ثانويـة التكنولوجيـا التطبيقيـة
Applied Technology High School

Robotics II

Module 5: Creating Custom Made Blocks (My Blocks)

PREPARED BY

Academic Services Unit

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Module 5: Creating Custom Made Blocks (My Blocks)

Module Objectives

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

- Create, edit and configure a my block
- Insert a my block inside a program and test its functionality

Module Contents:

5.1 Introduction

By now you may have noticed that an NXT-G program can quickly become very large. Furthermore, simple tasks such as displaying a number or adding one to a variable can require several blocks. Also, many of the same groups of blocks are used repeatedly in different programs and often within the same program. **My Blocks** help you overcome these issues. Figure 5.1 shows an example of using my blocks inside an NXT-G code.

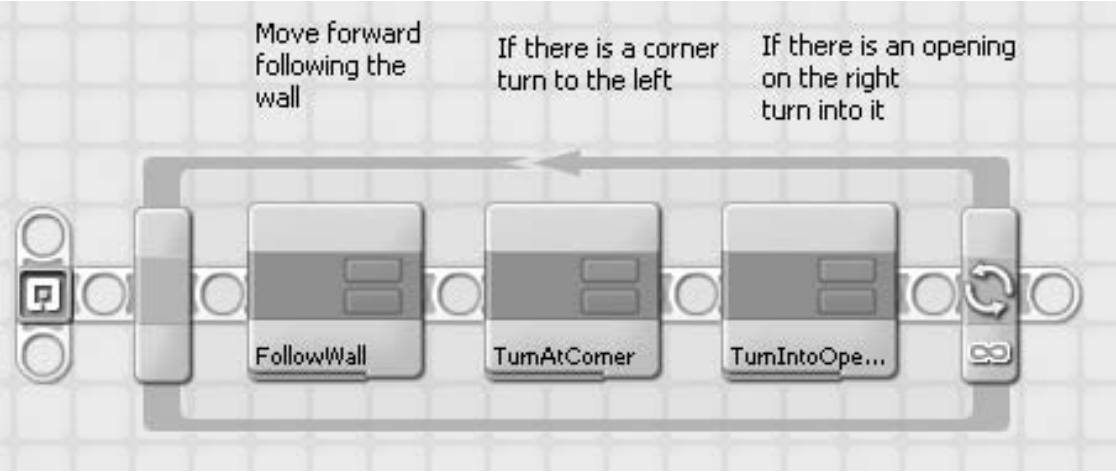


Figure 5.1: Using My Blocks inside a Maze Navigator Program

So, what is my block?

A My Block is a collection of NXT-G blocks that you have grouped together and may wish to reuse.

In this module, you'll learn how to create and use a My Block in your programs.

5.2 Lab Activity 1

Objectives:

1. Create, edit and insert a my block into a program

Material per Group:

1. 1 NXT Bricks
2. 1 USB cable

Procedure:

