ROBOTIC ACTIVITY MAT

GREEN ENERGY

NOTE: This activity mat was not designed for a specific robot but was designed to accomodate a large majority of the leading robotic platforms on the market. If you have any questions on the specific robot you have in regards to this activity, please contact us: info@brainstormedu.com

Summary: The Green Energy activity mat provides a strong emphasis on renewable energies; hydropower, wind power, and solar power. Can bring the grid back and help power up the city?

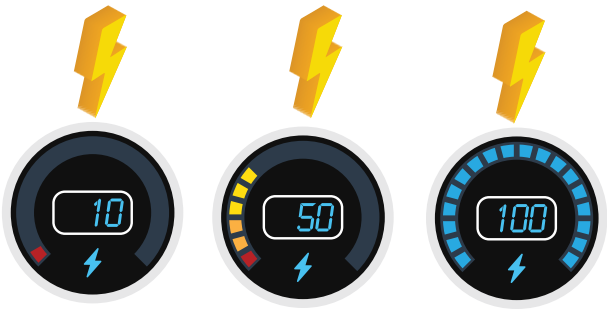
Objective: Bring the batteries to the city by navigating through the mazes through motor control or sensor control.

Skills taught: Students will learn programming, problem solving, sequential based navigation, sesor control, and critical thinking.

Navigation 1 : Distance Based Navigation

Distance Based Navigation

Students will program robots to navigate from the starting square to the finish using basic motor control, without driving out-of-bounds.



How to Use:

1. Robots will always begin in the starting square located near the corner of the mat.

2. Analyze the course and visualize the direction(s) needed for the robot to navigate through the maze to the finish.
(Tip: program your code 2 sequential commands at a time).

3. Code the sequential navigation commands into the robots program.

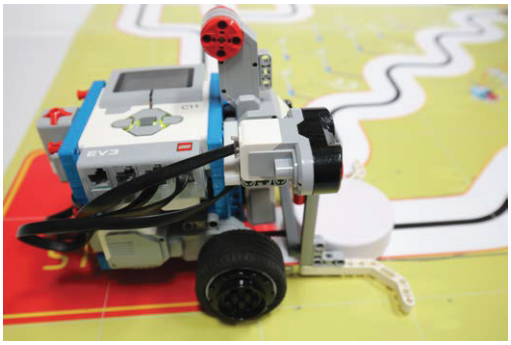
4. Place the robot in the starting square and execute the program.

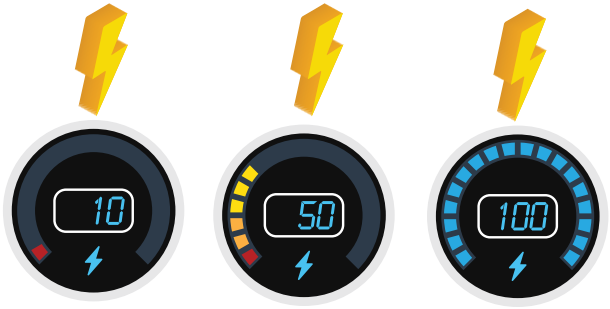
5. Repeat steps 2-4 until the robot has successfully completes the objective without drifting out of bounds.

Navigation 2 : Sensor Based Navigation

Sensor Based Navigation

Students will program robots to navigate from the starting square to the finish using motor and sensor controls, without driving out-of-bounds.





