

Computer Programming and Robotics at Luther Burbank High School

**Emerging Technologies Conference 2016
Clay Dagler**

Overview

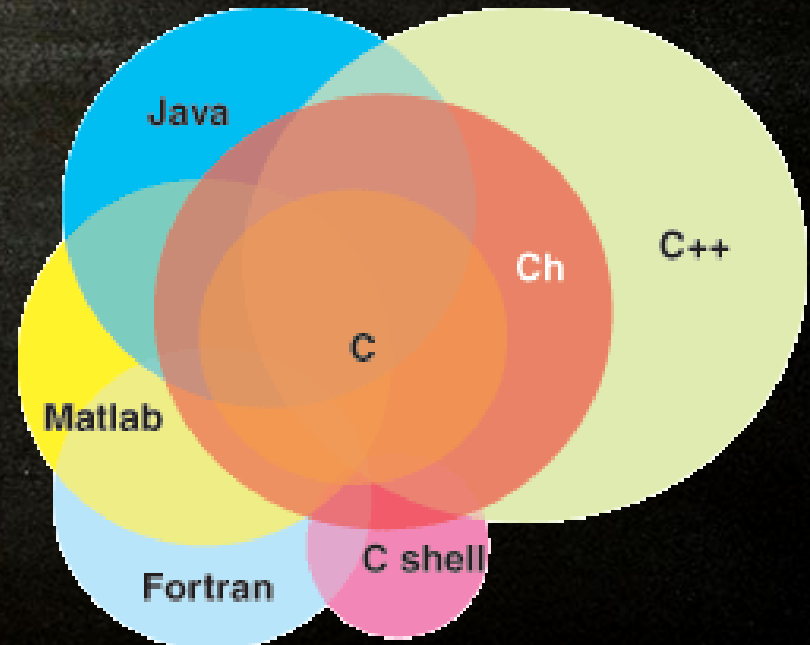
How I use programming and robotics to teach mathematics.



Background

I have been a teacher at Luther Burbank for the past 17 years.

I'm in my fourth year with the UCD C-STEM Center.



Practice Programs

The screenshot shows a web browser window with the following content:

- Browser tab: Algebra Praticce
- Address bar: mrdagler.com/old/practicePrograms.html
- Navigation icons: back, forward, refresh, search, star, home, power, menu
- Bookmarks bar: Apps, ★ Bookmarks, Yahoo!, Imported From Fi, Startup Coworkin, UCOP A-G Course, Introduction to C, Upcoming disc g, CCASN: Home
- Page title: Learning Math Using C - Praticce Programs
- Section: *Pre - Algebra*
- Links: [Integers 1 L.V.](#), [Integers 2 L.V.](#), [Order of Operations L.V.](#), [Fractions L.V.](#)
- Section: *Equations*
- Links: [Equations 1 L.V.](#), [Equations 2 L.V.](#)
- Section: *Lines*
- Links: [Slope of a Line 1 L.V.](#), [Slope of a Line 2 L.V.](#), [Finding M and B L.V.](#), [Equation of a Line 1 L.V.](#), [Equation of a Line 2 L.V.](#)
- Section: *Systems*

