ثانويـة التكنولوجيـا التطبيقيـة
Applied Technology High School

Robotics II

Module 3: Dealing with Files

PREPARED BY

Academic Services Unit

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Module 2: Dealing with Files

Module Objectives

Upon successful completion of this module, students should be able to:

- Understand the file access block and its configuration
- Create and use files inside NXT programs

Module Contents:

3.1 Introduction

Your computer uses files to store music, pictures, programs, documents, and other kinds of information. The NXT also uses files to store various types of information, such as your programs, images used by the display block, and the sounds used by the sound block. Figure 3.1 shows various types of information the NXT stores.

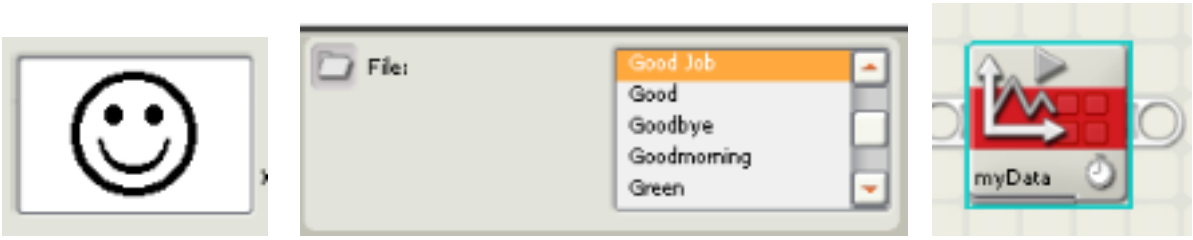


Figure 3.1: Various File Types stored inside the NXT

Files in NXT-G programs can be used to:

1. Store data collected by the program as it runs. For example, storing high scores for a game, or a map generated by a maze-solving robot.
2. Store program settings such as the speed the robot should use or trigger values for sensors.
3. Collect sensor data as part of an experiment or a test program. For example, collecting weather information from sensors.

In this module, you will learn how to create and use files in NXT programs.

3.2 File Access Block

The File Access block allows you to create your own files on the NXT. Such files can be used to store any data that your programs use. For Example, you can store the values of the sensors to analyze and process them.

File Access block can be found in the Advanced group on the Complete Palette (see Figure 3.2). Figure 3.3 shows how this block looks when you add it to your program.

Figure 3.2: The File Access Block on the Complete Palette

Figure 3.3: The File Access Block

The File Access block can be configured using either the configuration panel as shown in Figure 3.4, or data wires as shown in Figure 3.5.

Figure 3.4: The Configuration Panel for the File Access Block

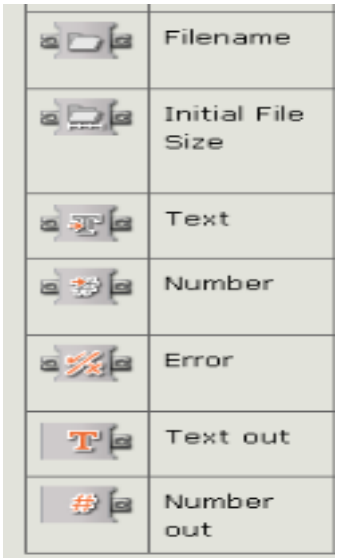


Figure 3.5: The Data Wires for the File Access Block

To use the File Access block, you must set the following parameters: Action, File Name and File Type.

- **Action:** The Action setting tells the block what you want to do with the file. You can do the following four operations:
  - **Write:** Stores information in a file. If the file doesn't exist, the access block will create one; otherwise, the new data is added on at the end of the existing file.
  - **Read:** Retrieves information from a file. The value read from the file is passed to other blocks in the program using a data wire (Text or Number data wire)
  - **Delete:** Deletes a file. You delete a file if you want to replace the information in it. For example, if you want to set the high score of a game, you need first to delete the file and then write the new value.
  - **Close:** Closes the file. You need to close the file before you can read from, write to or delete it.

- **File Name:** The file name setting sets the name of your file. The name of the file cannot exceed 15 characters. It can include numbers, letters, spaces, and most of the special characters such as * and #. When naming a file, use meaningful filenames that reflect the actual content of your files. To create a new file, enter the file name in the name box. To reuse an existing file, select it from the file list and the name box will be filled automatically (see Figure 3.6)

Figure 3.6: Selecting the name from a file list

- **Type:** File type setting tells the block which data type you are using. The file access block can read and write both numbers and text values.

  When the action is set to write, the value can be supplied via a data wire or the Configuration Panel. With Text selected for Type, you can enter the text to write to the file in the Text box. When writing a number, you can enter the number to write to the file in the Number box.

