

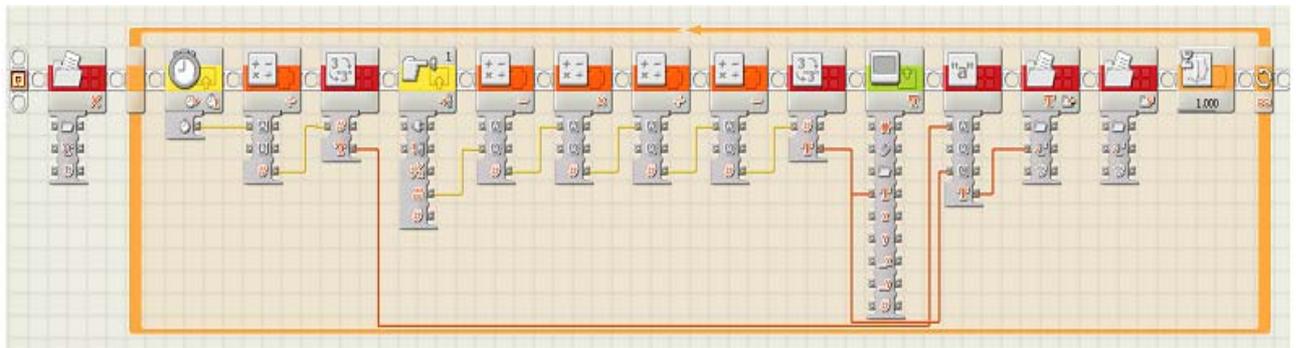
45 minutes

Purpose of this lesson

- Create a program using the LEGO Mindstorms software to collect and store data
- Upload a data file from the NXT to a computer

Procedure:

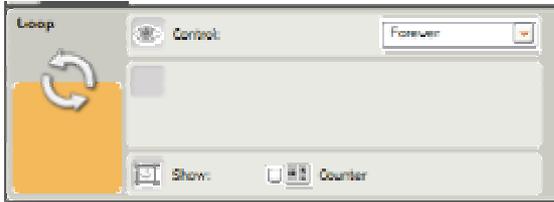
To use the NXT for data logging, modify the program created for the temperature sensor as shown below. This program will write data to a file on the NXT which can be transferred to a computer. Once every second the program (or whatever time you set) will take a measurement and write this measurement and the sample time to the file created on the NXT.



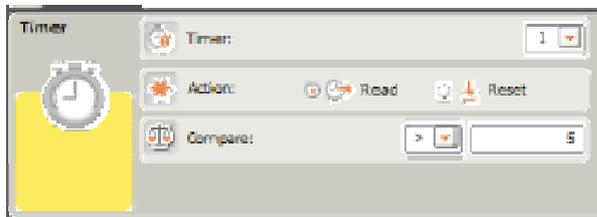
The first block from left to right is a file access block. This block makes sure the filename you chose for the data log is not in use already on the NXT. Without this block, any new data will be recorded in the same file as previous data if the program is run more than once. With this block, the old data file will be deleted from the NXT each time the program is run. The action pull down menu for this block must be set to delete and the Name text box should be set to the filename you intend to use for the data log. In the example below, the filename is “datalog”.



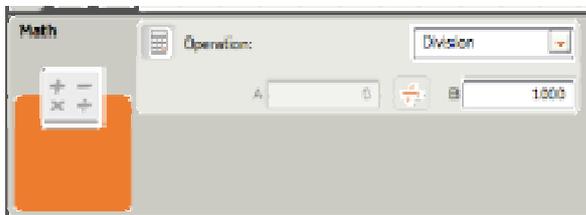
The next block required is the loop block which was used in the temperature sensor program. The control pull down menu should be set to Forever.



The next block required is a Timer block which will keep track of the number of milliseconds the program has been running when the temperature reading is taken. The action of this block should be set to Read.



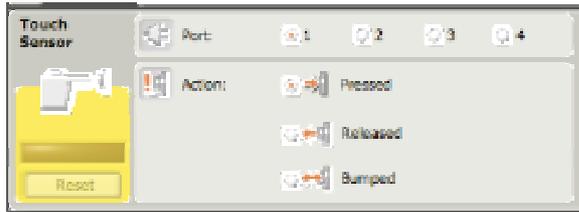
This Math block divides the number of milliseconds by one thousand to convert milliseconds to seconds. The operation should be set to Division and B should be 1000.



