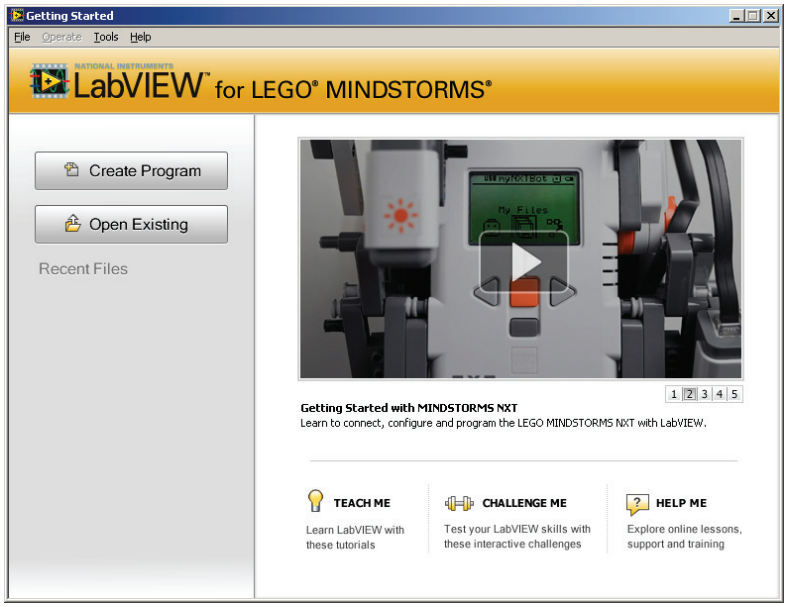
Line Follower Programming Guide (LabVIEW™ for LEGO® MINDSTORMS®): Part 1

Introduction:

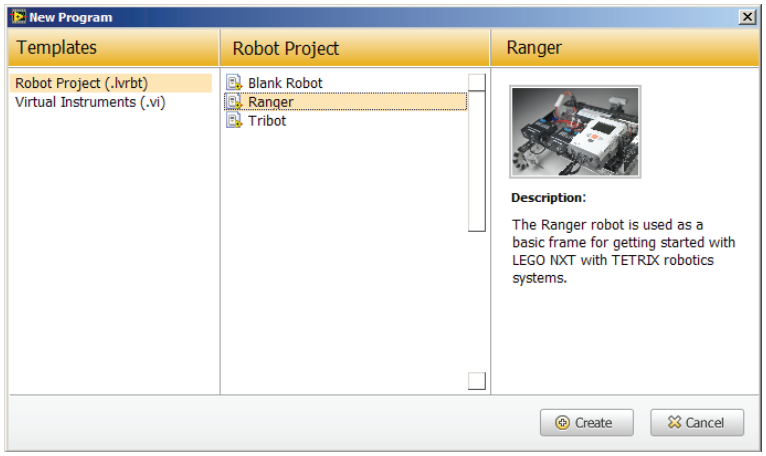
In this guide, the Ranger Bot will be programmed to move forward until it senses a line and then stop. This guide is for use with the LabVIEW™ for LEGO® MINDSTORMS® programming language.

Getting Started:

1. Launch LabVIEW for LEGO MINDSTORMS.

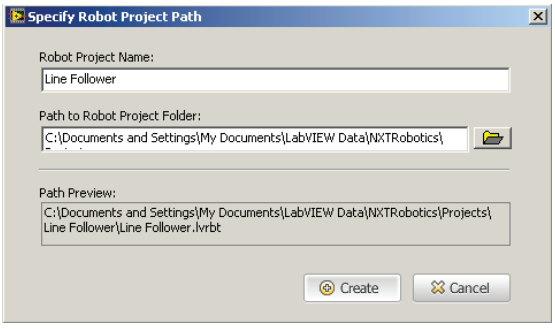


2. Press **Create Program** to open the New Program dialog window.



3. Select **Robot Project** from the **Templates** menu and **Ranger** from the **Robot Project** menu. Press **Create**.

4. Type "Line Follower" in the **Robot Project Name** field of the Specify Robot Project Path dialog window. Then press **Create**.