Step 1: Creating a my block

1. Write the following NXT-G code:

2. Download and run your program.
3. What does the program do:

_____

_____

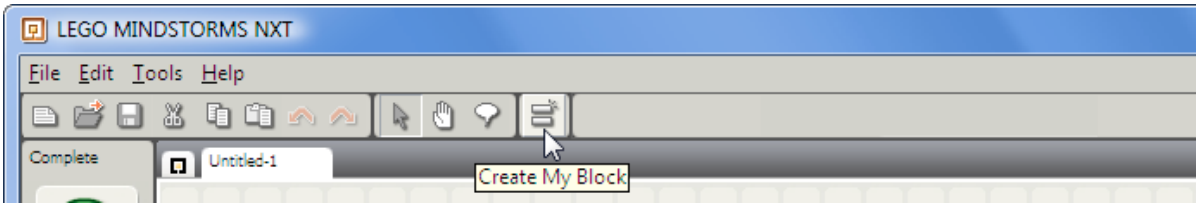
_____

_____

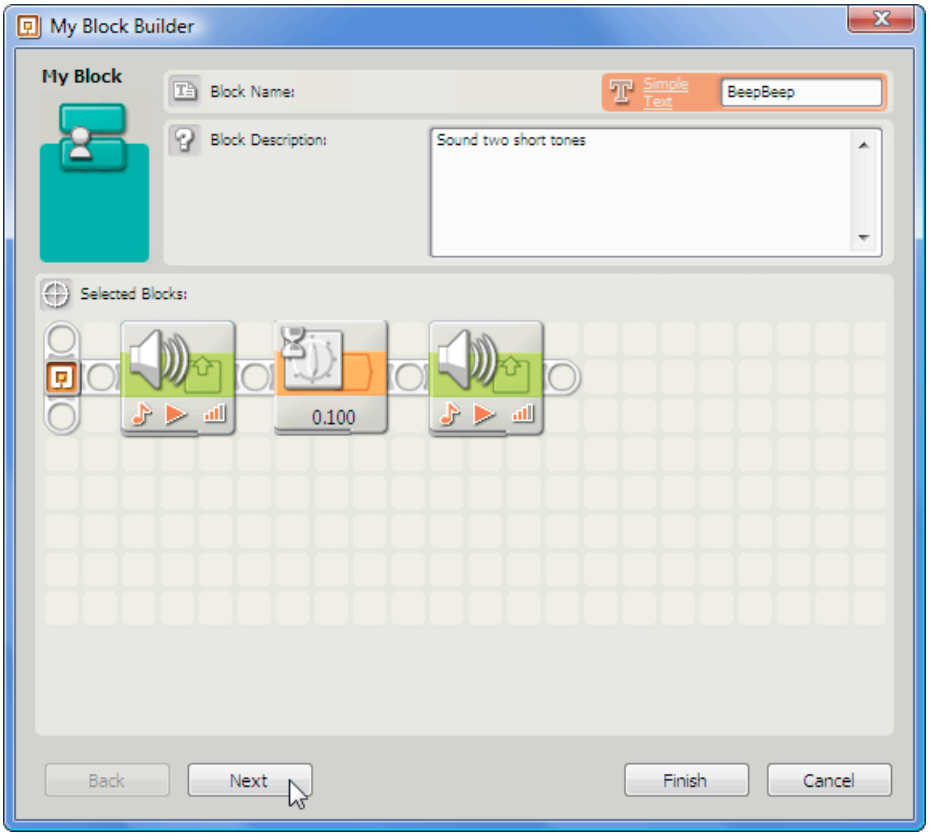
_____

4. Select the sequence of blocks that will make up the My Block by dragging a selection rectangle over them.

5. Click the "Create My Block" button on the toolbar as shown below:

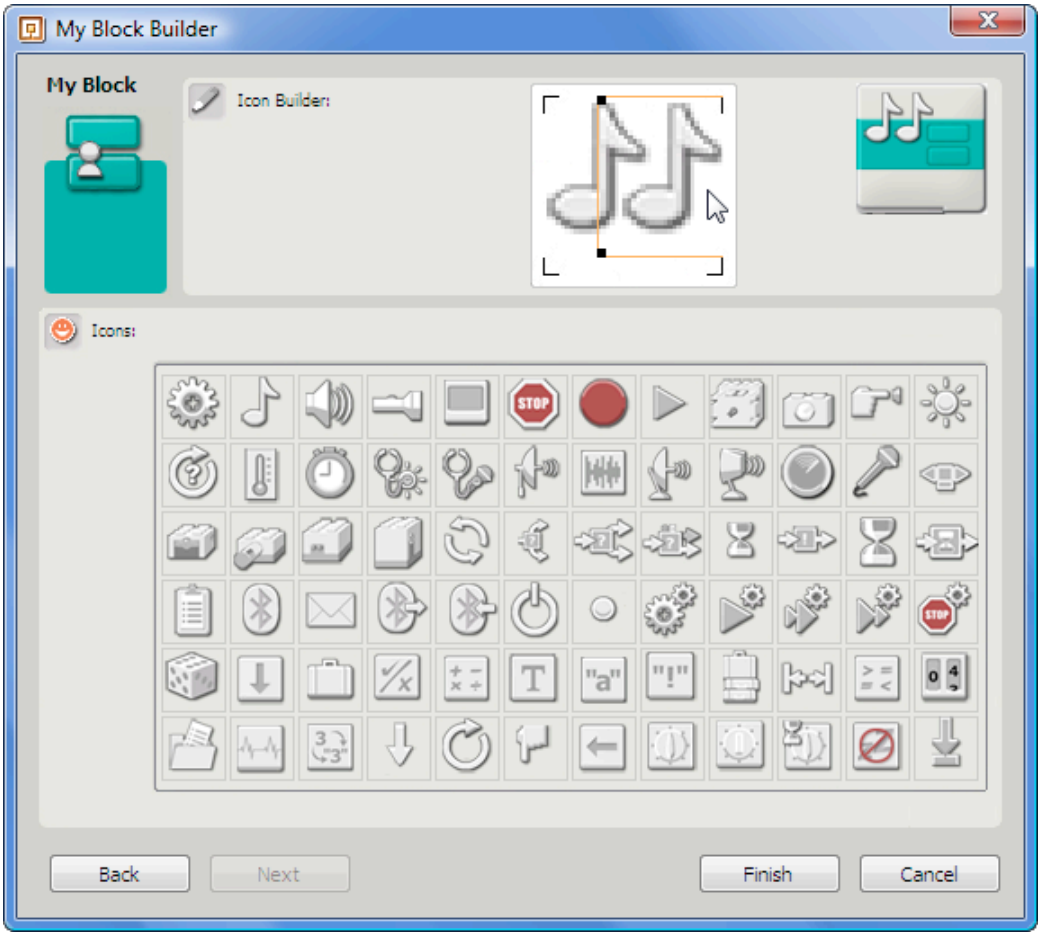


6. The My Block Builder window will appear:



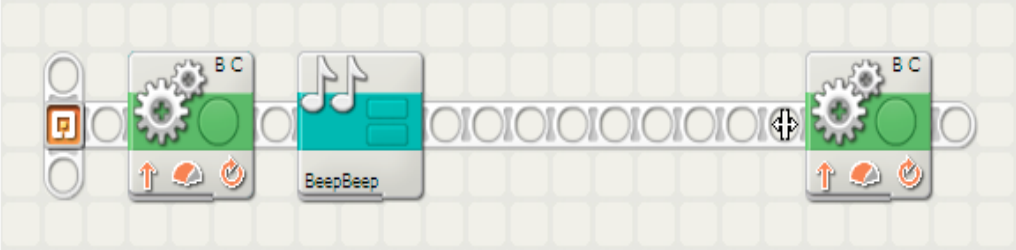
The My Block Builder window contains boxes for entering a name and description for the new block. The Selected Blocks area lets you see which blocks were selected to make sure you're creating the block you expect. If the correct blocks aren't displayed, click the Cancel button and start again.

