Master Driver

Master Driver Activity

Your Engineering Challenge

Make your robot move in a straight line from the start position, and make it stop accurately, as close to the finish line as possible, without hitting any people or crossing the finish line.

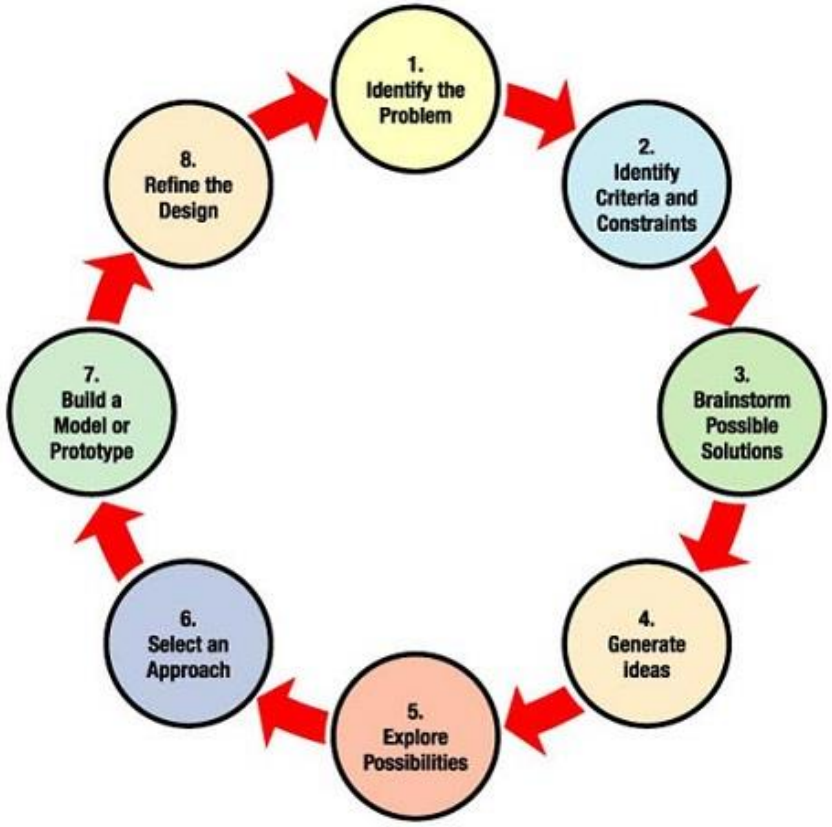
Engineering Design Process

What is the engineering design process?

A series of steps used by engineering teams to guide them as they develop new solutions, products or systems.

Steps

1. **Define the problem**
2. **Identify criteria and constraints**
3. **Brainstorm possible solutions**
4. **Generate ideas**
5. **Explore possibilities**
6. **Select an approach**
7. **Build a prototype to test**
8. **Refine the design**



➔ **The process is cyclical — it is usually necessary to test and modify many times to improve your design and get it right!**

Master Driver Activity (continued)

Part 1: Testing & Calibration

- Find the relationship between the number of rotations and the distance the robot travels.
- To do this, try out different number of rotations in the program, and then let the robot move. Then measure the distance the robot traveled each time. Record findings on your worksheet.
- Use the start line and a tape measure (or ruler) to help with testing and calibration.

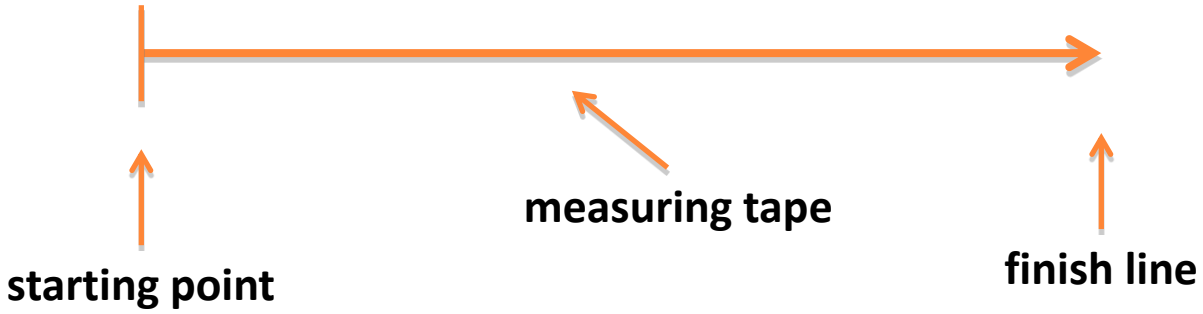
Part 2: Programming & Accuracy Competition

- Line up the people (action figures or LEGO people) on the finish line.
- Program your robot to move from the start line to the finish line without crossing the line or hitting any figures.
- One by one, groups test their programs.
- Record how close each robot comes to the people and the finish line.

