1ST MAKER SPACE
Design.
Build.
Sustain.

Frog Microcontroller Trainer (FMT): LED- Light Sensor

Length of Time: 55 Minutes

Recommended for Beginner

Contents

- Overview
- Objectives
- Standards
- Materials
- Lesson Elements
- Resources

© 2024, 1st Maker Space, LLC · https://1stmakerspace.com

Overview:

- Students will copy code to observe a Light Dependent Resistor.

Objectives:

Students will be able to:

- Determine what an LDR is
- Test code to determine light intensity
- Read the Serial Monitor to determine data output

© 2024, 1st Maker Space, LLC · https://1stmakerspace.com

Computer Science Teacher Association Standards

- 1A-CS-02 Use appropriate terminology in identifying and describing the function of common physical components of computer systems.
- 1B-AP-12 Modify, remix or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features.
- 1B-AP-15 Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended
- .

© 2024, 1st Maker Space, LLC · https://1stmakerspace.com

Materials:

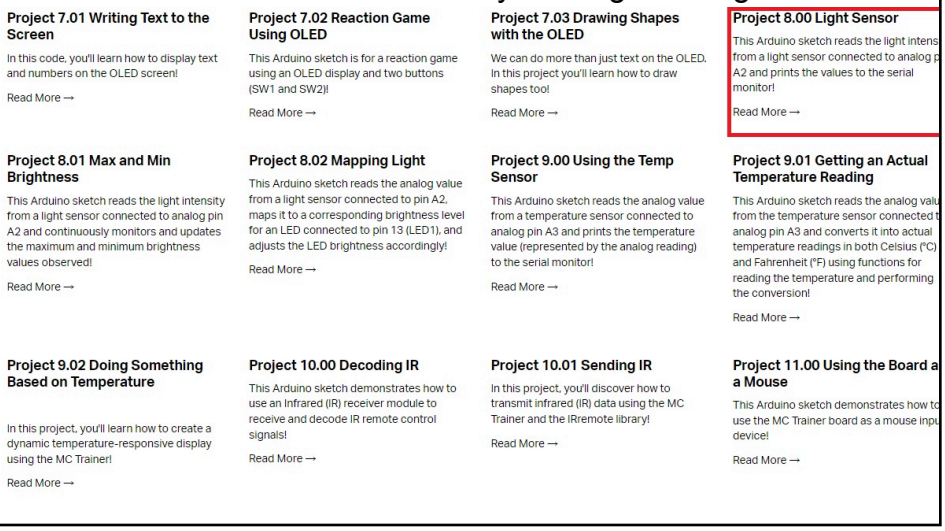
- Frog Microcontroller Trainer (FMT) from 1st Maker Space
- USB Power Cord
- Arduino IDE
- PC or Mac
- Chromebooks if using Arduino Create for Education App
- Introduction to Microcontroller Trainer Lesson (if needed as a resource)

Preparation:

- Ensure students have a compatible device and have downloaded the Arduino IDE software on device.
- Ensure all students know how to properly connect the FMT to the device via the USB cable.

Background Information:

A light-dependent resistor, or LDR for short, is a special kind of electronic component that can sense light. It's like having a tiny eye that can tell how bright or dark it is around it. When the LDR is in the dark, its resistance gets bigger. When light shines on it, its resistance becomes smaller.

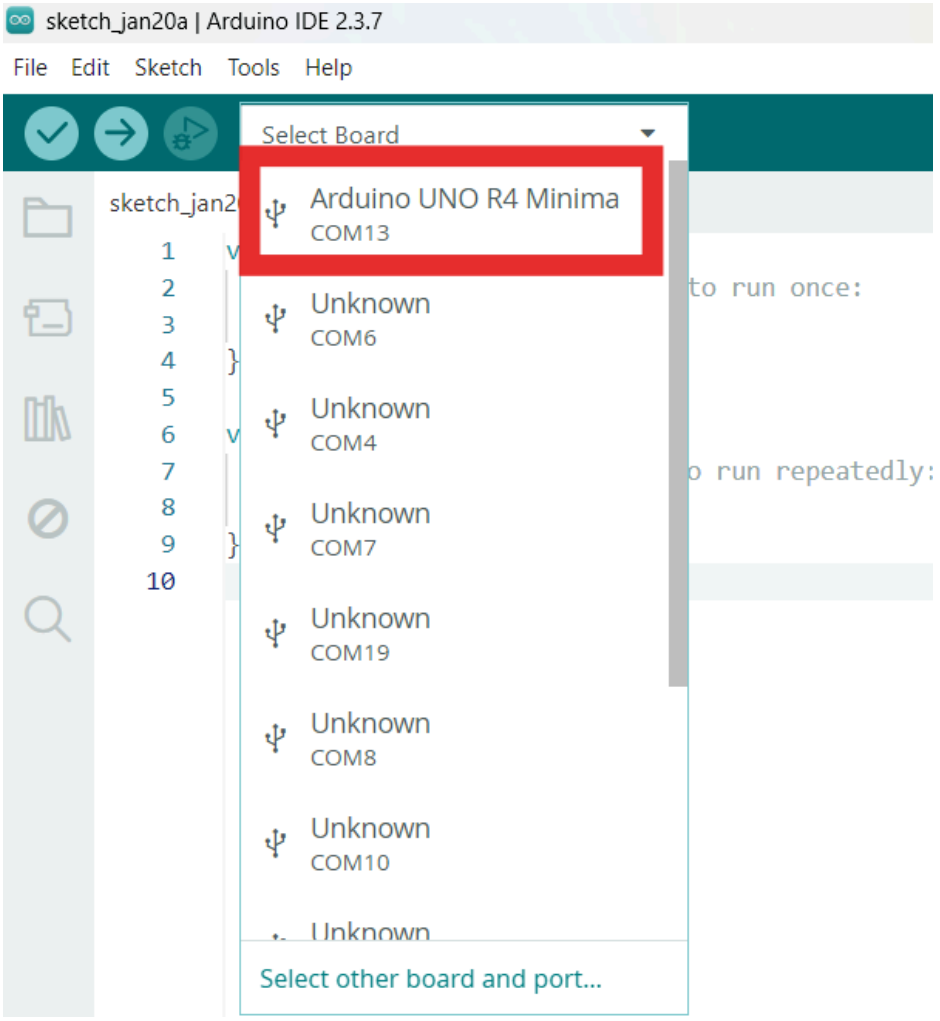
Lesson Elements	
Basic Part Identification– 10 minutes	Have students identify the Light Dependent Resistor (LDR) on the FMT.
Access 1MS Code – 15 minutes	Visit the 1st Maker Space website and access the library of code developed specifically for the FMT. Here, you will find a folder with various code written for each major component of the trainer. The teacher will locate the sketch by clicking 8.00-Light Sensor. 

