Smart Irrigation System: Challenge #5

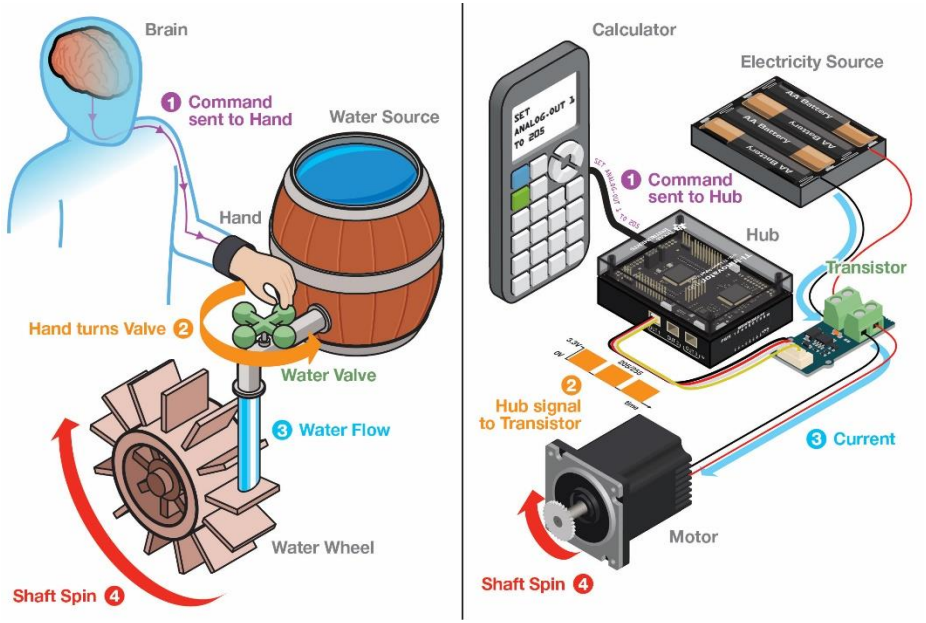
In this activity you will use submersible pump to pump water through a tube using a power module.

Goals:

1. Use the set command to control the flow of water.
2. Use a For loop to repeat code.

Background:

The Innovator Hub can control the amount of power delivered to the submersible pump using the power module with an attached battery pack. The power module has a special type of transistor called a MOSFET mounted on the unit. The illustration on the left shows how a human can turn a valve to control the flow of water. The illustration on the right shows how the calculator code sends a code to the transistor and electrical source to control the flow of water.



When the TI-BASIC command “SET.ANALOG.OUT 1 TO 205” is sent to the Hub, the Hub creates a control signal on the OUT port. This is similar to step 1 in the analogy, where the brain is sending a command to the hand.

When a power module is connected to the Hub’s OUT port, that control signal is sent to the transistor. This signal causes the transistor to adjust the amount of electricity that will flow through it. In step 2 of our water analogy, this signal can be thought of as the hand on turning the faucet.
When the transistor is turned on, more current flows through it and into the motor. Like in step 3 of the analogy, when the faucet is opened, more water flows onto the water wheel.

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When more electrical current flows through the motor, greater power is delivered to the shaft causing it to turn faster. As in step 4 of the analogy, greater water flow onto the paddles of the water wheel cause it to turn faster.

In this challenge, the power module is used to control the pump. A pump is just a motor with an impeller and housing attached to its shaft.
Note: The power module only needs to be SET once. It will keep the present setting until a new command is sent to the module or until power is removed from the Hub. Be sure to SET the module off "SET ANALOG.OUT 1 TO 0" before exiting the program. If your program fails to do this, the pump will continue to run even after the program has quit.

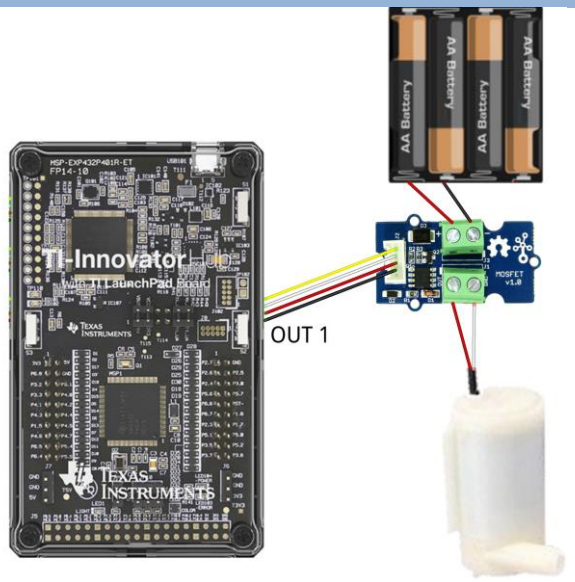
Command	Example	Behavior
CONNECT <type> <number> TO <port>	Send("CONNECT LIGHTLEVEL 1 TO IN1")	Associates the first LIGHTLEVEL object with a light sensor plugged into port IN1 on the Hub.
SET <type> <number> TO <value>	Send("SET ANALOG.OUT 1 TO 128")	Turns on an analog.out1 object, such as a pump, to a power setting of 128
Output(<row> ,<column>, <"text">)	Output(1,3,"Hello World")	Displays "Helllo World" on row 1 column 3.

For(index variable , start, stop)
  <statements>
End
	For(n , 1, 3)
	  Send("READ DHT 1 TEMPERATURE")
	  Get(t)
	  Wait2
	End
		Read and store the temperature as t 3 times. Wait 2 seconds between each reading

Challenge:

Write a program named C5 to connect the pump power module and run the pump for 20 seconds.

- Be sure to turn the pump off.
- Try setting the pump power to different values.
- Try to estimate the pump flow rate in mL/sec.



✓ Extension 1: Calculate the flow rate of the pump. To do this, run pump tubing into an empty graduated cylinder and fill the cylinder for a measured amount of time. Use the water volume and run time to calculate the flow rate.

✓ Extension 2: Find how changing the ANALOG.OUT value changes the flow rate. Explain the relationship in words or a mathematical formula.