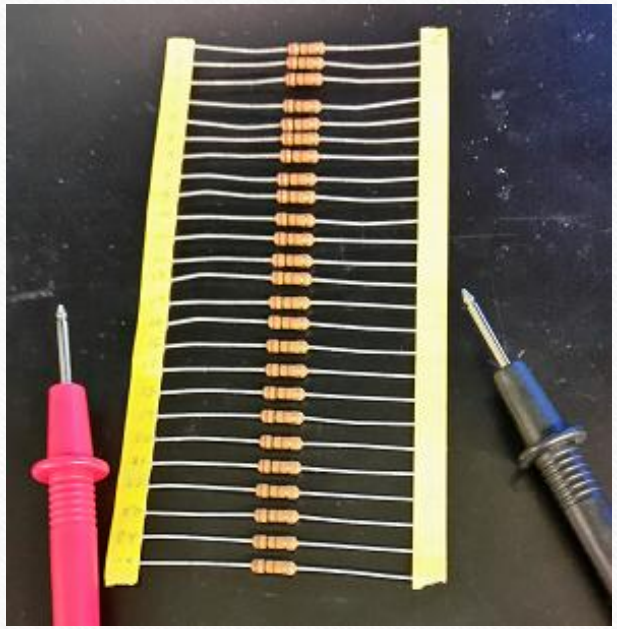
Lab 1: Resistors (1)

Objective:

Learn how resistors vary using 25 resistors with the same color code.

Equipment/Materials:

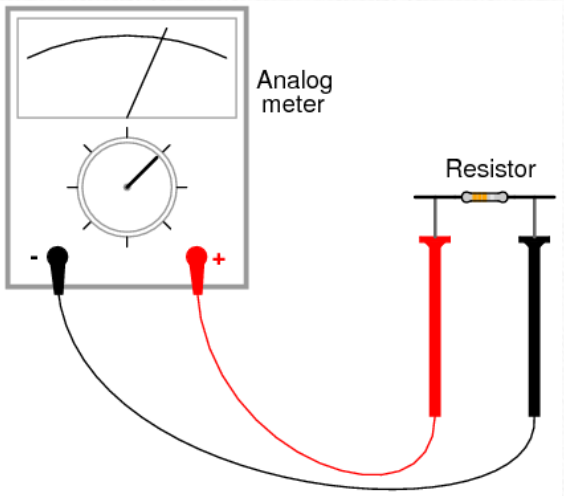
Bench 7	Brand	Model	S/N
Digital Multimeter	GW INSTEK	GDM-8245	CL860237
25 x 100 Ω resistors	N/A	N/A	N/A



Lab 1: Resistors (2)

Procedures:

1. Connect red and black ends of a Digital Multimeter each other to make sure the equipment is working properly.
2. Connect a resistor to the red and black ends of a Digital Multimeter to measure the resistors' value.
3. Record all measured data using Excel and calculate highest, lowest, average, and standard deviation of the readings.



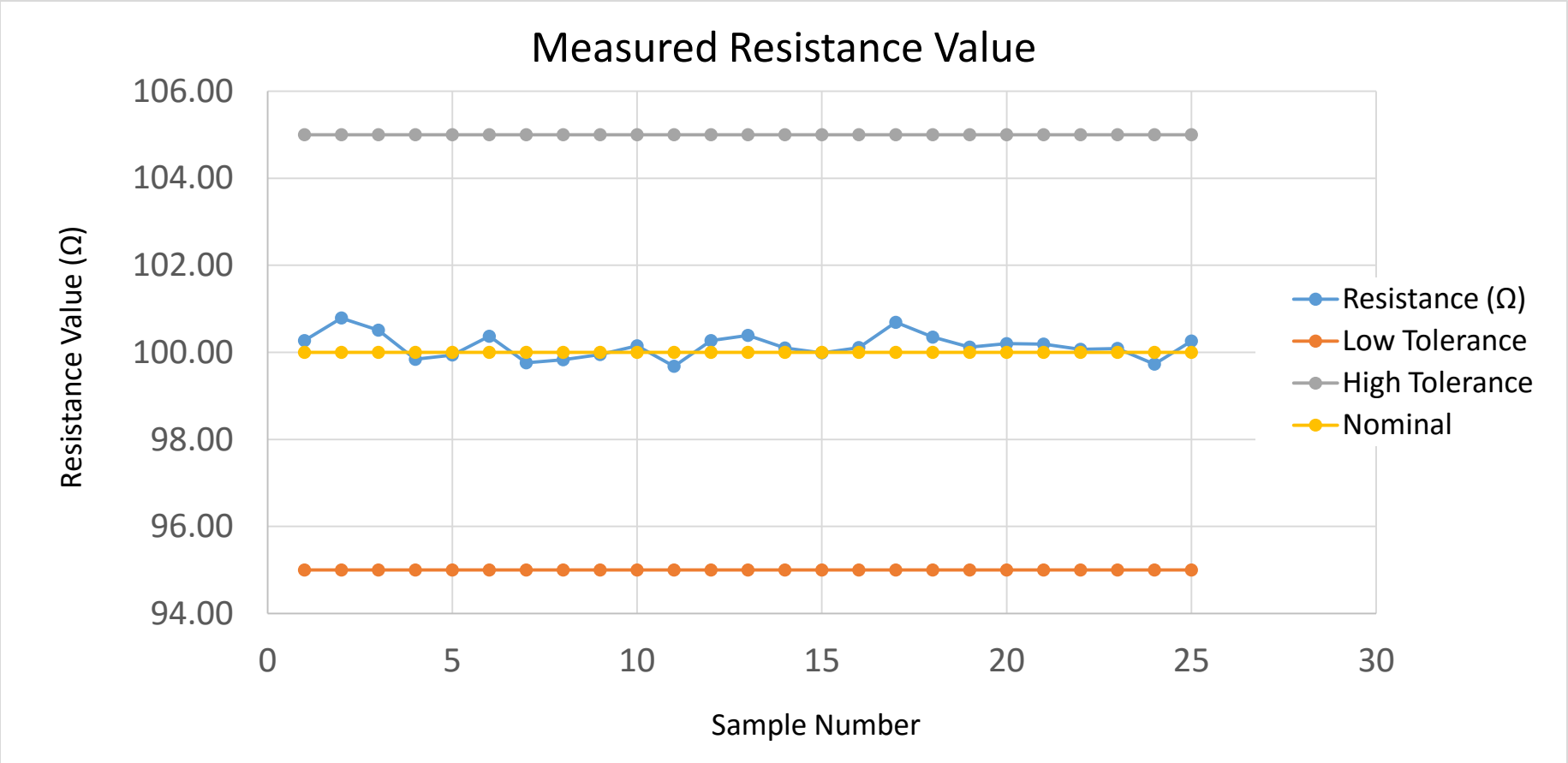
Lab 1: Resistors (3)