© 2024, 1st Maker Space, LLC · https://1stmakerspace.com

	Here, one can find the sketch to share with students. Students can copy the code by simply clicking on the blue copy button.
	
	Project Code:
	
	Copy
	`////////////////////////////////////////////////`
	`//8.00 - Reading Light Intensity`
	
	`byte lightSensorPin = A2;`
	
	`void setup() {`
	`  pinMode(lightSensorPin, INPUT);`
	`  Serial.begin(9600);`
	`}`
	
	`void loop() {`
	`  Serial.print("The light level is at: "); Serial.println(analogRead(lightSensorPin));`

Connect the Trainer and Verify the Sketch – 10 minutes	Plug the FMT into your computer's USB port. Using the dropdown box near the top, select the Arduino Uno R4 Minima and appropriate COM port. **Note:** Mac computers may automatically select the port.

© 2024, 1st Maker Space, LLC · https://1stmakerspace.com



Making sure the USB cable is connecting the FMT to the computer, verify the sketch by clicking on the check mark in the upper left-hand corner.

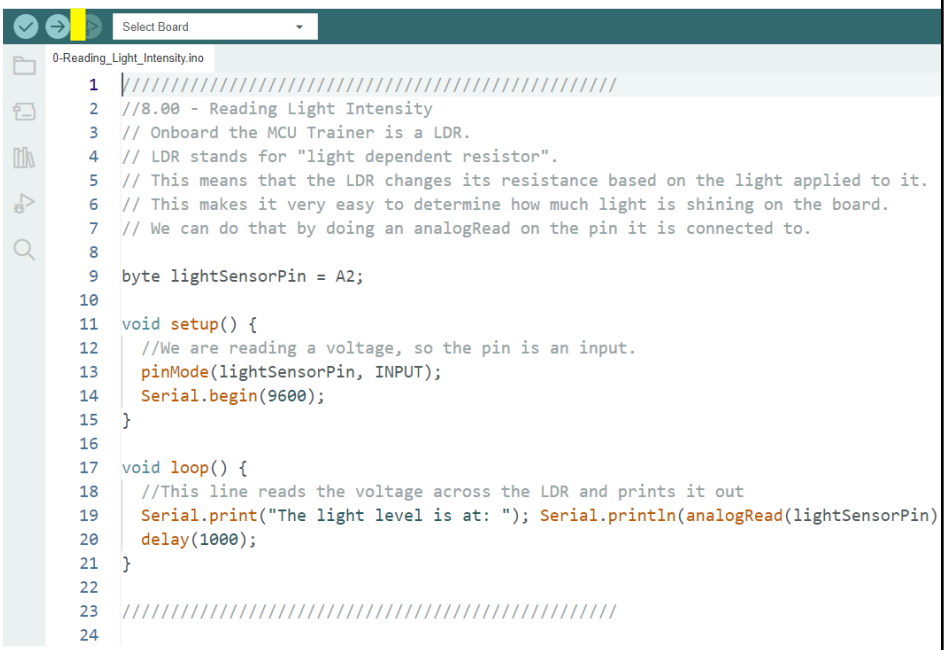
© 2024, 1st Maker Space, LLC · https://1stmakerspace.com

