Challenge: Design a Digital Mood Ring

In this project, you will investigate temperature measurement using a temperature sensor and then build a digital mood ring that changes the color of the TI-Innovator Hub's Red, Green, and Blue (RGB) light emitting diode (LED) as the temperature of your finger changes. You can even display what mood you are in on your calculator!

First, you will work through a series of "challenges" that will build your skills and knowledge to be able to achieve the final goal of creating a digital mood ring.

Background:

The mood ring was invented by Joshua Reynolds. Mood rings enjoyed fad popularity in the 1970s and are still around today. The stone of the ring changes color, supposedly according to the mood of the wearer. The 'stone' of a mood ring is really a hollow glass shell containing *thermotropic* liquid crystals. Modern mood rings are made from a flat plastic strip containing liquid crystals that is inserted into the hollow glass and mounted within the bezel of the mood ring. The crystals respond to changes in temperature by twisting in a regular way. The twisting changes their molecular geometry, which alters the wavelengths of light that are reflected from the crystals. Wavelengths of light are another way of saying color, so when the temperature of the liquid crystals changes, so does the color reflected from the stone. Thus, the ring changes color with the hand temperature of the wearer.

Activity Materials:

- Temperature Sensor
- TI-Innovator™ Hub (sketch vs. 1.3)
- TI-84 Plus CE (OS vs. 5.3)
- Colored pipe cleaner (Chenille stem)
- A mood to be measured!

Challenges:

1. Use SET COLOR to explore using the color LED. Try to find the RGB values of all the colors in the mood chart. e.g. Send("SET COLOR 255 128 0") will make yellow.

2. Use Output(command to display your name at several locations on the screen.

3. Use a For loop to display the numbers 1 through 10.

4. Connect a temperature sensor to the TI-Innovator Hub and display the temperature on the calculator.

5. Use a loop to read and display temperature.

6. (Optional) Use a loop to read, display and log into list arrays for time and temperature. Graph the result.

7. Use a While loop along with getKey function to monitor temperature and make a decision to display a message, "Hot" or "Cold". Then modify your program to include a 3rd level between hot and cold, "Nice".

8. **Final Challenge**: Build a mood ring to repeatedly read the temperature sensor, determine the mood of the person, display the temperature value and display the mood.

Example TI-BASIC Code for TI-Nspire CX:

Code snippet to set the RGB LED to blue on the Hub:

```
Send("SET COLOR 0 0 255")
```

Code snippet to set the RGB LED to yellow on the Hub:

```
Send("SET COLOR 255 128 0")
```

Code snippet to display a message on the calculator:

```
Output(5,1,"I AM HAPPY")
```

Code snippet to connect and read the temperature sensor:

```
Send "CONNECT TEMPERATURE 1 TO IN 1"
Send "READ TEMPERATURE 1"
Get(T)
Output(5,1 "TEMPERATURE IS  ")
Output(5,16,T)
```

Code snippet to read and display the temperature sensor every second until the clear key is pressed:

```
0→K
While K≠45
getKey→K
Send("READ TEMPERATURE 1")
Get(T)
Output(4,1,"TEMPERATURE(°C)= ")
Output(4,18,T)
Wait 1
End
```

Code snippet to read temperature every .5 second for 30 seconds and storing time into list named L_1 and temperature into a list named L_2. These lists may be graphed.

```
0→dim(L₁)
0→dim(L₂)
For( N,1,60)
N*0.5→L₁(N)
Send("READ TEMPERATURE 1")
Get(T)
T→L₂(N)
Output(5,1 "TEMPERATURE IS ")
Output(5,16,T)
Wait .5
End
```

Code snippet to make decisions using the If-Then-End programming structure:

```
Send "READ TEMPERATURE 1"
Get(T)
If T<24
Then
Send "SET COLOR 255 0 0"
End
If T≥24 and T<27
Then
Send "SET COLOR 0 255 0"
End
If T≥27
Then
Send "SET COLOR 0 0 255"
End
```

Sensor and actuator Hub connections:

Temperature Sensor into IN1
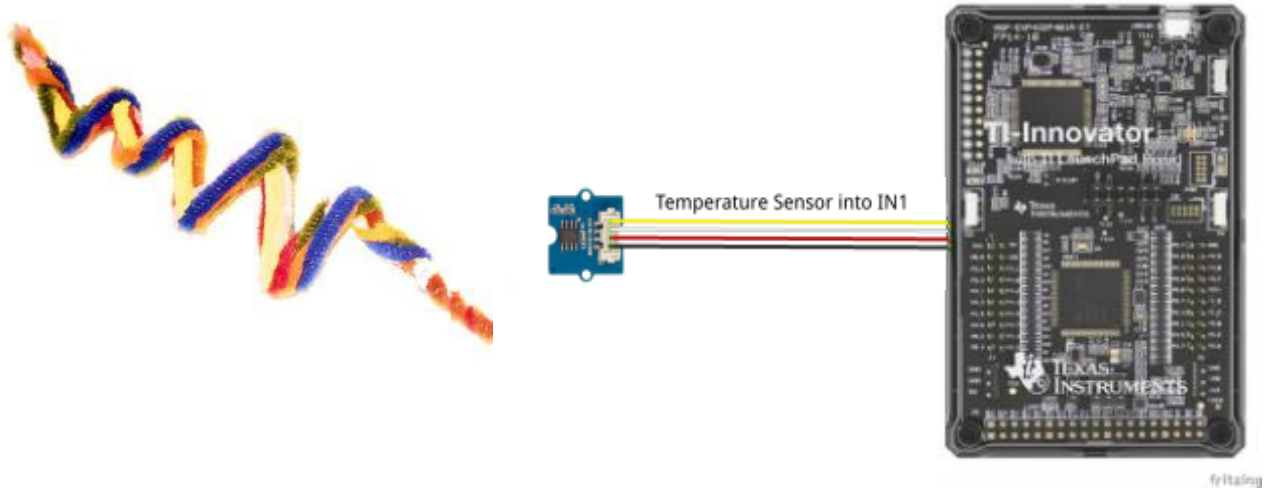
Calculator Notes:
- Press the [prgm] key to see a menu option for creating a new program.
- Press the [prgm] key to see a menu option for selecting programs to edit.
- While in the Program Editor, press [prgm] key to see menu items for programs.
- While in the Program Editor, press [alpha] [f5] to see editing options.
- While in Program Editor, use 2ⁿᵈ Left Arrow and 2ⁿᵈ Right Arrow to jump your cursor to the beginning and end of the line.
- Press [2ⁿᵈ] [quit] to leave the Program Editor and return to the home screen.

- While on the home screen, Press the [prgm] key and select the execution menu option for selecting a program names to paste to the home screen.
- While on the home screen, Press [enter] to run a program named on the home screen.
- The Home Screen "remembers" the last command entered. Press Enter after a program has run to run the program again.

- To stop ("break") a running program press and hold the ON key until you receive a dialogue box.