Calculation/Measured Data:

Mean	100.15	(Ω)	= AVERAGEA (B12:B36)
Std. Dev	0.28	(Ω)	= STDEV (B12:B36)
Median	100.12	(Ω)	= MEDIAN (B12:B36)
Mode	100.27	(Ω)	= MODE (B12:B36)
Smallest	99.68	(Ω)	= MIN (B12:B36)
Largest	100.79	(Ω)	= MAX (B12:B36)
Range	1.11	(Ω)	= B43 - B42

	A	B	C	D	E
10		Measured Value	Resistor Tolerance		
11		Resistance (Ω)	Low Tolerance	High Tolerance	Nominal
12	1	100.27	95.00	105.00	100.00
13	2	100.79	95.00	105.00	100.00
14	3	100.51	95.00	105.00	100.00
15	4	99.84	95.00	105.00	100.00
16	5	99.94	95.00	105.00	100.00
17	6	100.37	95.00	105.00	100.00
18	7	99.76	95.00	105.00	100.00
19	8	99.83	95.00	105.00	100.00
20	9	99.95	95.00	105.00	100.00
21	10	100.15	95.00	105.00	100.00
22	11	99.68	95.00	105.00	100.00
23	12	100.27	95.00	105.00	100.00
24	13	100.39	95.00	105.00	100.00
25	14	100.10	95.00	105.00	100.00
26	15	99.99	95.00	105.00	100.00
27	16	100.11	95.00	105.00	100.00
28	17	100.69	95.00	105.00	100.00
29	18	100.35	95.00	105.00	100.00
30	19	100.12	95.00	105.00	100.00
31	20	100.20	95.00	105.00	100.00
32	21	100.19	95.00	105.00	100.00
33	22	100.07	95.00	105.00	100.00
34	23	100.09	95.00	105.00	100.00
35	24	99.73	95.00	105.00	100.00
36	25	100.26	95.00	105.00	100.00

Lab 1: Resistors (4)



Lab 1: Resistors (5)

Conclusion:

Measured data were vary and none of them were exact same value as the color code. However, all of data were within 5% of tolerance value.

We observed that standard resistors do not have the exact value as the color code value.

Lab 2

Computer Hardware

Experiment Date: 6/22/2015

Lab 2: Computer Hardware (1)

Objective:

To understand how computer hardware are consisted.

Equipment/Materials:

Bench 7	Brand	Model	S/N
Computer	DELL	**OPTIPLEX 780**	00196-165-775-717
Tool Kit	N/A	N/A	N/A

Lab 2: Computer Hardware (2)

Procedures:

1. Decompose the computer using tool kit.
2. Record model name and serial number of mother board, CPU, RAM, Hard drive, CD/DVD drive, video card, and power supply to find three alternative replacement.
3. Research those parts' replacements online website.

Lab 2: Computer Hardware (3)

What is MOHTERBOARD?

A **Motherboard** is the main printed circuit board (PCB) found in computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals. Unlike a backplane, a motherboard contains significant sub-systems such as the processor and other components.