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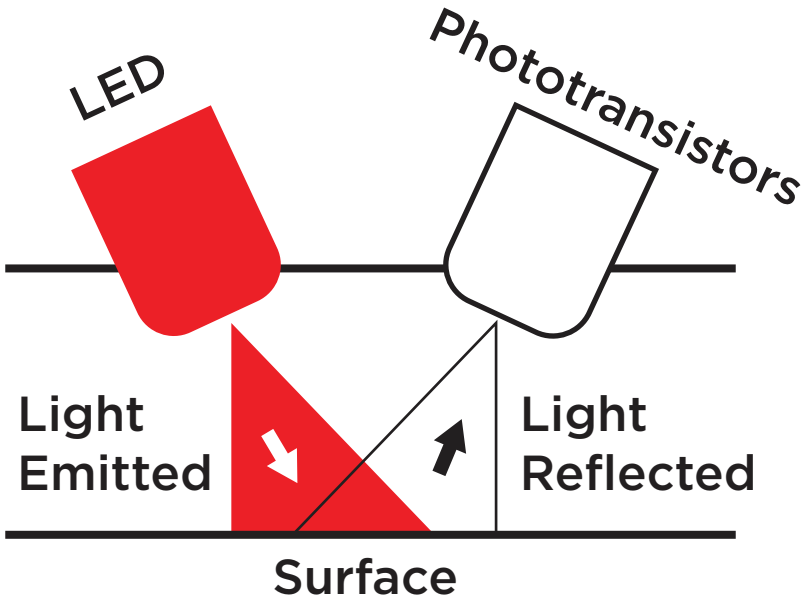
Phototransistors

What are they?

Phototransistor: a phototransistor is a light sensor that detects and measures the amount of light that has been reflected from a surface.

Most robots are equipped with a light sensor. This sensor is made up of two main electronic components:

1. Red Light Emitting Diode (LED)
2. Phototransistor (light sensor)



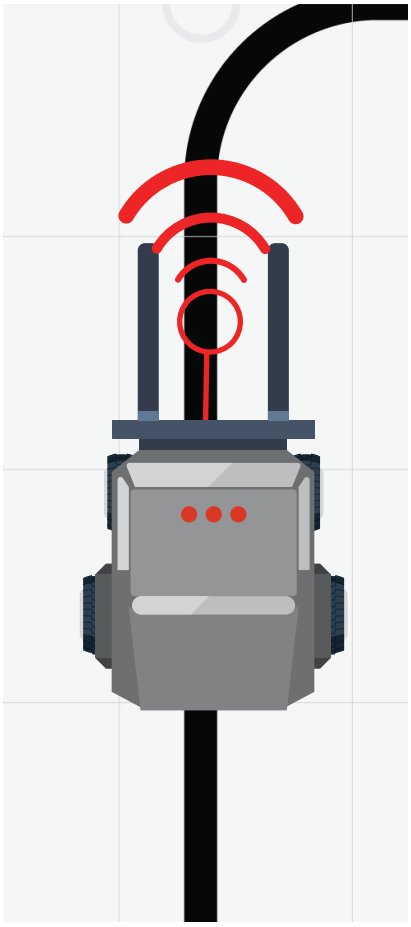
The LED shines light on the surface its driving on and reflects that light into the phototransistor. Try lifting up the robot slightly and have a closer look at the LED light it produces on the surface. Compare how bright the spot of light is when placed on a white surface vs a black surface.

When light is emitted, some of its energy is reflected and absorbed by objects it strikes. White light holds all the wavelengths of the visible spectrum, so when the color white is being reflected, that means all wavelengths are being reflected and none of them absorbed. This makes white the most reflective color. Therefore the phototransistor gives the robot a higher light reading when reflecting off a white surface than on a black surface. A black surface is considered to be 'non-reflective' and a white surface is considered 'reflective'.

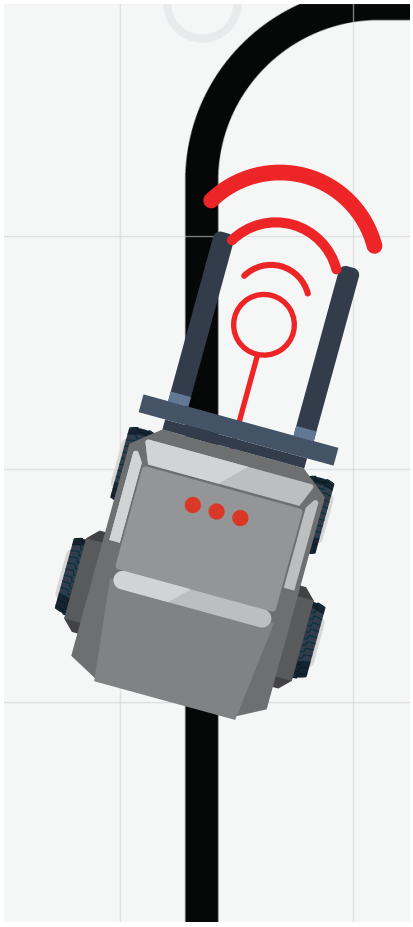
Phototransistors (Cont.)

