

GROVE THERMISTOR SENSOR AND MOTION SENSOR

COLLECTING DATA WITH TI-INNOVATOR HUB (TI-84 PLUS CE)

Overview:

In workshop, participants will use an external grove motion sensor, thermistor sensor and some Vernier probes. After collection of different types of data, proper regression method will be used to get equation and display everything on the graph screen.

Goals:

Participants will:

1. Use the grove motion and thermistor sensor by connecting to the TI-Innovator Hub
2. use the control structures:
 - a. For...End
3. Create lists for collected data.

Background:

Hub Command	Example	Behavior
CONNECT THERMISTOR	Send("CONNECT THERMISTOR")	This Hub command makes HUB to identify external THERMISTOR sensor and prepares sensor to data collection.
READ THERMISTOR	Send("READ THERMISTOR")	This Hub command reads the temperature from THERMISTOR sensor installed on the TI-Innovator and returns that reading to the calculator when the program requests it with the Get command.
Get variable	Get(X)	The Get command retrieves the value returned to the calculator from the Hub after a READ command is issued. In this example, the temperature measurement is stored in the variable named X.
CONNECT RANGER	Send("CONNECT RANGER")	This Hub command makes HUB to identify external Grove MOTION sensor and prepares sensor to data collection.
READ RANGER	Send("READ RANGER")	This Hub command reads the distance from Grove MOTION sensor installed on the TI-Innovator and returns that reading to the calculator when the program requests it with the Get command.
Get variable	Get(X)	The Get command retrieves the value returned to the calculator from the Hub after a READ command is issued. In this example, the distance measurement is stored in the variable named X.

Setup:

Participants may work individually or in groups of two or three. If every individual or group choose an area with a temperature change, related to airflow etc., data collected by different sensors varies.

Supplies:

- TI-Innovator HUB
- TI-84 CE
- Grove Thermistor Sensor with proper cable to set up the link.

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Activity	Presentes Notes
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Challenge 1: Write a program that collects one temperature data from the room and displays the value on the calculator screen.

Guidance during challenge 1:

- The Disp displays a prompt and variable value.

Sample Code:

```
PROGRAM: TEMP
Send("CONNECT CONNECT THERMISTOR 1 TO IN1")
Disp "DURATION"
Send("READ THERMISTOR 1")
Get (X)
Disp X
```

Challenge 2: Write a program that collects multiple temperature data from the room, put data to L₁ and L₂. Calculates the proper regression by using collected data displays the value on the calculator screen.

Guidance during challenge 2:

- This challenge requires the use of a new programming control structure For...End. For command sets up a loop to repeat the enclosed lines of code as many times as stated in the command.
 - The For...End For command sets up a loop to repeat the enclosed lines of code as many times as stated in the command.

```
For(1,0,10)
...
...
End
```

- The Disp displays a prompt and variable value.

```
Disp "DURATION", X
```

- The Wait command halts the TI BASIC program for the specified number of seconds.

```
Wait 2
```

Sample Code:

```
PROGRAM: TEMP
SetUpEditor L1 and L2
ClrList L1, L2
Send("CONNECT CONNECT THERMISTOR 1 TO IN1")
Disp "DURATION"
```

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```
Prompt T
T →dim(L1)
T →dim(L2)
For (N,1,T)
Send("READ THERMISTOR 1")
Wait 1
Get (X)
Disp X
X →L2(N)
N →L1(N)
End
LinReg(ax+b) L1,L2,L1,Y1
DispGraph
```

Challenge 3:

- Write a program that collects one distance data from a certain point on the room and displays the value on the calculator screen.

Guidance during challenge 3:

Sample Code:

```
PROGRAM: DISTANCE
Send("CONNECT CONNECT RANGER 1 TO IN1")
Disp "DURATION"
Send("READ RANGER 1")
Get (X)
Disp X
```

Challenge 4:

- Write a program that collects multiple distance data from different points in the room, put data to L₁ and L₂. Calculates the proper regression by using collected data, displays the value on the calculator screen.

Guidance during challenge 4:

Sample Code:

```
PROGRAM: TEMP
SetUpEditor XX and YY
ClrList LXX, LYY
Send("CONNECT CONNECT RANGER 1 TO IN1")
Disp "DURATION"
Prompt T
T →dim(LXX)
T →dim(LYY)
```

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```
For (N,1,T)
Send(`READ RANGER 1`)
Get (X)
Disp X
Wait 1
X→LYY(N)
N→LXX(N)
End
LinReg(ax+b) LXX,LYY,LXX,Y1
DispGraph
```