7. Enter BeepBeep in the Block Name box
8. Insert comments to describe your block in the block description box.
9. Click the next button. The following window will appear:

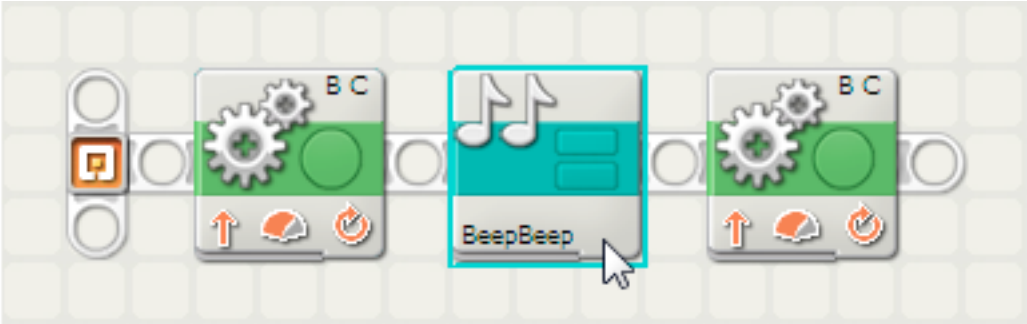


10. Create a new icon by dragging one or more icons from the lower section of the window into the box in the Icon Builder section. You can resize and move the individual images to create a new unique icon for your block.

11. Click the Finish button. Clicking Finish will create the BeepBeep block and replace the old three blocks with the new block in the program.



12. Move the blocks closer together



13. Download and run your program after creating BeepBeep block. What does the program do:

_____

_____

_____

_____

_____

Question:

What is the effect of creating BeepBeep Block on the sequence of the program? _____

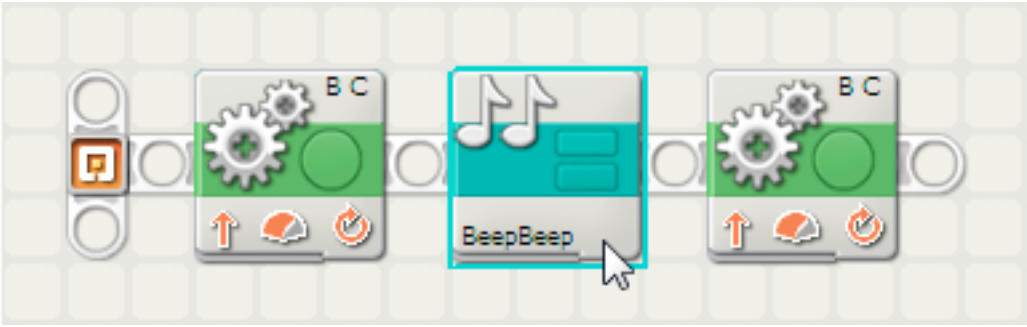
_____

Step 2: Viewing and Editing the Contents of a My Block

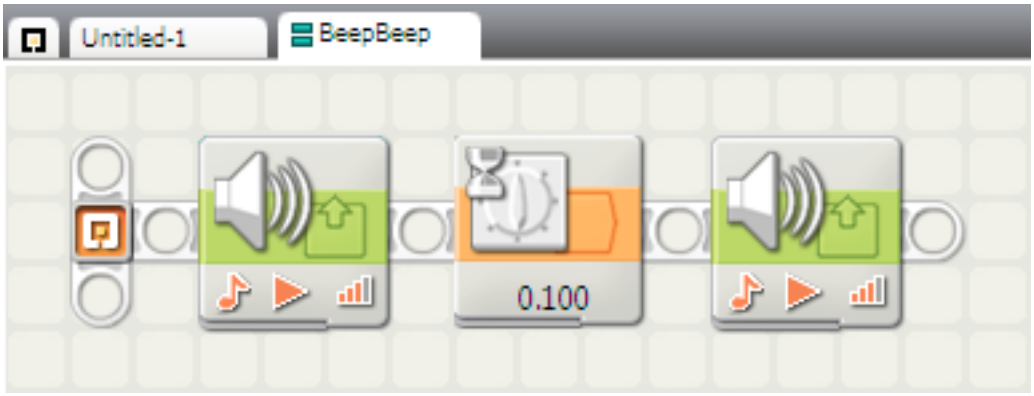
To edit a My Block, you can either double-click it or select it and choose Edit→Edit Selected My Block from the menu.

This will open the block in the MINDSTORMS software, where it will look like a small program. Now, to edit the BeepBeep block, follow these steps:

1. Select BeepBeep Block



2. Select Edit→Edit Selected My Block from the menu
3. The blocks that make up the BeepBeep block should look as follow:



4. Once the block is open, you can make changes, including adding and removing blocks, changing the settings of the blocks, or adding comments. Change the wait block time to 0.5 seconds.
5. Save and close the BeepBeep block (go to File→ Save and File→ Close)
6. Download and run your program. What do you observe?