Math, Coding, and the SMP

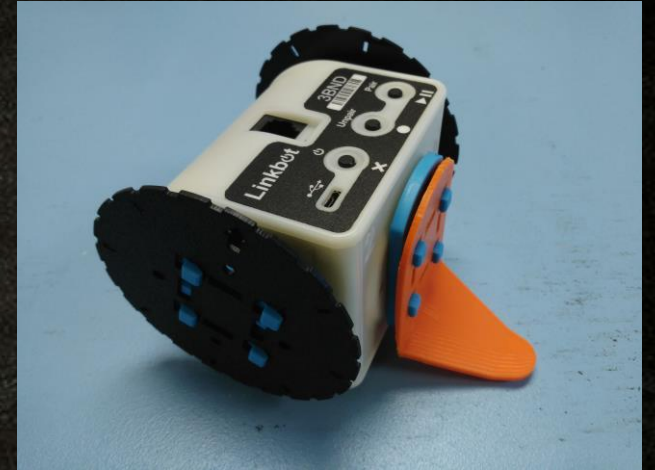
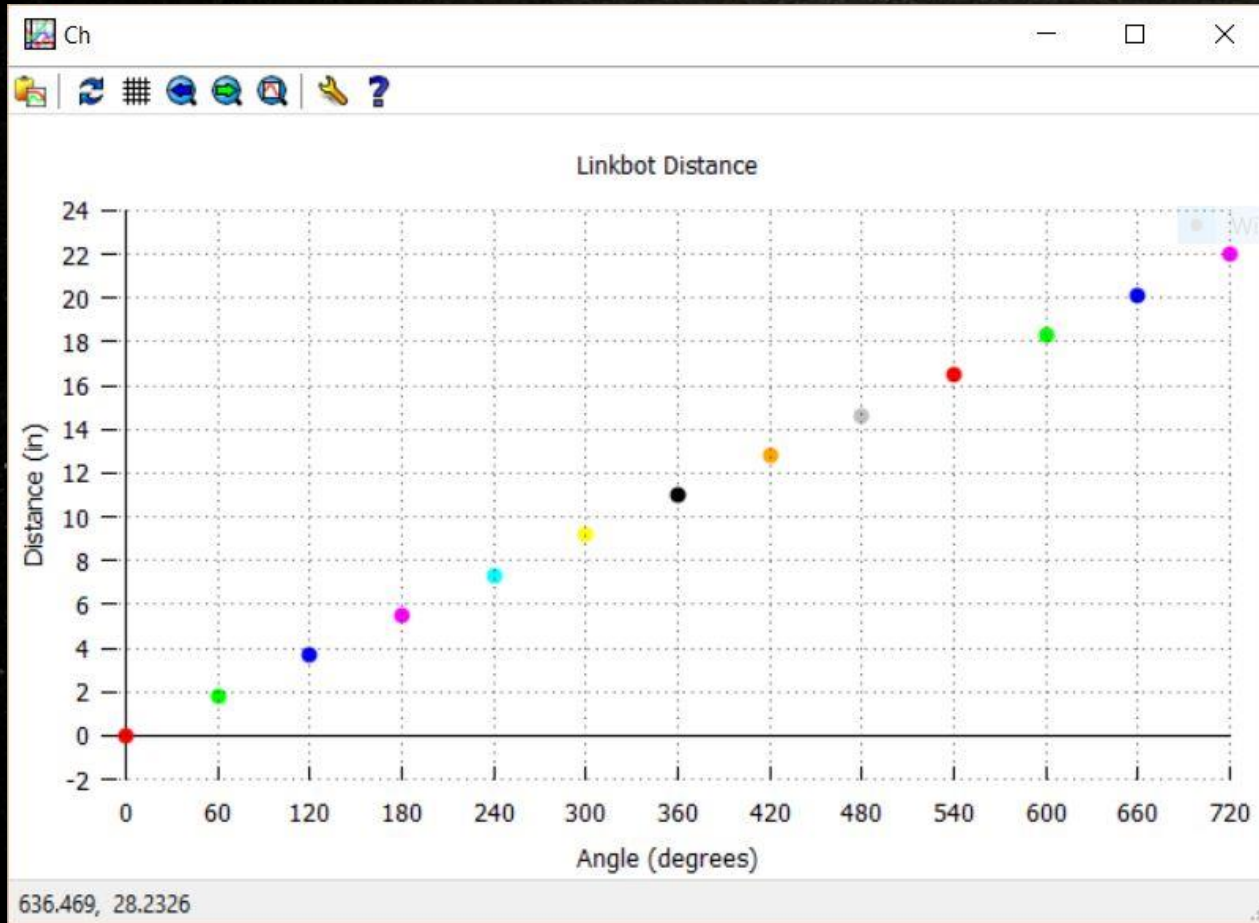
Make sense of problems and persevere in solving them.

Construct viable arguments and critique the reasoning of others.

Model with mathematics.

Use appropriate tools strategically.

The Robots



$$C = 2\pi r$$

$$\frac{360^\circ}{10.99 \text{ in}} = \frac{15^\circ}{x \text{ in}}$$

Word Problems

You are going to Starbucks to buy yourself and your 4 BFFs some tall lattes. How much money are you going to spend before tax if each drink cost \$2.95?

```
int numOfDrinks = 5;
```

```
double costOfOneDrink = 2.95;
```

```
double totalCost = numOfDrinks * costOfOneDrink;
```