Lab 2: Computer Hardware (4)

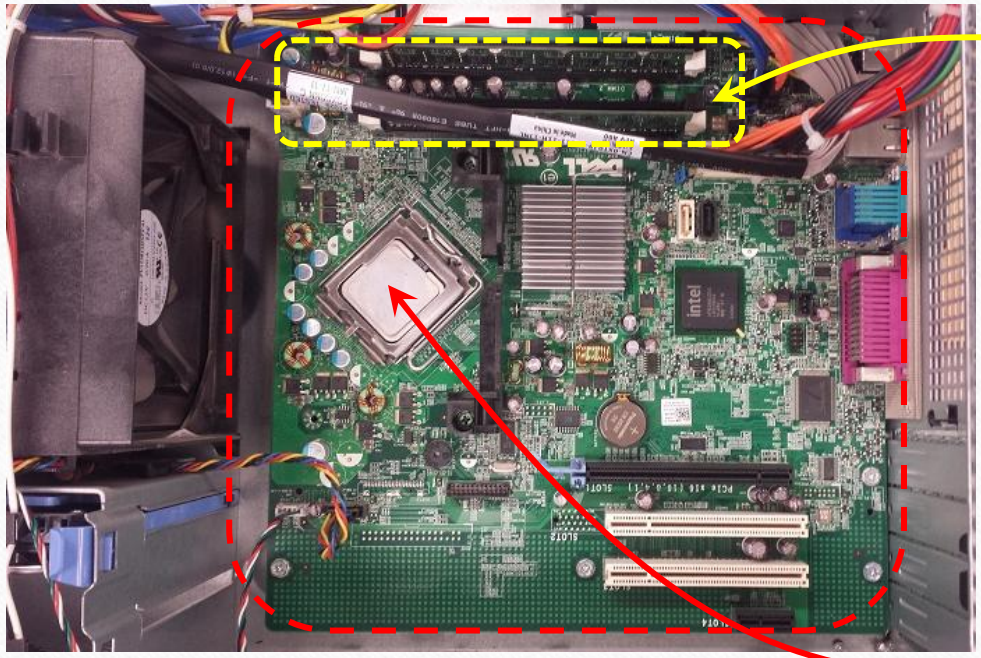
What is CPU?

CPU (*pronounced as separate letters*) is the abbreviation for ***c****entral* ***p****rocessing* ***u****nit*. Sometimes referred to simply as the *central processor*, but more commonly called processor, the CPU is the brains of the computer where most calculations take place. In terms of computing power, the CPU is the most important element of a computer system.

http://www.webopedia.com/TERM/C/CPU.html

Lab 2: Computer Hardware (5)

Configuration:



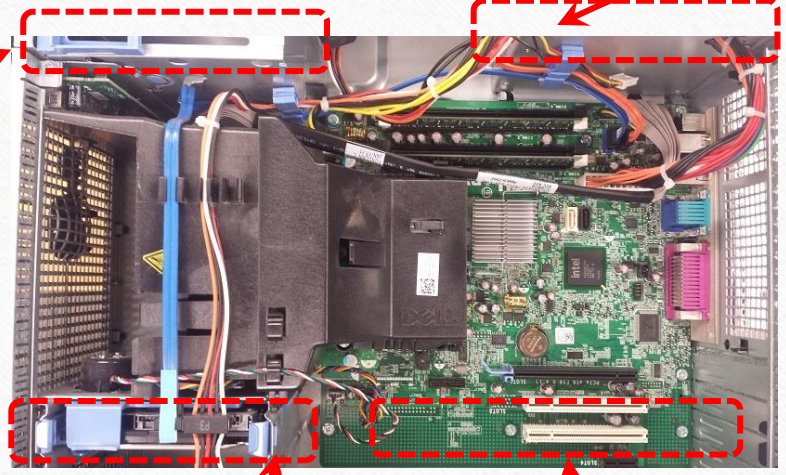
Motherboard

RAM (Memory)

CPU

Lab 2: Computer Hardware (6)

Configuration:



CD/DVD drive

Hard Drive

Video Card (not existed)

Power Supply

Lab 2: Computer Hardware (7)

Alternative for CPU:

I chose No. 2 component as my alternative because it is cheaper and faster clock speed compared to others.

			Clock Speed (GHz)	FSB Speed (MHz)	Cache Memory (MB)	Processor Type	Compatible Slots	Price		URL
								new	used	
1	INTEL AW80576ZH0836M	CPU Core 2 Duo Extreme X9100 3.06GHz FSB1066MHz 6MB uFCPGA8/Socket P Tray	3.06	1066	6	Core 2 Duo Extreme	Socket P	$149.95	$128.68	http://www.amazon.com/AW80576ZH0836M-Extreme-3-06GHz-FSB1066MHz-uFCPGA8/dp/B001BN17X4/ref=sr_1_7?s=pc&ie=UTF8&qid=1435016022&sr=1-7&keywords=cpu+intel+core+duo
2	EU80570PJ0876M; AT80570PJ0876M	Intel Core 2 Duo Processor E8500 3.16GHz 1333MHz 6MB LGA775 CPU, OEM	**3.16 GHz**	1333	6	Intel Core 2 Duo Processor E8500	LGA 775	**$24.95**	**$12.70**	http://www.amazon.com/Intel-Processor-3-16GHz-1333MHz-LGA775/dp/B009AG2YJ0/ref=sr_1_1?s=pc&ie=UTF8&qid=1435016866&sr=1-1&keywords=cpu+intel+core+duo&pebp=1435017061301&perid=0XKYDE4CR6G8Y3JRACKJ
3	EU80570PJ0806M; AT80570PJ0806M	Intel Core 2 Duo E8400 3.0GHz Processor EU80570PJ0806M OEM TRAY	3.0 GHz	1333	6	Intel Core 2 Duo Processor E8400	LGA 775	$36.95	$8.60	http://www.amazon.com/Intel-E8400-3-0GHz-Processor-EU80570PJ0806M/dp/B0019NKGR4/ref=sr_1_2?s=pc&ie=UTF8&qid=1435016866&sr=1-2&keywords=cpu+intel+core+duo&pebp=1435017224111&perid=0XKYDE4CR6G8Y3JRACKJ

Lab 2: Computer Hardware (8)

Alternative for RAM:

I chose No. 1 component as my alternative because it has the most greater memory.