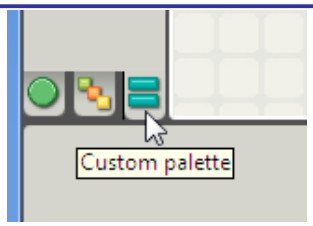
_____

_____

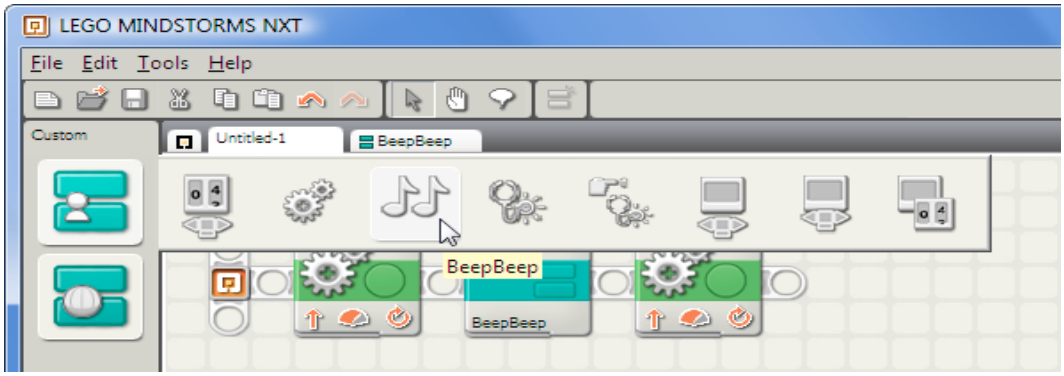
Step 3: Inserting a my block into a program

Once you've created a My Block, you can use it in any program, just like any other block. All of your My Blocks will appear on the Custom Palette.

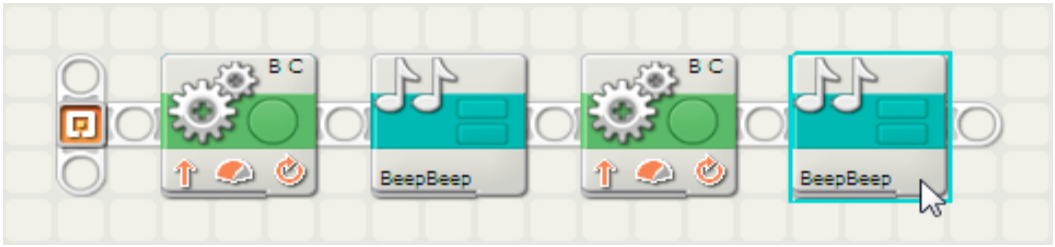
1. Select the Custom Palette as shown below:



2. Insert BeepBeep block into your program. Newly created My Blocks will appear in the top group on the Custom Palette, as shown below:



3. Your modified program will look as follows:



5.4 Lab Activity 2

Objectives:

- Build a My Block for displaying numbers on the NXT's screen

Material per Group:

- 1 NXT
- 1 USB cable
- 1 Sound sensor

Background Information:

Several of the programs presented in the previous modules have used the Number to Text, Text, and Display blocks to display a labeled value. For example, light meter, sound meter and pinball machine programs. Figure 5.2 shows the sound meter program where the sound sensor readings are collected and displayed on the NXT Screen.

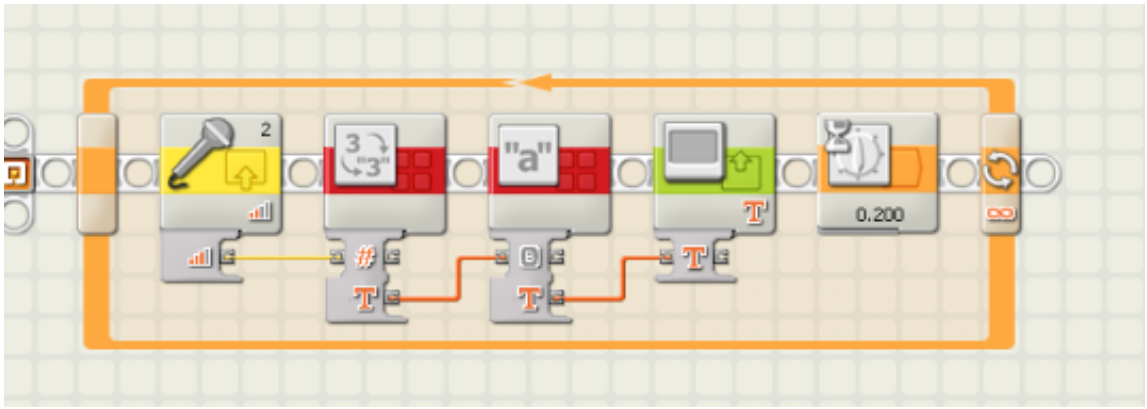


Figure 5.2 The Sound Meter Program

In this activity, you'll create the DisplayNumber block from the Number to Text, Text, and Display blocks, which will make displaying numbers much more convenient.

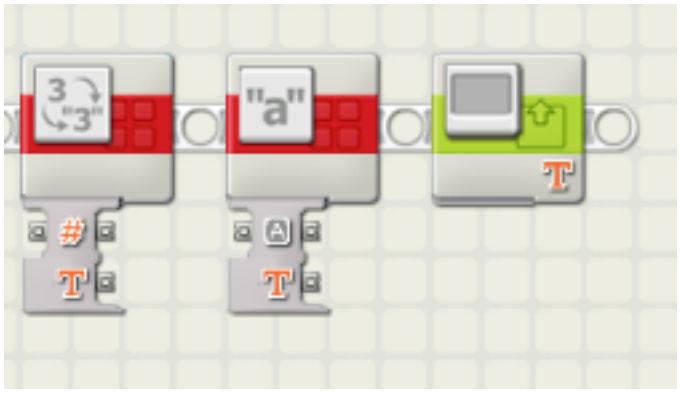
Before creating a My Block, think about the configuration items that your new block will need. For Example, DisplayNumber block will need the following configuration:

- The number passed to the Number to Text block → the displayed value
- The A value for the Text block→ the label for the value.
- The C value for the Text block→ the unit of the value.
- The Clear setting for the Display block.