  When the Action is set to Read, the data will be available on either the Text out or Number out data plug, depending on the Type setting (see Figure 3.5).

3.3 Lab Activity 1

Objectives:

1. Understand the use of file access block
2. Write and read from files
3. Display the content of the file on the NXT Screen

Material per Group:

1. 1 NXT Brick
2. 1 USB cable

Procedure:

1. Create a new program and name it **myfiles**
2. Write the following NXT-G code:

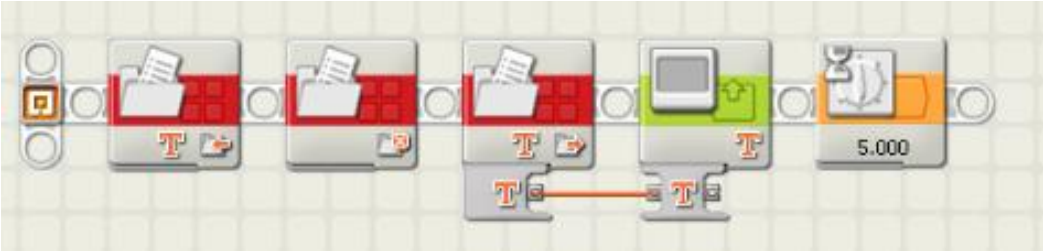
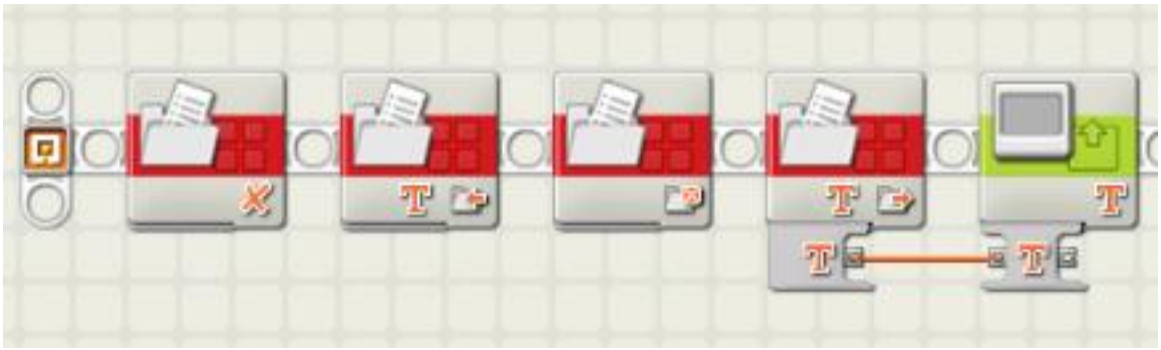


Figure 3.7: Writing to and Reading from NXT Files

3. Configure the programing blocks as follow:

Programming Block	Configuration
File Access Block	• Action→ write • Name→ Robotics • Type→ Text • Text→ explorer
File Access Block	• Action→ close • Name→ Robotics
File Access Block	• Action→ read • Name→ Robotics • Type→ Text
Display Block	• Action→ Text
Wait Block	• Control→ Time • Until→ 5

4. Download and run your program
5. What is the text displayed on the NXT? _____
6. Update the content of the Robotics file to pinball.
7. Download and run your program.
8. What is the text displayed on the NXT? _____
9. Modify your code to the following code:



10. Configure the new file access block as follow:
    - Action → Delete
    - Name→ Robotics
11. Download and run your program.
12. What is the text displayed on the NXT? _____

Question:

What is the effect of deleting the file "Robotics" at the beginning of the second code?

_____

_____

_____

3.4 Lab Activity 2

Objectives:

1. Write the light sensor readings to a file
2. Analyze the light collected light sensor reading

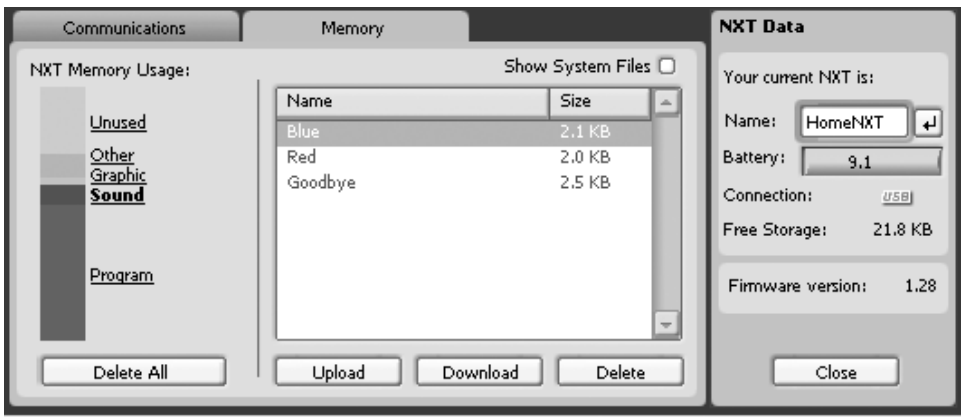
Material per Group:

1. 1 NXT Brick
2. 1 USB cable
3. 1 light sensor

Procedure:

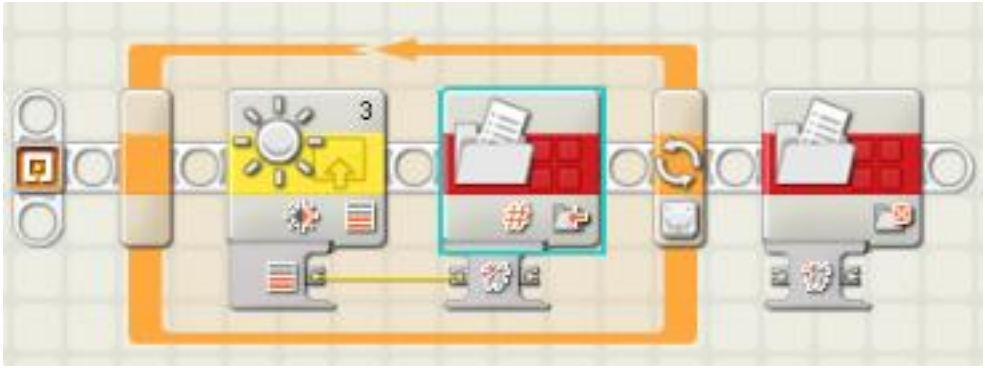
1. Connect the light sensor to port 3 of the NXT
2. Create a new program and name it **loglight**
3. Delete all programs from the NXT memory using the NXT window
   - Click the NXT window button on the controller

   - Select the memory tab in the NXT window



- Select program, and then delete all programs.

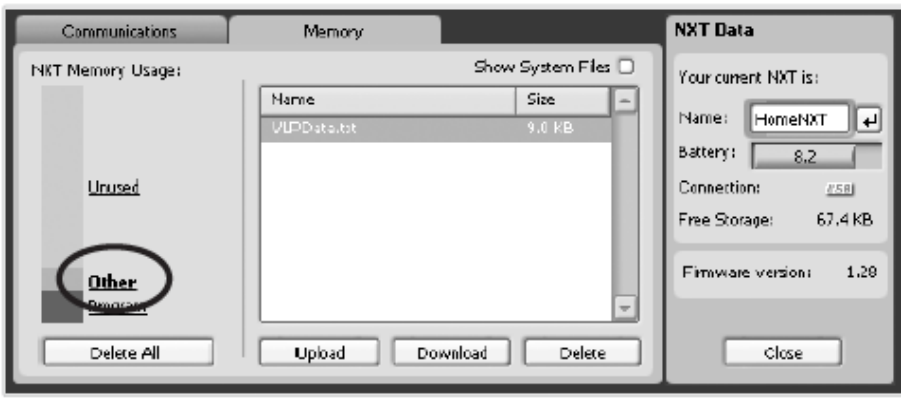
4. Write the following NXT-G code:



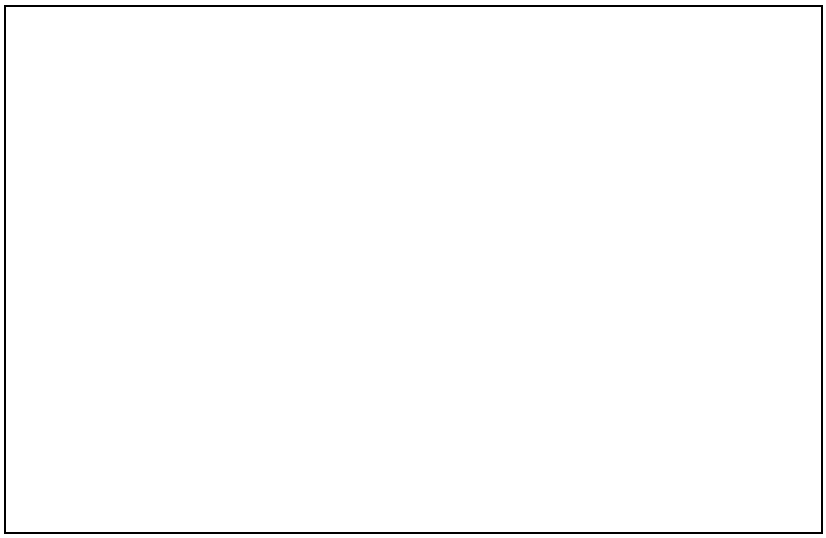
5. Configure the programing blocks as follow:

Programming Block	Configuration
Light sensor	• Port→ 3
File Access	• Action→ write • Name→ lightlog • Type→ number
Loop	• Control→ time • Until→ 20
File Access	• Action→ close • Name→ lightlog

6. Download and run your program.
7. Change the light intensity on the sensor.
8. Wait till the program finishes running.
9. Click the NXT Window button on the Controller.
10. Select the Memory tab in the NXT window, and then select other from the NXT Memory Usage section.