		Memory	Operating Frequency	Price	URL
		GB	MHz	(new)	
1	8GB (2x4GB) Memory RAM Compatible with Dell Optiplex 780 DT / MT / SFF Desktops	4	1333	$47.50	http://www.amazon.com/Memory-Dell-Optiplex-780-Desktops/dp/B00AAL6KHG
2	2GB Memory RAM Upgrade for the Dell OptiPlex 760 Mini Tower (DDR2-800, PC2-6400)	2	N/A	$11.98	http://www.amazon.com/Memory-Upgrade-OptiPlex-DDR2-800-PC2-6400/dp/B0030V8WN8
3	2 GB Dell New Certified Memory RAM Upgrade for Dell Optiplex 780 Desktop SNPP223CC/2G A4051419	2	1333	$21.95	http://www.amazon.com/Dell-Certified-Optiplex-SNPP223CC-A4051419/dp/B005CPUF12/ref=sr_1_1?ie=UTF8&qid=1435018177&sr=8-1&keywords=dell+memory+optiplex+780

Lab 2: Computer Hardware (9)

Alternative for Video Card:

I chose No. 2 component as my alternative because it has the most greater memory size.

		Memory Size	Descriptions	Price		URL
				(new)	used	
1	Dell ATI Radeon Hd 3450 Dms-59 256mb Y103d Pcie X16 S-video Graphics Card B629	256MB	Dell ATI Radeon HD 3450 DMS-59 256MB Y103D PCIe x16 S-Video Graphics Card B629	$49.00	$6.59	http://www.amazon.com/Dell-Radeon-Dms-59-S-video-Graphics/dp/B00K3WW3UK/ref=sr_1_1?ie=UTF8&qid=1435018566&sr=8-1&keywords=dell+optiplex+780+video+cardGraphics/dp/B00K3WW3UK/ref=sr_1_1?ie=UTF8&qid=1435018437&sr=8-1&keywords=dell+optiplex+780+video+card
2	AMD radeon HD 7470 1GB 1024MB low profile video card with display port and DVI for SFF / slim desktop computer	**1 GB**	DVI-I and DisplayPort, support ultra high 2560x1600 Support: DirectX v11, shader Model: 5.0, support Blu-ray 3D and Stereoscopic 3D For office computers in work or home, NOT for gaming Cetified for windows 7, 8, windows vista and XP.	$85.00	N/A	http://www.amazon.com/radeon-profile-display-desktop-computer/dp/B00CR230G0/ref=sr_1_2?ie=UTF8&qid=1435018566&sr=8-2&keywords=dell+optiplex+780+video+card
3	Dell W459D ATI Radeon HD3470 256MB Video Card 102B4031900 w/Fan Optiplex 780 580 960 Graphics	256MB	Video Card Optiplex 780 Dell computer-graphics-cards	$29.95	N/A	http://www.amazon.com/Dell-Radeon-102B4031900-Optiplex-Graphics/dp/B00XCGUJKK/ref=sr_1_3?ie=UTF8&qid=1435018566&sr=8-3&keywords=dell+optiplex+780+video+card

Lab 2: Computer Hardware (10)

Conclusion:

We opened a computer case and verified the location of each parts (mother board, CPU, RAM, Hard drive, CD/DVD drive, video card, and power supply) and choose alternatives for CPU, RAM, and Video Card.

I learned that there are a lot of alternatives for all computer parts.

Lab 3

Surveying

Experiment Date: 7/6/2015

Lab 3: Surveying (1)

Objective:

To understand how to determine the tall object's height using Theodolite.

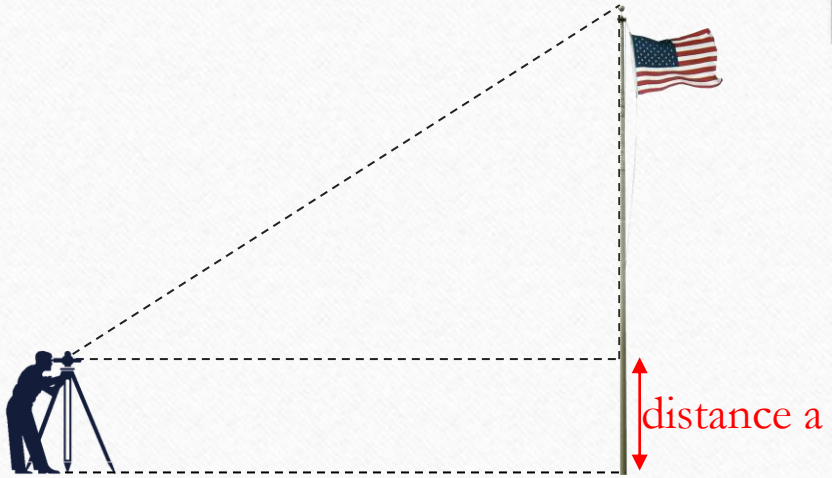
Equipment/Materials:

	Brand	Model
Digital Theodolite	CST/Berger	**DGT10**
Tripod	CST/Berger	**Universal Contractor's Aluminum Tripod**
Measuring Rod	CST/Berger	**16' Telescoping Aluminum Leveling Rod**
Measuring Tape	N/A	**N/A**

Lab 3: Surveying (2)

Procedures:

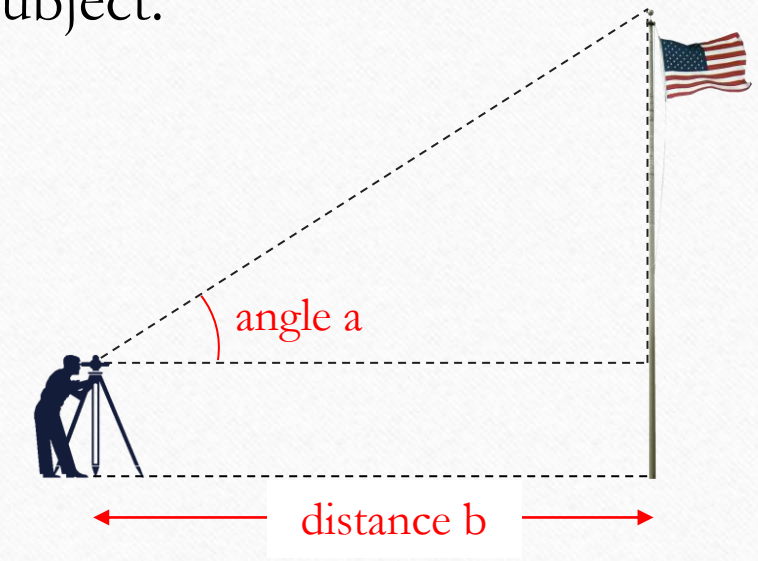
1. Set the tripod on the ground which is stable and leveled with the subject to be measured.
2. Set the Digital Theodolite on the tripod and set it to be horizontal using adjuster knob.
3. Set the lens to be 90° from the vertical line of the ground using another knob.
4. Look into the lens and find the subject.
5. Set the measuring rod near by the subject.
6. Measure the height of the position of the subject which horizontal to the lens (*distance* ***a***).



Lab 3: Surveying (3)

Procedures:

7. Hung a plumbob under the theodolite.
8. Measure the distance between the object and theodolite using the tip of the plumbom (*distance* ***b***).
9. Rotate the lens to aim to the tip end of the subject.
10. Measure the angle of the lens (*angle* ***a***).
11. Calculate the length of the subject using trigonometric functions.



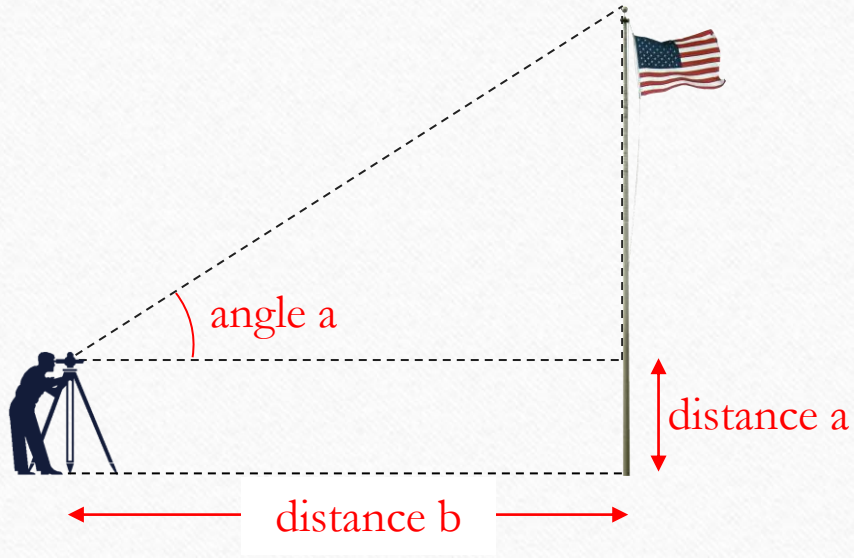
Lab 3: Surveying (4)

Measured Data:

	distance **a**	distance **b**	angle **a**
IvyTech Flag	4' 8.5"	38' 2"	61° 32' 13"
American Flag	4' 3.3"	44' 9"	58° 39' 51"
Indiana State Flag	4' 0.6"	45' 4"	64° 48' 28"

Convert

	distance **a** (ft)	distance **b** (ft)	angle **a** (°)
IvyTech Flag	4.71	38.17	28.46
American Flag	4.28	44.75	31.34
Indiana State Flag	4.05	45.33	25.19

