Smart Irrigation System: Challenge #1

In this activity, you will use a light sensor to read and report the light level. This is the first challenge in a series of five challenges, where you will be learning programming skills with the TI-Innovator™ Hub and various sensors. In the final challenge, you will need to apply the skills you learn in the first 5 challenges, as you design and build a smart irrigation system to manage a limited amount of water collected in a cistern to irrigate a garden.

Goals:

1. Use the read command to read light levels
2. Use the range command to scale values
3. Use a While loop to repeat code.

Background and Project Overview:

In this TI-Innovator™ project, you will design a smart irrigation system that could be used to monitor and meter water from a rain collection cistern that might be used to irrigate a small family garden in Zimbabwe. This model also applies to other related scenarios where "smarter water" usage makes sense. For example, water restrictions are often put in place during the hot summer months in areas of excessively hot and dry climates. A smart water irrigation system could alleviate some of these restrictions as well, if people are smarter about the way they water their yards.

You will have to utilize math skills, computer programming and engineering to design and build a smart watering system to solve a real world problem like the drought in Zimbabwe or, even the problem right in your backyard! You will be learning the skills along the way as you complete 5 challenges leading up to the final challenge.

Command	Example	Behavior
CONNECT <type> <number> TO <port>	Send "CONNECT LIGHTLEVEL 1 TO IN1"	Associates the first LIGHTLEVEL object with a light sensor plugged into port IN1 on the Hub.
SET <type> <number> TO <value>	Send "SET ANALOG.OUT 1 TO 128"	Turns on an analog.out1 object, such as a pump, to a power setting of 128
RANGE <type> <number> <min value> <max value>	Send "RANGE LIGHTLEVEL 1 0 100"	Scales the measured values read from LIGHTLEVEL 1 to return in the range 0 to 100.
	The light level sensor is a device that has a large range of responses to light intensity. As a result, the output is not linear with light intensity. In addition, the device does not measure with a particular unit. Instead, the device returns a raw value from 0 to 2^{14}. It is useful to use the RANGE command to scale the output from 0 to 2^{14} to 0 to 100	
READ <type> <number>	Send "READ LIGHTLEVEL 1"	Reads one measurement from the light sensor.
Get <variable>	Get m	Stores the measurement into the variable named m. *Note a get command must immediately follow a read command. The value

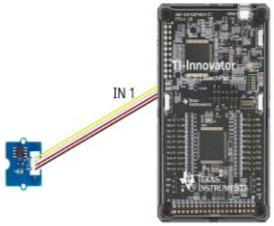
		stored will contain the measurement from the immediately preceding READ command."
DispAt <line #> , <"text"> , <variable name>	DispAt 3, "Light level = ", l	"Light level = #", where # is the value store in variable l, is displayed on line 3 of the calculator.

While <Boolean expression>
  <statements>
EndWhile
	key:=" "
	While key ≠ "esc"
	  Send "READ LIGHTLEVEL 1"
	  Get l
	  key:=getKey()
	EndWhile
		The commands inside the While structure are looped until the escape key is pressed. The loop continues while logical expression key ≠ "esc", is true. The variable *key* is initially assigned an empty value so the while loop will execute at least once. The getKey() function monitors the keypad and returns a string with the name of the last key pressed.

Challenge:

Write a program named *c1* that continuously measures and displays the ambient light level. The program should:

1. connect a light level sensor to IN 1.
2. range the light level reading from 0 to 100.
3. use a while loop to continuously read and display light level every ½ second on the calculator screen.
4. enable the ESC key to quit the while loop and end the program.



Explore:

1.) What is the light level reading in the classroom? _____

2.) What is the light level reading if you shade the sensor with your hand? _____

If your teacher allows you to go outside, answer questions 3 and 4.

3.) What is the light level reading in a sunny place? _____

4.) What is the light level reading in a shady place? _____

5.) Choose two more conditions in which to measure the light level. Record your results below.

Condition: _____ Light Level _____

Condition: _____ Light Level _____

6.) Give a range of reading levels you think would be ideal for watering a field. Why did you choose this range?

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