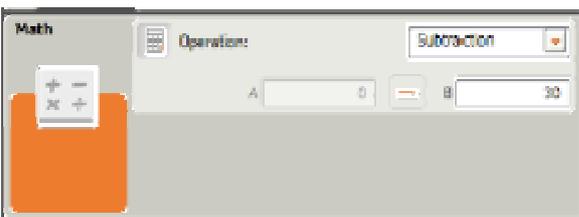
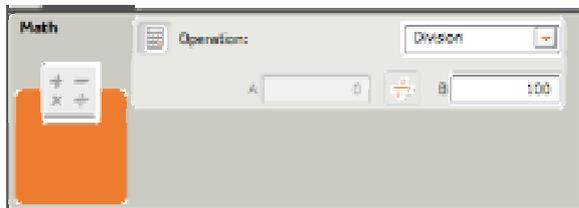
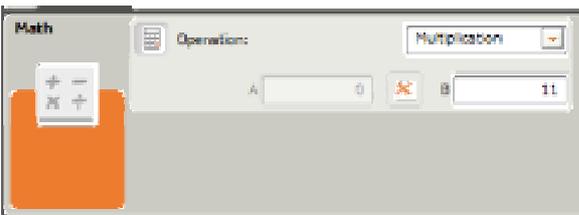
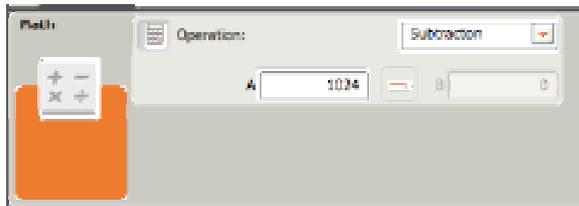
The number block will convert the number from the previous math block to text.

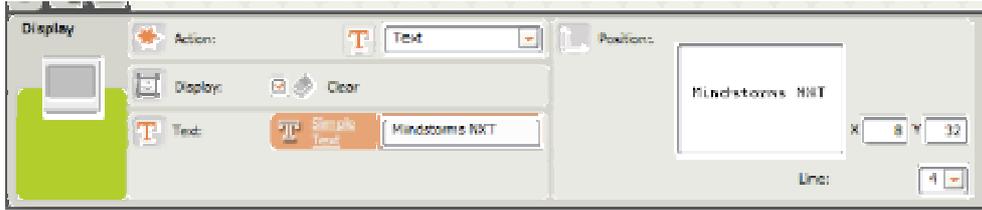


The next block is the touch sensor block, this will be the same as in the temperature sensor program.



The next four math blocks, the number to text block and the display block are configured the same as in the temperature sensor program.





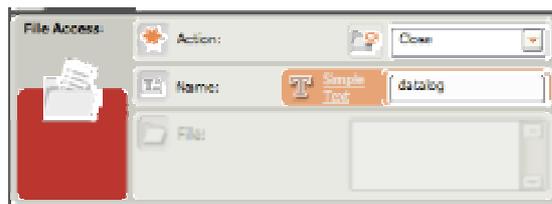
The next block is a text block; this will add the text from the time value to the text from the temperature reading to tell what time a temperature reading is taken. It is important to put several spaces in the B text box so that the temperature and time are separated.



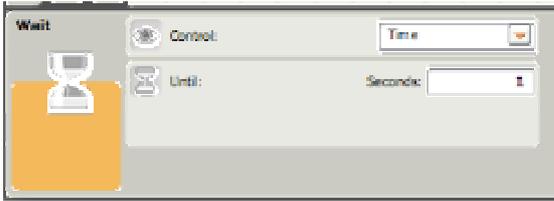
A file access block is needed to write to the file on the NXT. The action pull down menu must be set to write and the name box must be the file name you chose, datalog in this case.



Another file access block is needed to close the file and upload later. The action pull down menu must be set to close and the name box should be the same file name.



The last block is the wait block. This stops the program for a predetermined time to control how often samples are taken. The control pull down menu must be set to time and the desired sample time should be typed into the seconds' box, in this case one second was used.