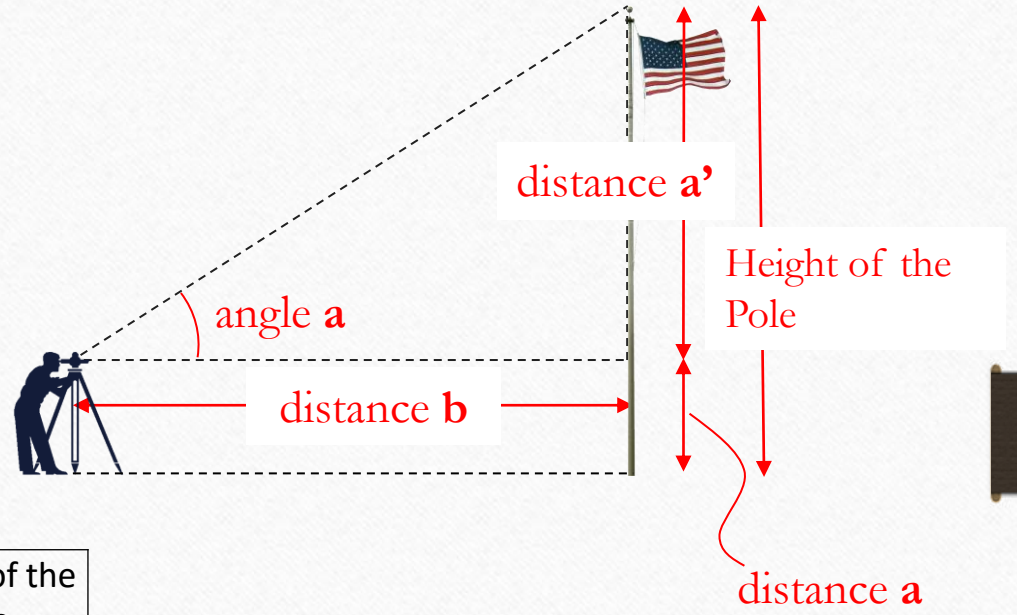


Lab 3: Surveying (5)

Calculation:

distance a' = tan(angle a) × distance b

Height of the Pole = distance a + distance a'



	distance **a** (ft)	distance **b** (ft)	angle **a** (°)	Distance **a'** (ft)	Height of the Pole (ft)
IvyTech Flag	4.71	38.17	28.46	20.69	**25.40**
American Flag	4.28	44.75	31.34	27.25	**31.52**
Indiana State Flag	4.05	45.33	25.19	21.32	**25.37**

Ivy Tech flag and Indiana State flag are almost same height!

Lab 3: Surveying (6)

Conclusion:

We measured distance between Theodolite and flag poles, also angle of tip of the pole and Theodlite. Using those data, I calculated to determine flag's height.

The height of Ivy Tech flag and Indiana State flag are almost same. I concluded they are the same height.

Lab 4

Robotics

Experiment Date: 7/15/2015

Lab 4: Robotics (1)

Objective:

Set the program to lead robot to a goal of maze without touching the wall.

Equipment/Materials:

	Brand	Model
Robotics Lab	LEGO	Robot Name: Junior
LEGO Mindstorms	LEGO	NXT v2.0

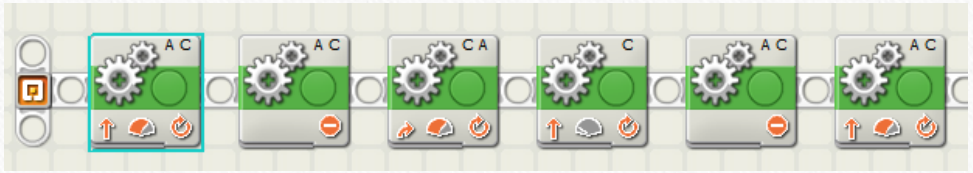
Lab 4: Robotics (2)

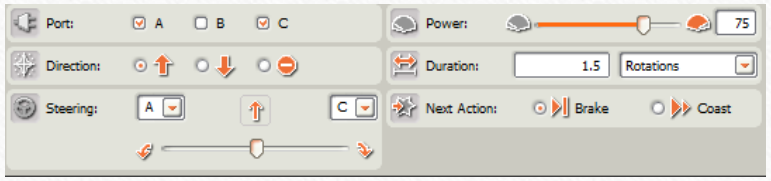
Procedures:

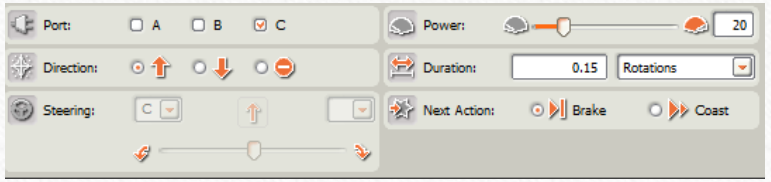
1. Connect Lego mindstorm robot and motor, right(A slot) and left(C slot), using connector codes.
2. Connect Lego mindstorm robot and PC using USB connector code.
3. Program the robot operation using NXT v2.0 software.
4. Install the program and run the robot to lead to a goal of maze without touching the wall.