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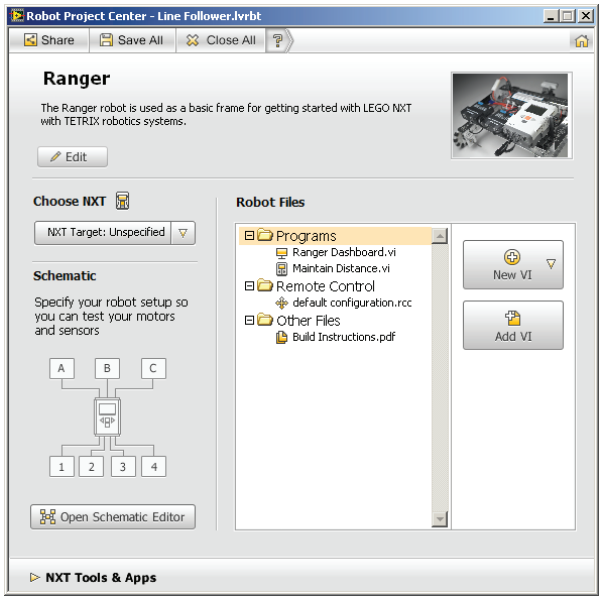
The Robot Project Center:

5. Once a Robot Project name and path have been created, the Robot Project Center will open.

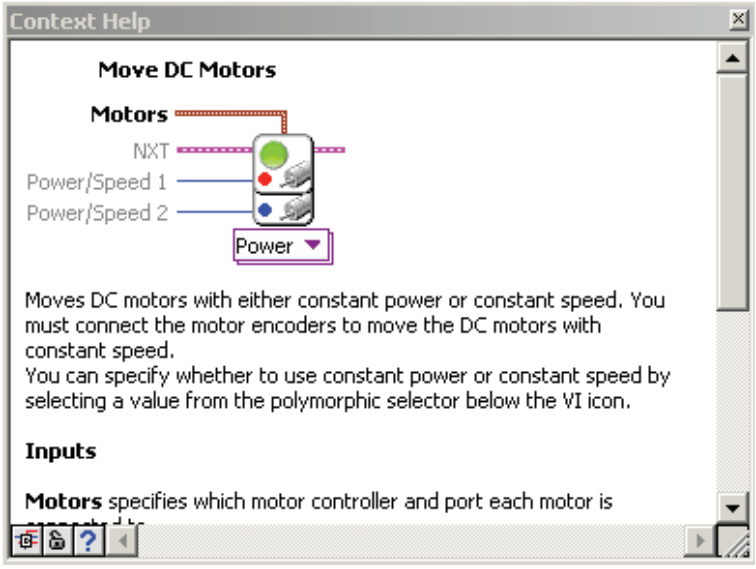


6. Click **New VI**.
   a. Select **VI for NXT target** from the selection window.
   b. In the **Specify VI Name** dialog window, type "line follower program," then press **Create**.
7. Press **Ctrl-E** on the keyboard to open and switch to the block diagram if it isn't already open. This is where the code is written.

   Note: By default, the block diagram is white and the front panel is gray.

Accessing Online Help:

8. Open the **Context Help** window by pressing **Ctrl-H** on the keyboard.
   a. The **Context Help** window will display a brief description of any function the mouse is hovering over.
   b. For more detailed help, click the **Detailed Help** link at the bottom of the **Context Help** window.



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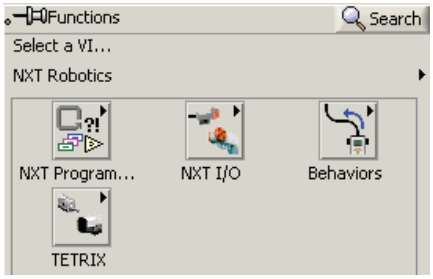
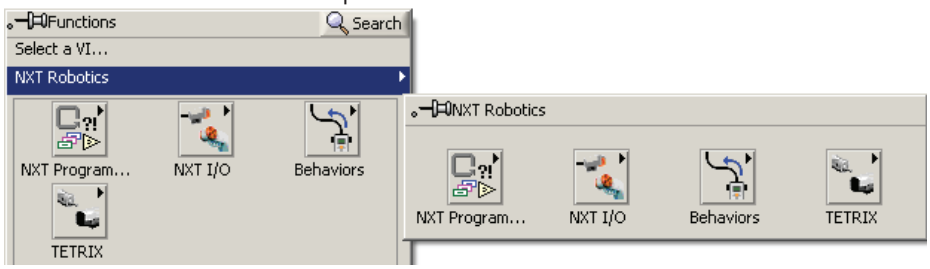
Programming the Robot to Move:

9. Begin the program by placing a **Move DC Motors** function on to the block diagram to control the motor. This function sets the power of one or more TETRIX® DC Motors.