The group with the robot that comes closest without touching the people has the winning *best* design.

Track Setup and Constraints

Part 1: Testing & Calibration (without people)



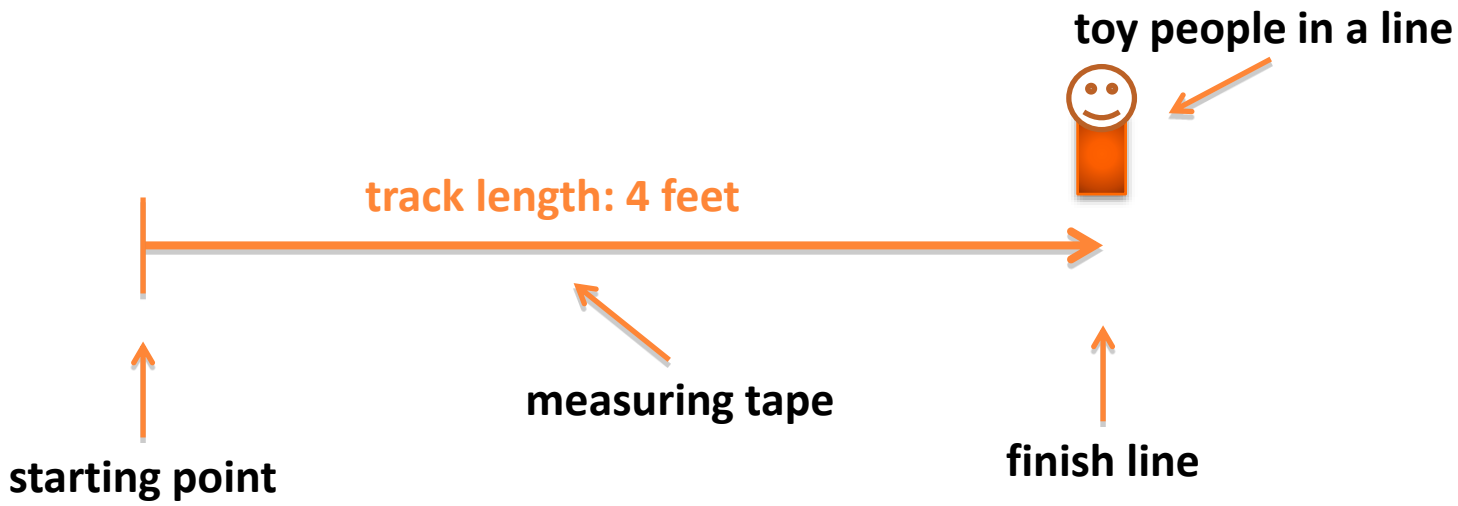
Master Driver Worksheet

- **Part 1: Use this chart to help you find a pattern between the number of rotations and the distance the NXT moves.**
- **Calculate the ratio of distance to the number of rotations for each trial. Compare this ratio for each trial. *What does this tell you about the distance the robot travels for each wheel rotation?***
- ***Hint*: You may find using inches easier to find the pattern.**

Number of Rotations	Distance (inches)	Ratio=$\frac{Distance}{\#\ of\ Rotations}$
1		
2		
3		
4		
5		
6		
7		

Track Setup and Constraints

Part 2: Programming & Accuracy Competition (with people)



Master Driver Worksheet

Part 2

- How close was your robot from the people and the finish line when it came to a stop?
- For each trial, measure this distance and record your results in a chart like this:

Trial	Ending Distance from Finish Line (inches)
1	
2	
3	

The group with the robot that comes closest without touching the people has the winning *best* design.

Images Sources

Slide 1: NXT servo motor; source: LEGO Education: http://education.lego.com/en-gb/lego-education-product-database/mindstorms/9842-interactive-servo-motor

Slide 1: man waving checkered flag; source: Microsoft® clipart: http://office.microsoft.com/en-us/images/results.aspx?qu=checkered+flag&ex=1#ai:MC900229925|

Slide 2: award trophy graphic; source: Microsoft® clipart: http://office.microsoft.com/en-us/images/results.aspx?qu=winner&ex=1#ai:MC900199250|

Slide 3: Engineering design process graphic; source: NASA: http://www.nasa.gov/audience/foreducators/plantgrowth/reference/Eng_Design_5-12.html

Slide 4: hand holding LEGO person; source: Looking Glass, flickr (CC): http://www.flickr.com/photos/fernando/5224676727/sizes/o/

Slide 8: gold medal graphic; source: Microsoft® clipart: http://office.microsoft.com/en-us/images/results.aspx?qu=winner&ex=1#ai:MC900139591|