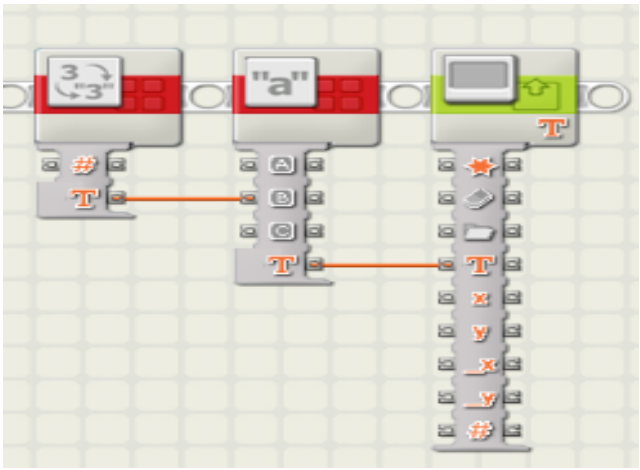
Procedure:

Step 1: Setting the configuration of the DisplayNumber block

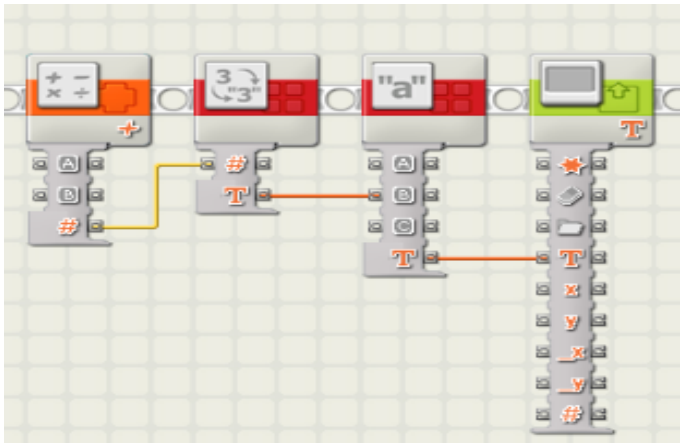
1. Create a new program named DisplayBlockBuilder.
2. Add a Number to Text block, a Text block, and a Display block.



3. Set the Display block's Action setting to Text.
4. Open the data hubs of the Text and Display blocks.
5. Connect the Number to Text block's Text data plug to the Text block's B data plug.
6. Connect the Text block's Combined Text data plug to the Display block's Text data plug.



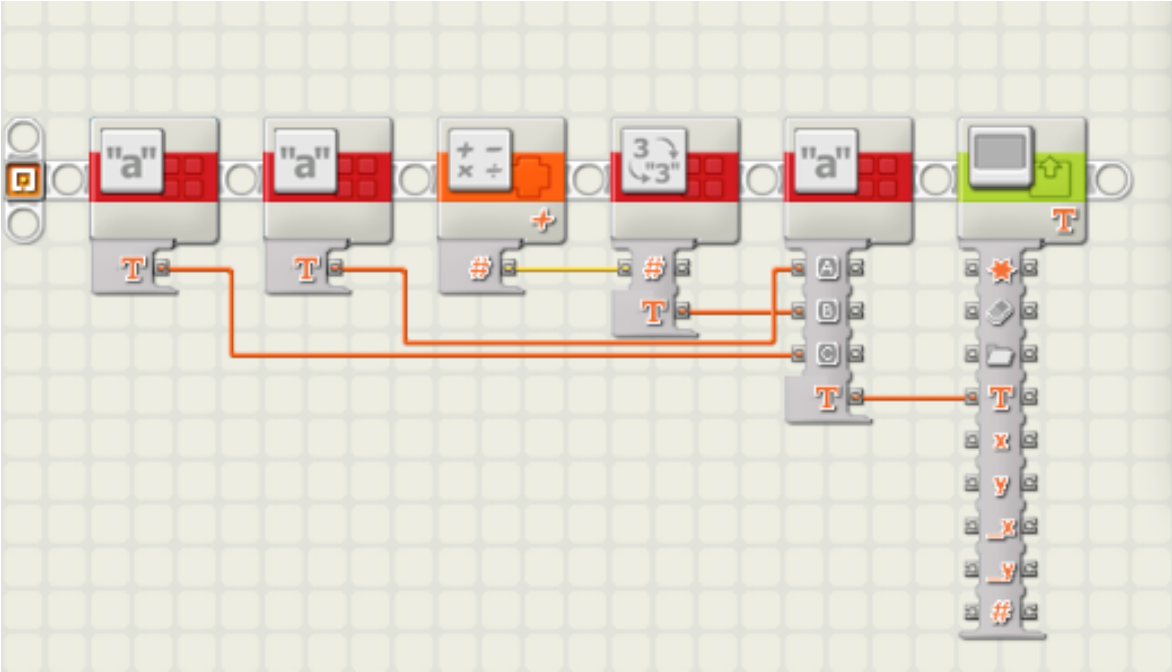
7. Add a Math block at the beginning of the program, to the left of the Number to Text block.
8. Connect the Math block's Result data plug to the Number to Text block's Number data plug.