How do they work?

Robotic sensors are used to estimate a robot's condition and environment. In order for the robot to perform a line-follow we need to give the robot two conditional loop statements. Since the phototransistor detects the color of a surface depending on how reflective it is, we can use the black line and white background colors on the Mat as our two conditions for the robot to detect. Look at the figures below and answer the following questions:



If sensor sees Black
then turn _____

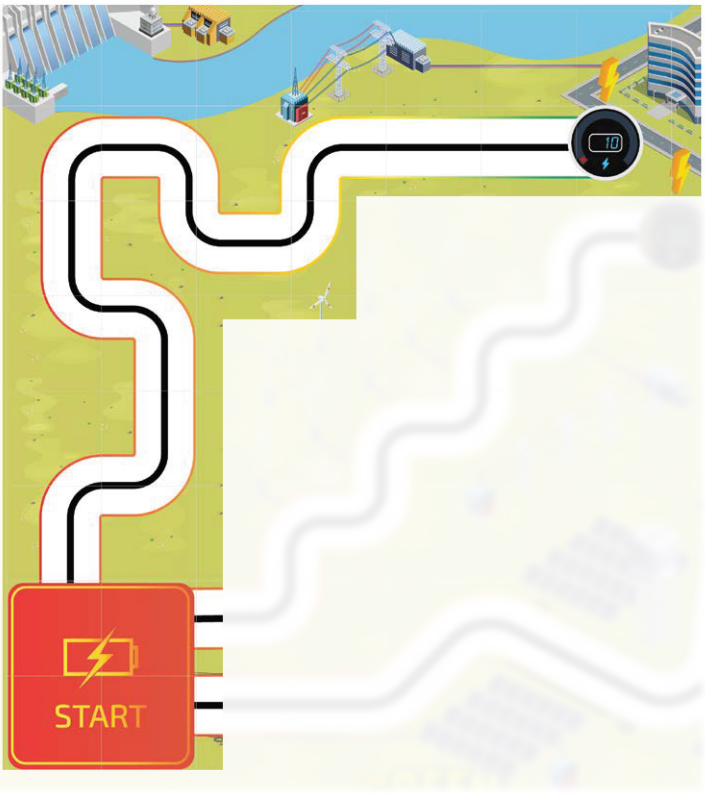


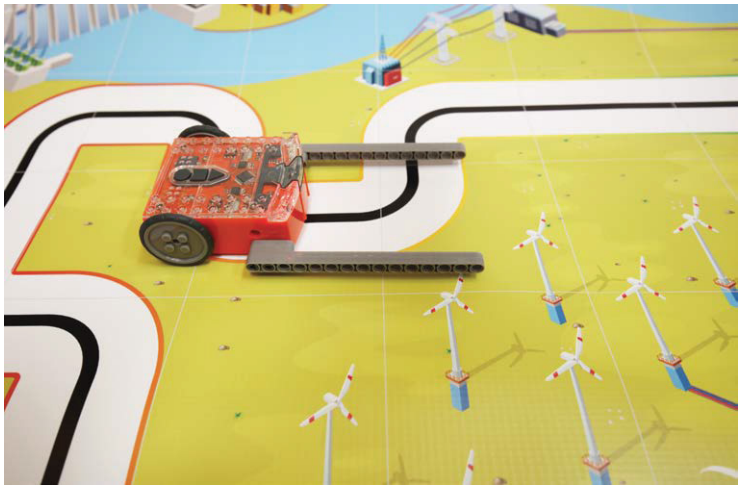
If sensor sees White
then turn _____

Activity 1 : Hydropower

Objective

Use the hydroenergy created through stored water in the dams as well as flowing through rivers to help bring power back to the city.





How to Use:

1. Robots will begin in the starting square located near the corner of the mat with a game piece(20% Battery side facing up) in its posession.
(Tip: Build an attachment for your robot to help it move the game pieces).