Select Board

0-Reading_Light_Intensity.ino

```
1  ////////////////////////////////////////////////////
2  //8.00 - Reading Light Intensity
3  // Onboard the MCU Trainer is a LDR.
4  // LDR stands for "light dependent resistor".
5  // This means that the LDR changes its resistance based on the light applied to it.
6  // This makes it very easy to determine how much light is shining on the board.
7  // We can do that by doing an analogRead on the pin it is connected to.
8
9  byte lightSensorPin = A2;
10
11 void setup() {
12   //We are reading a voltage, so the pin is an input.
13   pinMode(lightSensorPin, INPUT);
14   Serial.begin(9600);
15 }
16
17 void loop() {
18   //This line reads the voltage across the LDR and prints it out
19   Serial.print("The light level is at: "); Serial.println(analogRead(lightSensorPin)
20   delay(1000);
21 }
22
23 ////////////////////////////////////////////////////
24
```

Once verified, upload the sketch to the trainer by clicking the right-facing arrow. It will turn yellow.



Students will open the Serial Monitor in the upper right-hand corner. Here, students will see the light level increase or decrease based on the amount of light. The number that appears

© 2024, 1st Maker Space, LLC · https://1stmakerspace.com

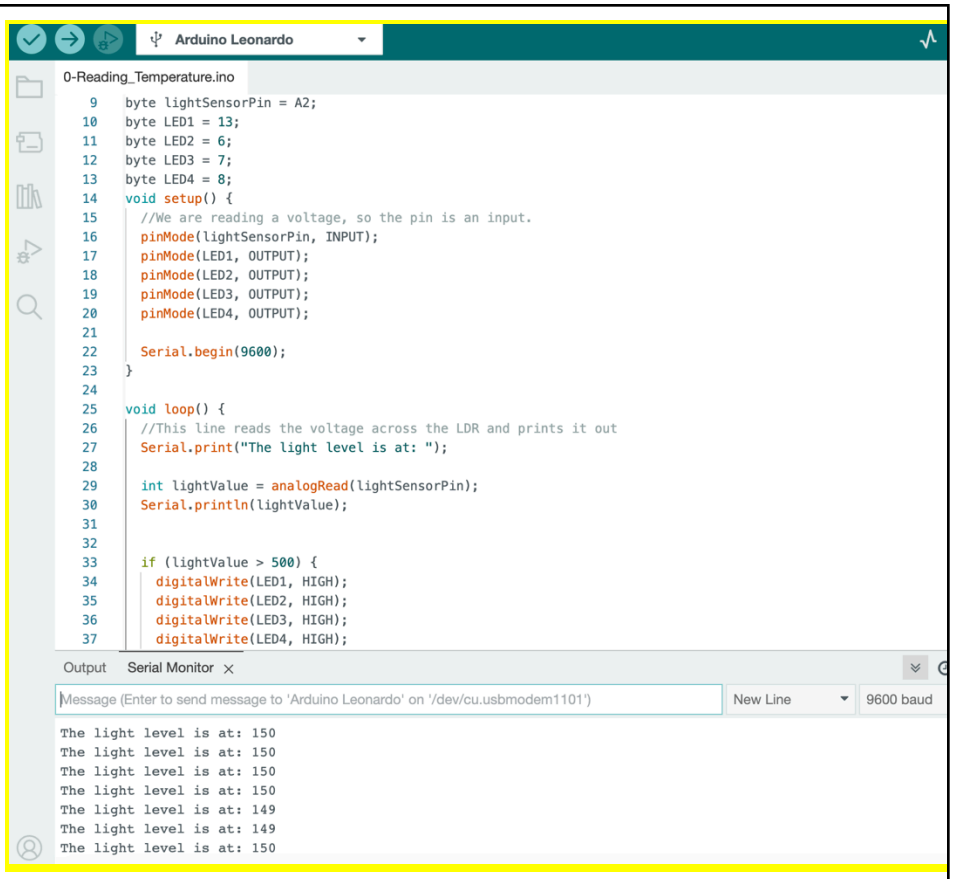
will increase as the amount of light decreases. As students pass their finger over the light sensor, they should see the number change.



© 2024, 1st Maker Space, LLC · https://1stmakerspace.com

	
Modify the Sketch – 10 Minutes	Once students have successfully run the sketch, they will now make a modification to change the program. One possibility is to change the sketch to allow for all LEDs to light up after the LDR reaches a certain level.

© 2024, 1st Maker Space, LLC · https://1stmakerspace.com



All LEDs should respond by lighting up when the LDR is covered.

© 2024, 1st Maker Space, LLC · https://1stmakerspace.com



Career Exploration:

- A good resource is the IDOE Career Explorer database.
- Another good resource for career information is the Bureau of Labor Statistics

Practical Application:
The application of LDR's can be found in light-sensitive switches, burglar alarm systems where a beam of light appears when a sensor is triggered and in camera exposure.

Additional Resources:

- 1st Maker Space Frog Microcontroller Library
- 1st Maker Space Learn Arduino with the Frog Microcontroller

Performance Assessment/Check for Understanding :

- Was the student able to upload the sketch and use the Serial Monitor to see if the LDR is working?
- Was the student able to modify the sketch to show all LEDs lit as a response to the LDR light exposure?

Additional Feedback:

© 2024, 1st Maker Space, LLC · https://1stmakerspace.com