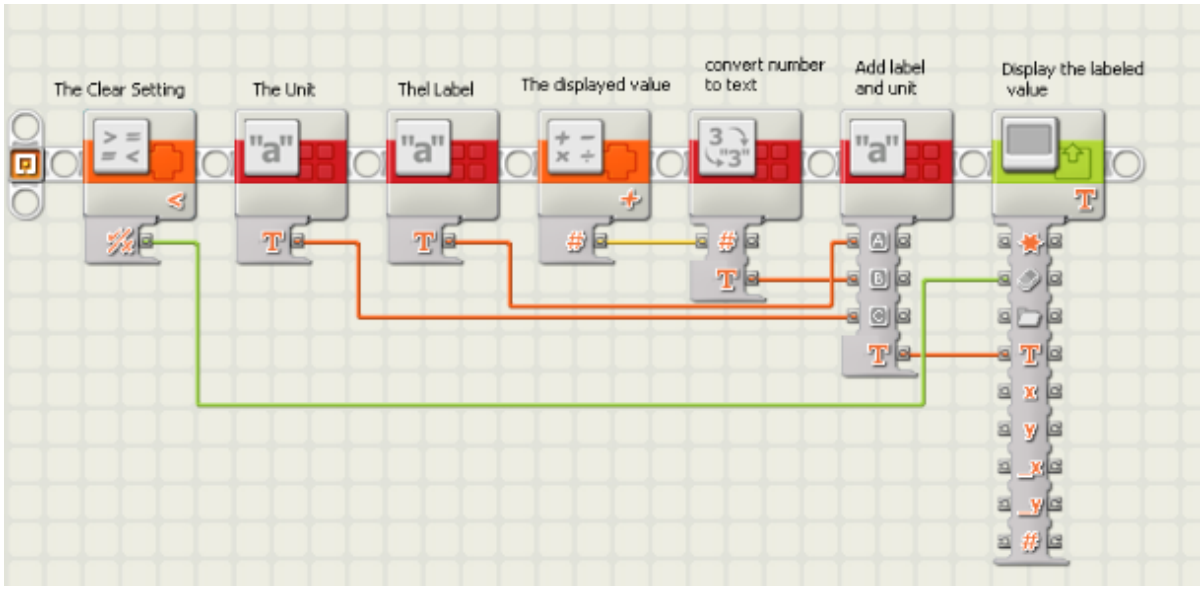
Note: The only reason the Math block is there is to connect a data wire to the Number to Text block's Number data plug. The Math block won't become part of the DisplayNumber block. A Math block is used because we need to connect a data wire to the Number to Text block's input data plug, and the Math block has an output data plug that uses a number. Any block that has an output data plug that uses a number would work just as well as a Math block.

9. Add two Text blocks at the beginning of the program
10. Connect the Combined Text data plug of one of the new Text blocks to the original Text block's A data plug.

11. Connect the Combined Text data plug of the other new Text block to the original Text block's C data plug.
12. Close the data hubs for the two new Text blocks and the Math block. The program should look like this:



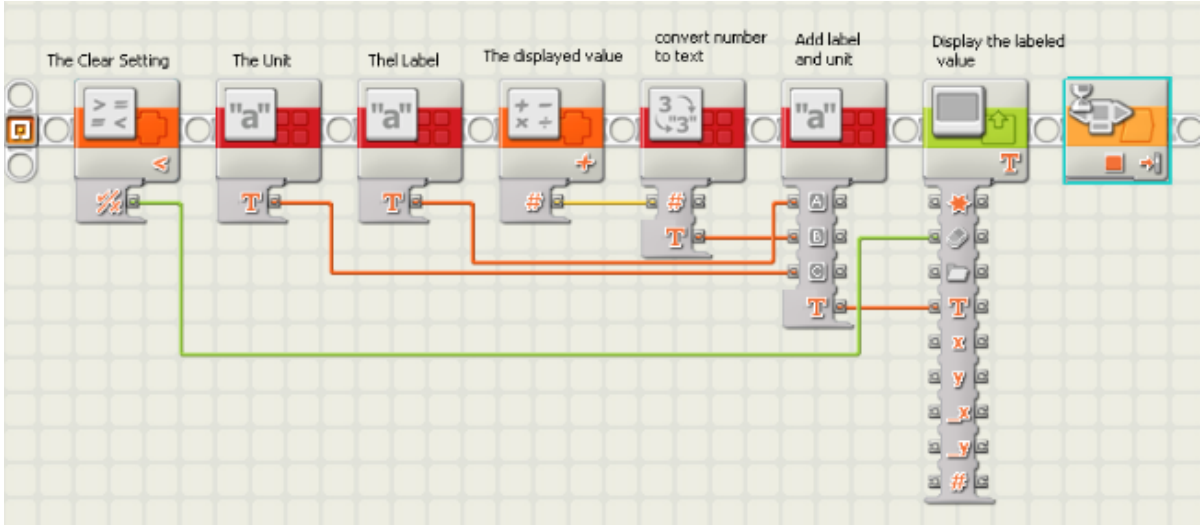
13. Add a Compare block at the beginning of the program.
14. Connect the Compare block's Result data plug to the Display block's Clear data plug.
15. Close the Compare block's data hub. The program should look like this:



Step 2: Testing

All the blocks are now in place and connected. But how do you know it's really going to work? The only way to find out is to test the code, and the earlier you test it, the easier it will be to fix any problems. To test the code, you can set the four input values and then see whether the correct text is displayed.

1. Add a Wait block to the end of the program.
2. Select NXT Buttons from the list of sensors.
3. Your new program will look as follow:



4. Select the first Text block. Set the A value to **Unit**, with a space

before the *U*.