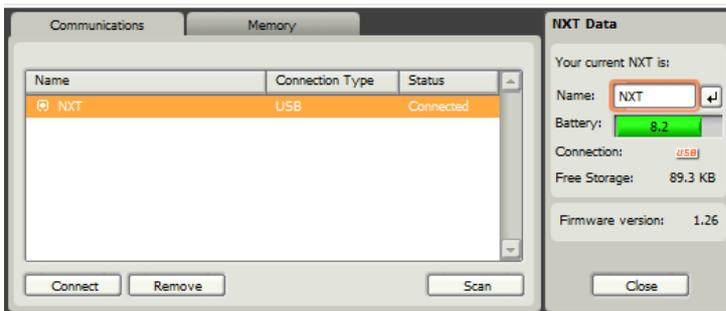
Once the blocks are configured and wired as shown in the first picture the program should be saved, downloaded to the NXT and run. Then the NXT should be connected to the computer with a USB cable.

Once the program has been run, retrieve the data file from the NXT.

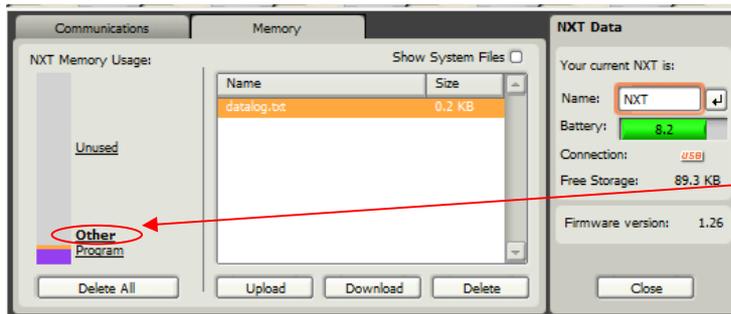
To do this, first click on the NXT window button shown below.



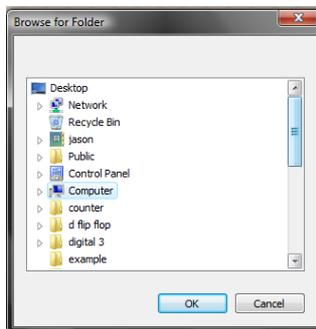
The NXT window button will bring up the NXT window shown below. After scanning for a few seconds, it should show that your NXT is connected under the Status column.



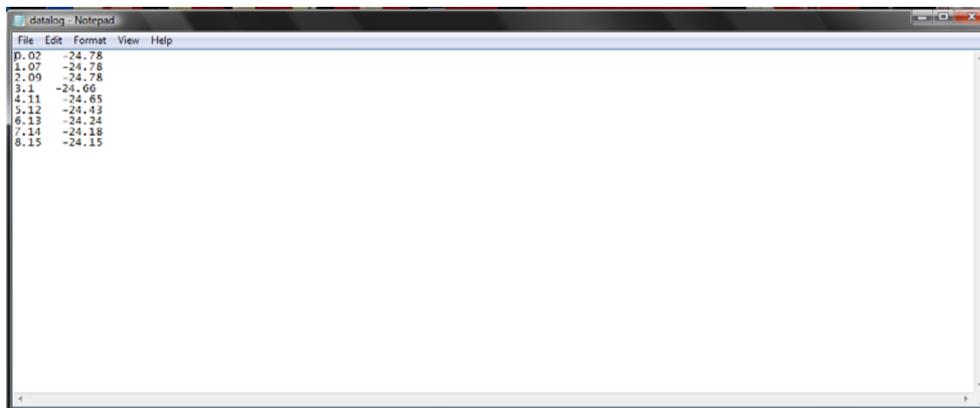
After verifying that your NXT is connected correctly click the Memory tab at the top of the NXT window. Once the memory screen comes up, click the word "Other" on the left side of the NXT window next to the NXT Memory Usage bar. Select the name of your file in the window and click upload.



Select where you would like the datalog file saved and click OK. Then close the NXT window.



Go to where you saved your data log file and open the file. In the file there will be two columns, the left will contain the time in seconds and the right column will contain the temperature in Celsius taken at that time.



If you wish, you can also open your data in Microsoft Excel. To do so, open Microsoft Excel, and select "Open". Under Files of Type, select "Text files". Choose the folder on your computer where you saved your file, and it should show up in the list. (In this example, the file would be called "datalog.txt".) Click on Open. The Text Import Wizard should appear. Make sure "delimited" is selected, then click on Next. Place a checkmark next to "space", then click on Finish. This should place your data in two columns in an Excel file.

Introduction to the NXT and Datalogging