DRAWING ROBOT

STEM CLUB ACTIVITY

CHALLENGE

Scribit (https://scribit.design/) is a robot that can draw decorations on the wall and completely erase them with heat. Can you think of some reasons why this could be useful? What would you do with a Scribit? Root (https://www.irobot.com/en/Root) is another drawing robot specifically designed for kids that allows you to program drawing routines on a whiteboard. Your challenge is to design, build, program, test, and share a robot that can draw a card for a friend on paper using a marker. You might also work within your club to draw a large poster you could display in your club meeting room. Have fun!

VOCABULARY

Pseudo code: In computer programming, the programmer will write out the program's steps in words before writing the code in the programming language.

DO

1. Begin by choosing your materials. Will you use the LEGO® Mindstorms® EV3? Hummingbird Bit? Scratch programming and craft supplies?

2. Next, sketch out your drawing by hand. Think about the steps you took to draw your design. It's a good idea to write out the list of steps on paper using words before writing the computer program. This is a technique called pseudo coding that even professional programmers use!

3. Build and program your robot to carry out your plan. If you decide to use Scratch, add the pen extension. If you decide to use a physical robot, make sure it has a way to hold a marker pointed down.

4. Align your robot onto your card, and let it run your program to draw the design.

GRADES: 4-8

SKILL LEVEL: Beginning, Intermediate, or Advanced options

GROUP SIZE: 1-3 students per robot

TIME: 2-3 hours

IOWA COMPUTER SCIENCE STANDARDS: 1B-AP-15 Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended.

NEXT GENERATION SCIENCE STANDARDS: MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

MATERIALS:
- Computer with internet access
- Robotics kit: LEGO® Mindstorms® EV3 or Hummingbird Bit Premium Kit or Ozobot or Edison Robot
- Markers
- Optional craft supplies: cardboard, construction paper, markers/colored pencils/crayons, tubes, disposable cups, popsicle sticks, craft foam sheets, and anything else you would like to use

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Extension and Outreach

REFLECT

1. What did you enjoy about this activity?
2. What challenges did you face along the way, and how did you solve them?
3. Did your drawing end up different from your original plan?

APPLY

1. How is programming a drawing similar to drawing it by hand? How is it different?
2. What robot building and/or programming techniques did you learn that you can apply to future robots you design?

CAREER CONNECTION: AGRICULTURAL ENGINEER

Agricultural engineers program robots to autonomously travel along paths they design through planted fields. This is like what you did by programming your robot to autonomously travel along paths while drawing! For more information about careers in agricultural engineering visit check out Iowa State University's Department of Agricultural and Biosystems Engineering: https://www.abe.iastate.edu/.