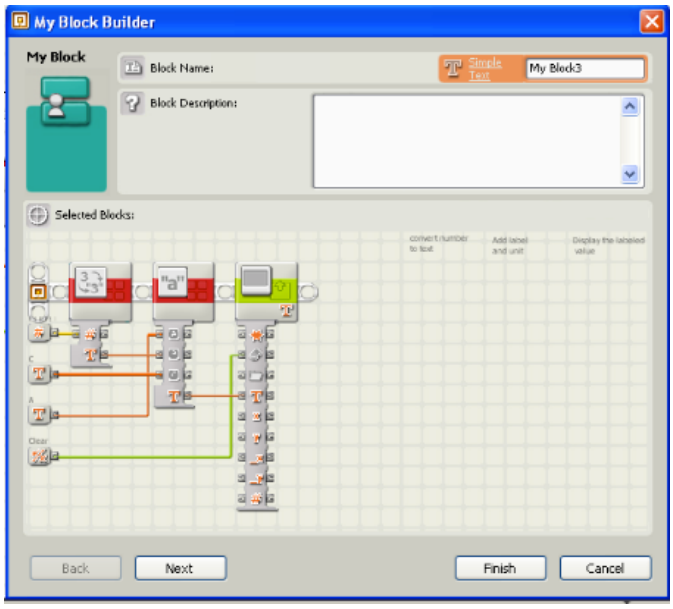
5. Select the second Text block. Set the A value to **Label:** ,with a space after the colon.
6. Select the Math block. Set the A value to **17.**
7. Download and run your program. What is the text displayed on the NXT Screen? _____

Note: If the program doesn't work, check all the data wire connections; there are a lot of them, and it's easy to get one wrong.

Step 3: Creating the DisplayNumber Block

Once you have tested your block; it's time to create the My Block. Follow these steps to create the DisplayNumber block:

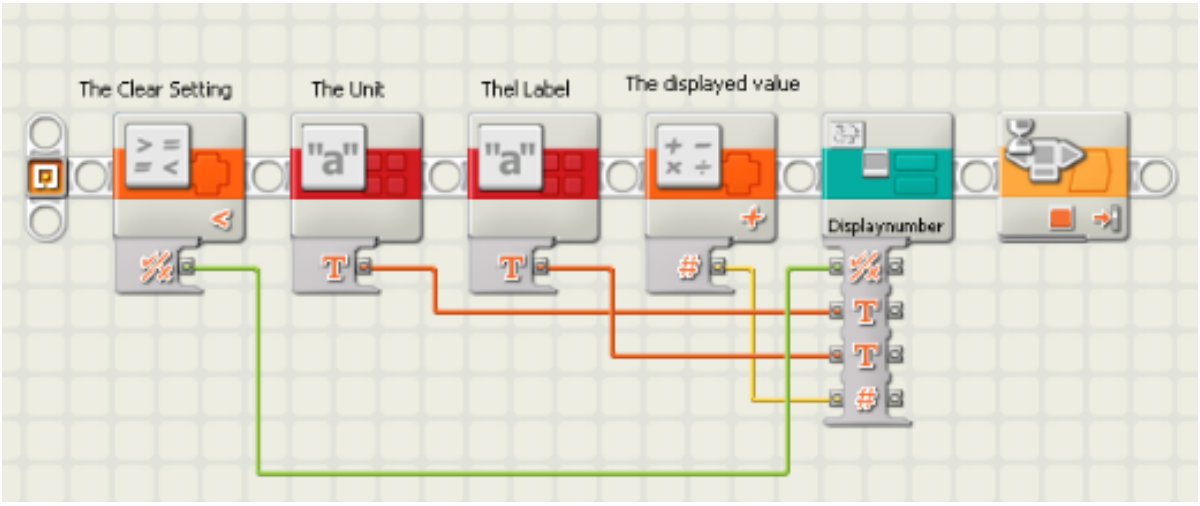
1. Select the Text, number to text and the display block.
2. Click the "Create My Block" button on the toolbar. The My Block Builder Window will appear:



3. Enter DisplayNumber for the Block Name option.
4. Enter Display a number with a label and unit for the Block Description option.
5. Click the Next button. The My Block Builder window should now show the controls for building an icon for the new block.

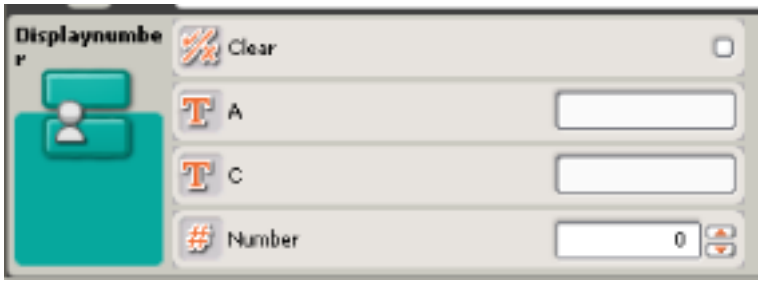
6. Create an icon for the new block.

7. Click the Finish button. The blocks that were selected should be replaced by a DisplayNumber block



Step 4: Changing the names of the configuration items

The Configuration Panel for the new DisplayNumber block is shown below:

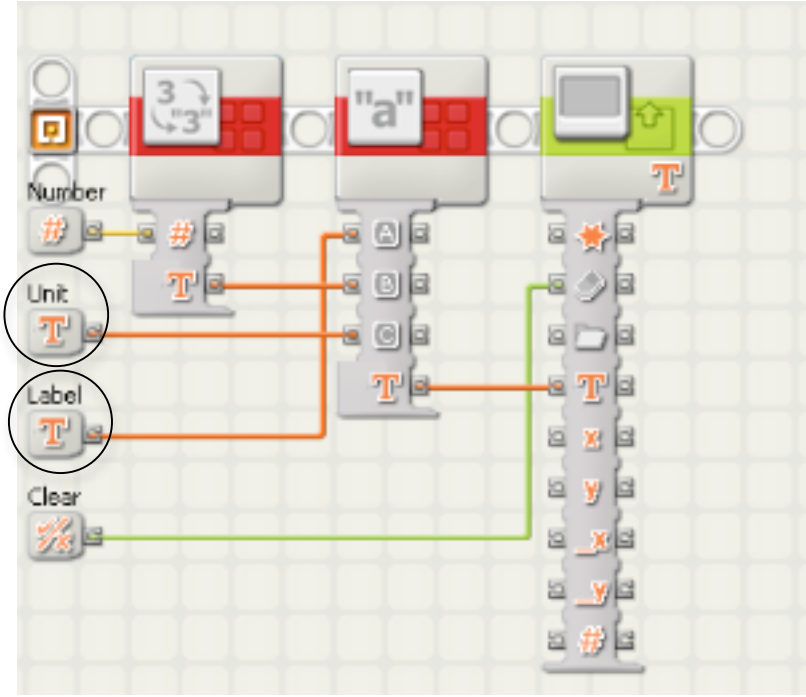


As you can see, the names for most of the configuration items are not very meaningful. For example, the block uses two texts: the label and the unit. The configuration Panel has boxes to enter two texts, but the

names A and C don't tell you which value each box is used for.

To fix this problem, open the block, and change the names to something more meaningful by following these steps:

1. Double-click the DisplayNumber block to open it.
2. Double-click the comment with the text **A**, and change it to **Label**.
3. Double-click the comment with the text **C**, and change it to **Unit.**

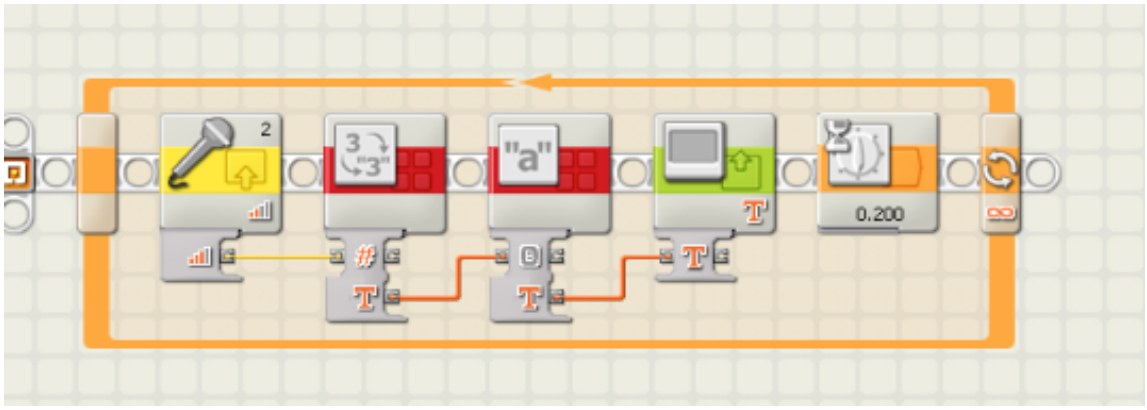


4. Save and close the DisplayNumber block.
5. To see the updated Configuration Panel, add the DisplayNumber block to a new program. The DisplayNumber block should appear on the Custom Palette. The new configuration will be as follow:

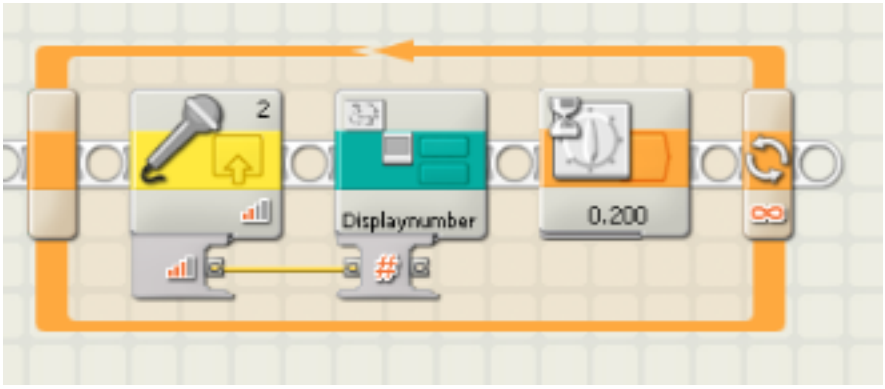
Step 5: Using the DisplayNumber block inside your program

let's put it to use. Follow these steps to use the DisplayNumber block in the sound meter program.

1. Write the sound meter program
2. Delete the Number to Text, Text, and Display blocks from the sound meter program



3. Add the DisplayNumber block from the custom palette after the sound sensor block.
4. In the DisplayNumber block's Configuration Panel, set the Label item to Sound: (with a space after the colon).
5. Check the Clear option.
6. Draw a data wire between the sound level data plug to the number data plug of the DisplayNumber block.



7. Download and run your program. What do you see on the NXT Screen? _____

5.4 Review Exercise

1. Create a "my block" that will convert the rotation of a motor into a distance. The configuration of the created block will be as follow
   - Block Name: R2D
   - The block will have one input (the rotation of the motor)
   - The block will display the distance on NXT Screen

   Hint: distance = circumference of the wheel X rotations

   Write your program here:

2. Mention the advantages of using a My Block inside your programs?

   _____

   _____

   _____

References:

- Terry Griffin (2010). *The Art of LEGO MINDSTORMS NXT –G Programming*. No starch press: USA