Equations and Inequalities

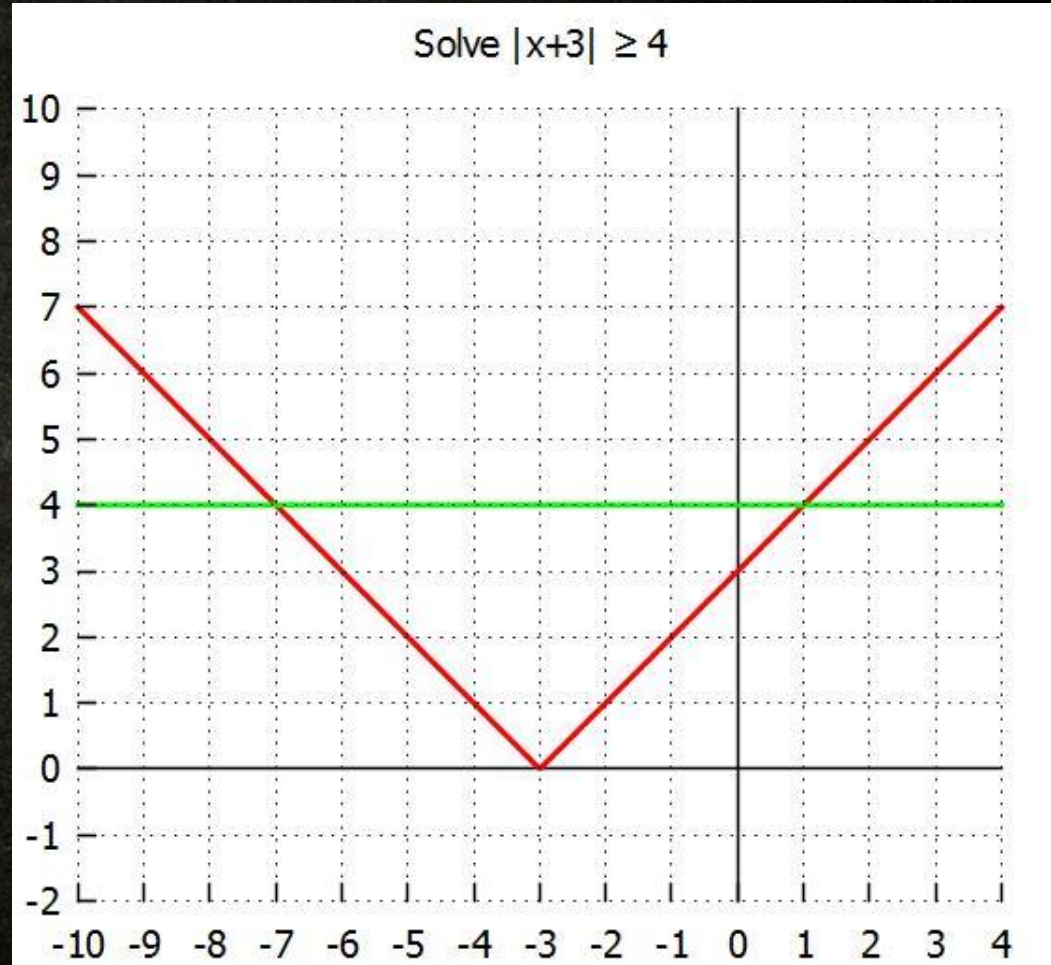
$$|x + 3| > 4$$

$$-(x + 3) > 4 \text{ or } x + 3 > 4$$

$$-x - 3 > 4 \qquad x > 1$$

$$-x > 7$$

$$x < -7$$



Systems and RoboSim

```
#include <linkbot.h>  
  
double line1(double x){  
    return (1.0/2.0)*x;  
}  
double line2(double x){  
    return (-1.0/4.0)*x;  
}  
  
CLinkbotI robot1, robot2;  
  
robot2.setJointSpeeds(100, NaN, 100);  
  
robot1.drivexyNB(20, line1(20), 1.75,  
    3.69);  
robot1.delaySeconds(10);  
  
robot2.drivexyNB(20, line2(20), 1.75,  
    3.69);  
robot2.delaySeconds(15);
```

Animations and Polygons

$$A = \frac{r^2 n}{2} \sin\left(\frac{360}{n}\right)$$

$$\pi \approx 3.14159\dots$$

Functions and RoboSim

x	$f(x)=2^x$
-3	1/8
-2	1/4
-1	1/2
0	1
1	2
2	4
3	8

Linkbots as Modular Robots



Thanks

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www.mrdagler.com