2. Analyze the course and decide if you will code motor control or sensor control for navigation.

3. Code the navigation commands into the robots program.

4. Place the robot in the starting square and execute the program.

5. Repeat steps 2-4 until the robot successfully reaches the finish with the game piece without drifting out of bounds. Once finished flip the game piece to showcase 100% battery.

Activity 2 : Wind Power

Objective

Use the wind energy harnessed by the turbines which use mechanical energy to help bring power back to the city.

How to Use:

1. Robots will begin in the starting square located near the corner of the mat with a game piece(20% Battery side facing up) in its posession.
(Tip: Build an attachment for your robot to help it move the game pieces).

2. Analyze the course and decide if you will code motor control or sensor control for navigation.

3. Code the navigation commands into the robots program.

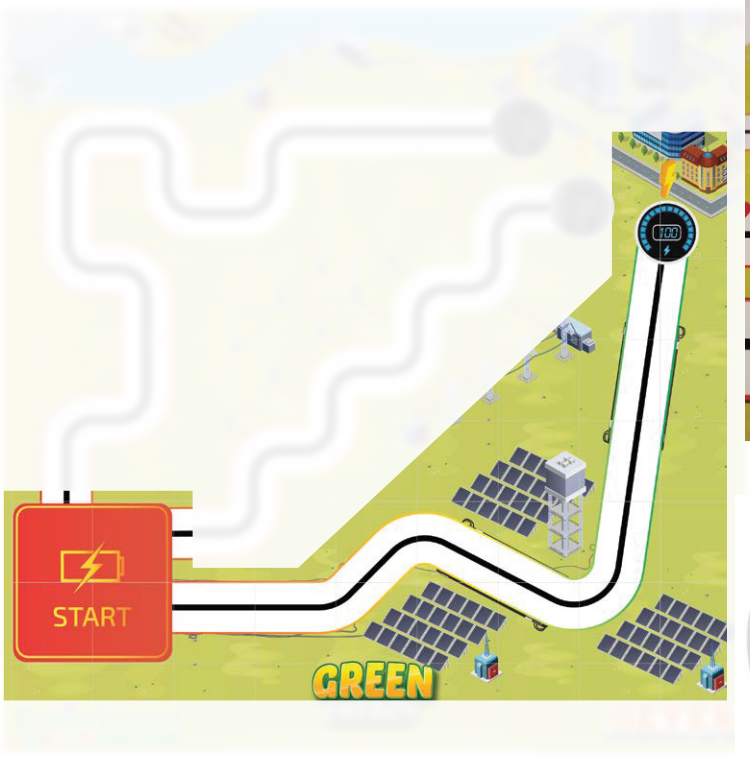
4. Place the robot in the starting square and execute the program.

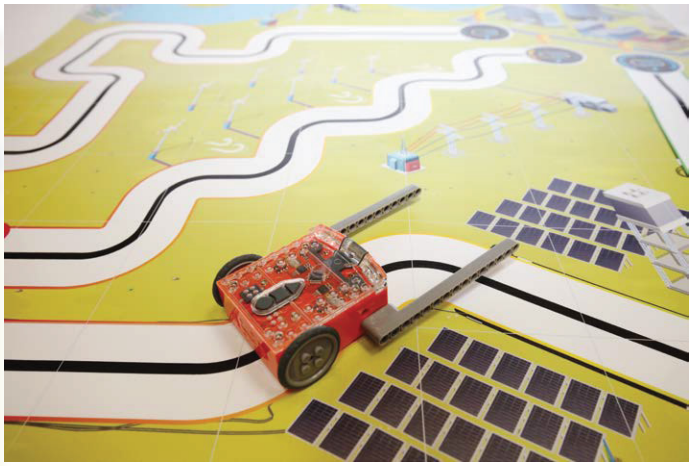
5. Repeat steps 2-4 until the robot successfully reaches the finish with the game piece without drifting out of bounds. Once finished flip the game piece to showcase 100% battery.

Activity 3 : Solar Power

Objective

Use the suns energy harnessed by the solar panels which use photovoltaics (PV), also called solar cells to help bring power back to the city.





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