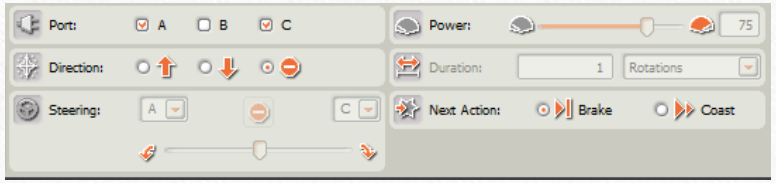
Lab 4: Robotics (3)

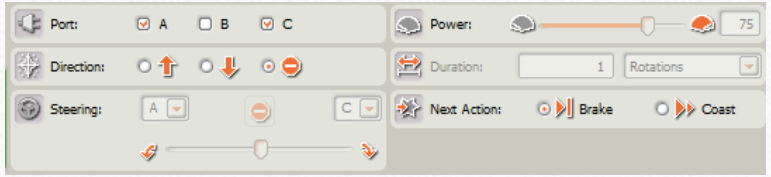
Settings:

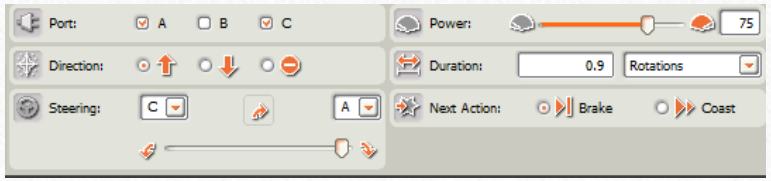


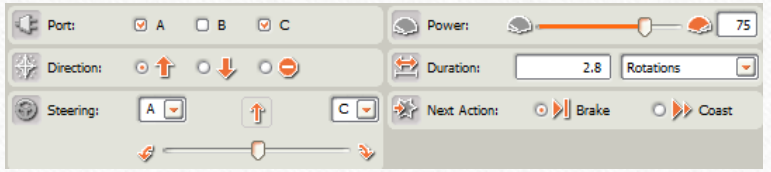






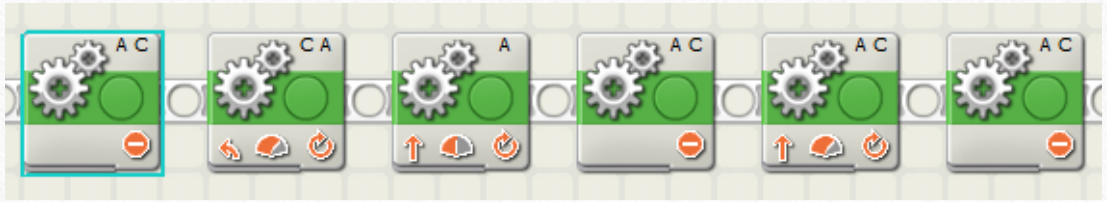


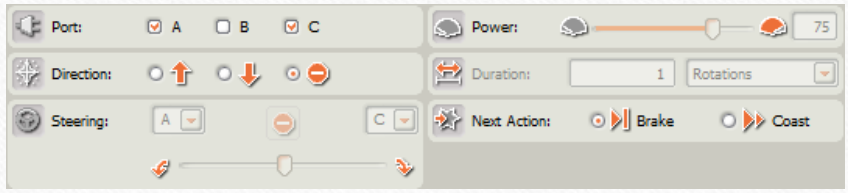


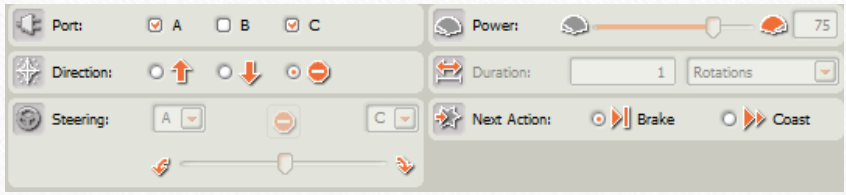


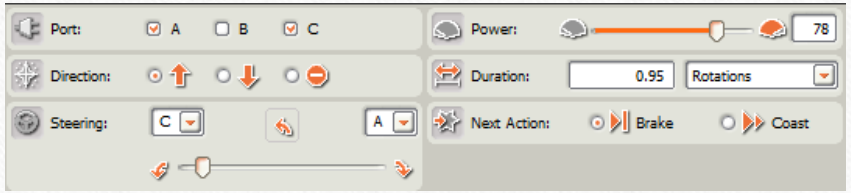
Lab 4: Robotics (4)

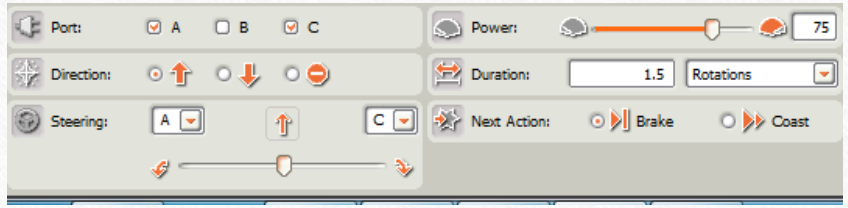
Settings:

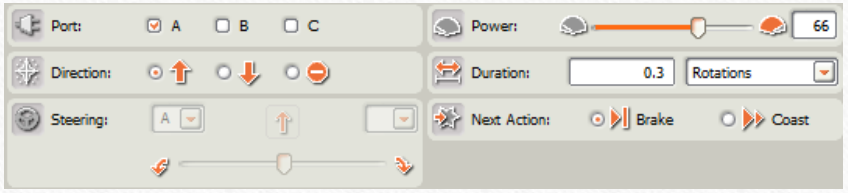


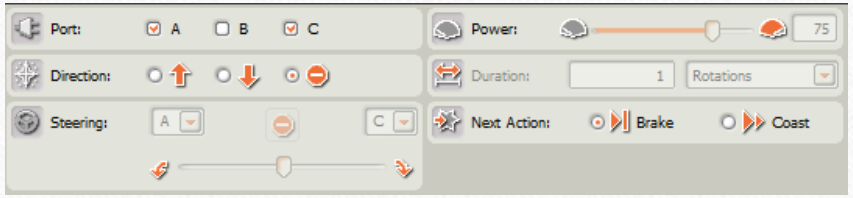






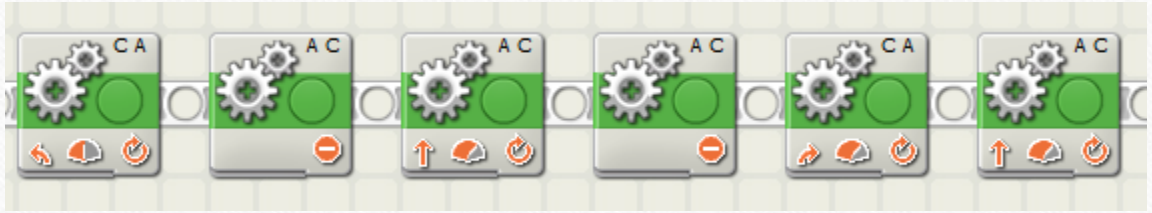


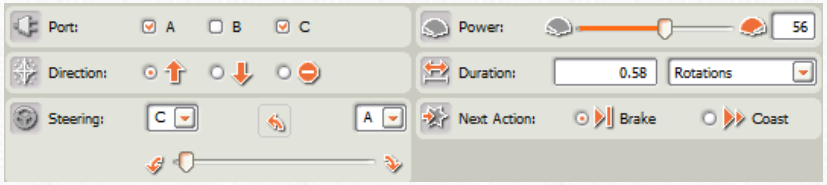


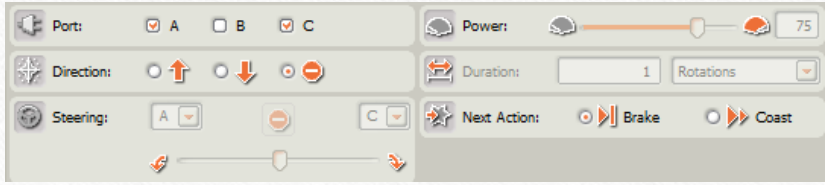


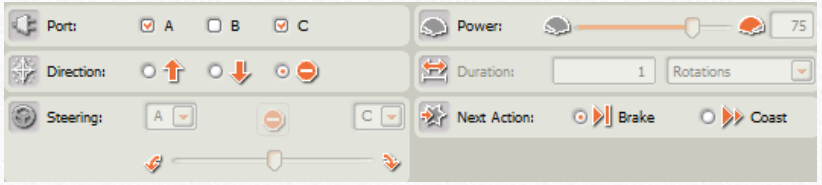
Lab 4: Robotics (5)

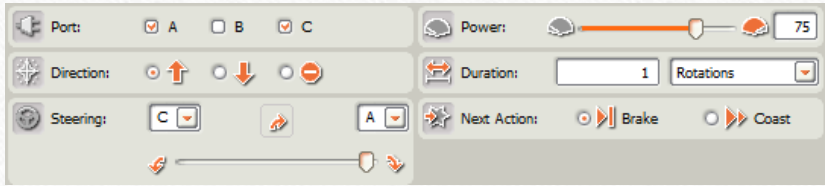
Settings:

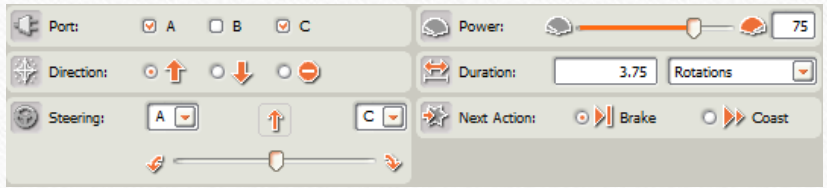


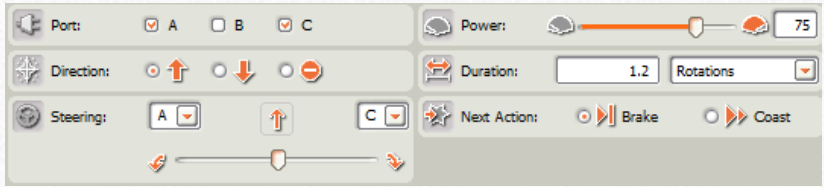












Lab 4: Robotics (6)

Result:

The Robot made turns and ran as programed, led Robot to the goal without touching walls three consecutive times.

Lab 4: Robotics (7)

Conclusion/Observations:

I learned how to manipulate a robot using software. It was difficult to make a fine adjustment to operate the robot, so I needed to try and error.

The robot operated differently in some trials with the same program. I can think that there were some factors that affected to the robot. I think one of the factors was the condition of carpet that we tried it on. The robot ran different path depending on where the start point was. I think the robot caught on a floor due to the friction effect.