11. Click on the file lightlog.txt
12. Click the Upload button. You'll be prompted to select the folder on your computer where the file should be placed. Place to file on the desktop
13. Use Microsoft Excel to open the upload file (lightlog.txt) from your desktop.
14. Plot the light data



Question:

- From the graph, describe the collected light intensity data.

_____

_____

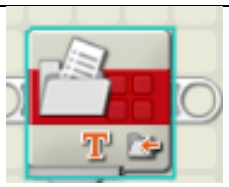
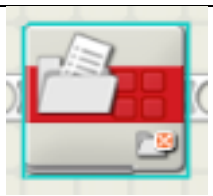
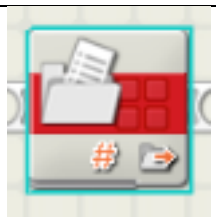
_____

_____

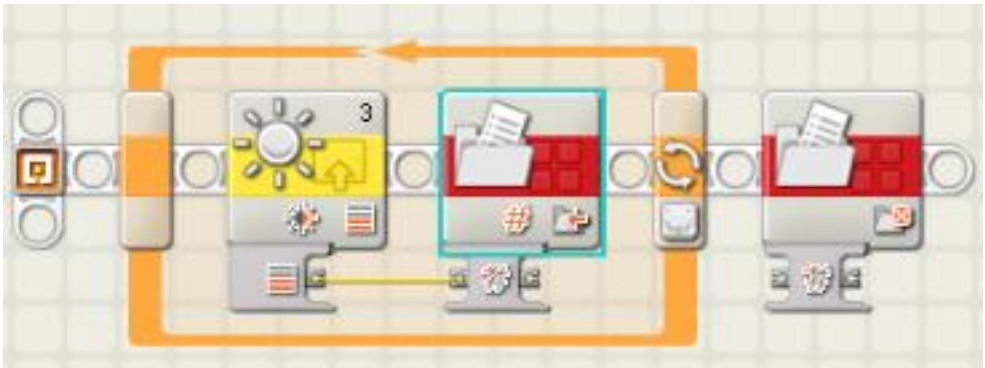
_____

3.5 Review Exercise

1. Identify the setting of the following file access blocks. Fill the required information in the table below:

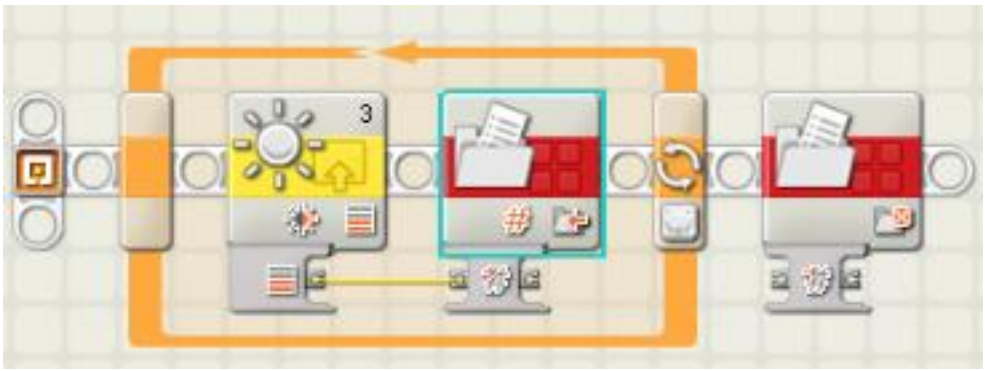
				
Action				
File Type				

2. Explain the sequence of the following NXT-G Code:



1. _____
2. _____
3. _____
4. _____

3. The following code is used to monitor the light intensity inside a room. Modify the code to monitor both the light intensity and the sound level. (**Hint: you can use the text block**)



Write your modified program here:

References:

- Terry Griffin (2010). *The Art of LEGO MINDSTORMS NXT –G Programming*. No starch press: USA
- Kelly,F,G. (2007). *LEGO MINDSTORMS NXT –G Programming Guide.* Apress:USA