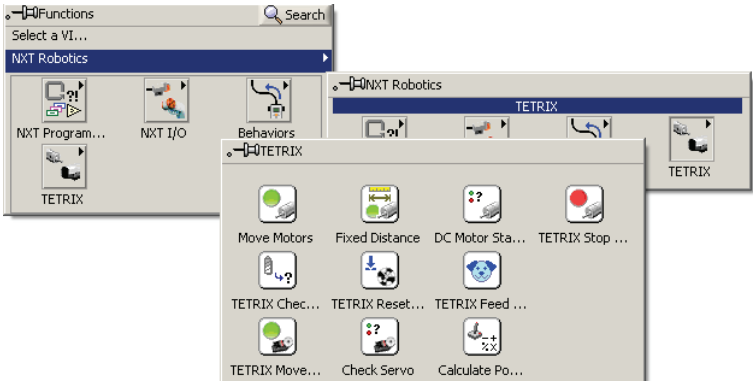
a. Right-click anywhere in the block diagram to pull up the **Functions** palette.



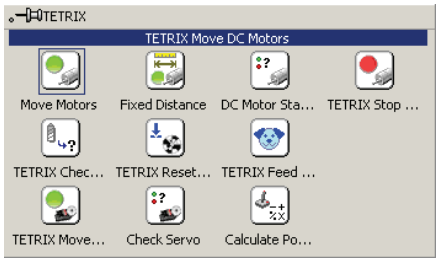
b. Select the **NXT Robotics** sub-palette.



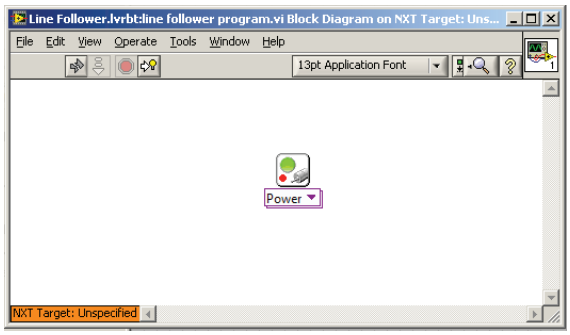
c. Select the **TETRIX** sub-palette.



d. Select the **Move Motors** function.



e. Click the **block diagram** to place the function.



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10. Create a constant for the motor ports to tell the function which motors to drive.

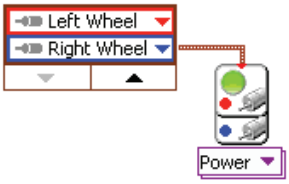
    a. Right-click the **Motors** terminal and select **Create Constant**. (Use the Context Help window to locate the Motors terminal.)

    b. Hover the mouse over the bottom edge of the new constant. Left-click and drag down, or click the downward triangle, to expand the constant.

    c. Click the **orange drop-down menu** and select **Left Wheel**.

    Note: These motor names are defined in the Schematic Editor. Because a Ranger Bot was selected in Step 3, the proper names exist in the Robot Project already.

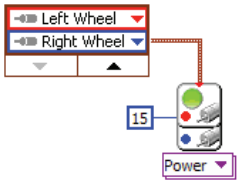
    d. Click the **blue drop-down menu** and select **Right Wheel**.



11. Create a constant to set the power of the motors. This will determine the motor speed.

    a. Right-click the **Power/Speed 1** terminal of the Motor function and click **Create>>Constant**.

    b. Click the **blue box** and enter a value of 15.



Tools Palette and Wiring:

12. Wire the constant to the Power/Speed 2 terminal of the Motor function.

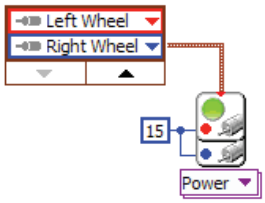
    a. Bring up the **Tools** palette by clicking **View** on the menu bar at the top of the block diagram and then select the **Tools**

    palette.

    b. Ensure that automatic tool selection is enabled by clicking the **LED** beside the wrench and screwdriver icon at the top of the **Tools** palette. The LED will be bright green when automatic tool selection is enabled. With automatic tool selection, the mouse pointer will change into different tools depending on the function the mouse is hovering over.

    c. Hover over the section of wire that runs from the constant of 15 to the Move Motor function.

    d. Position the mouse just below the wire until the wiring tool is selected. Left-click the **wire** and then drag the mouse to the **Power/Speed 2** terminal and release the mouse button when the terminal is blinking. There should now be a short section of wire joining the terminal to the constant.



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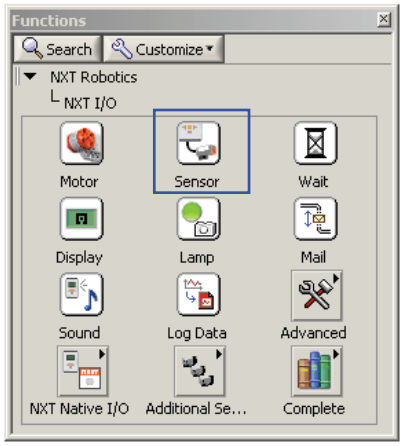
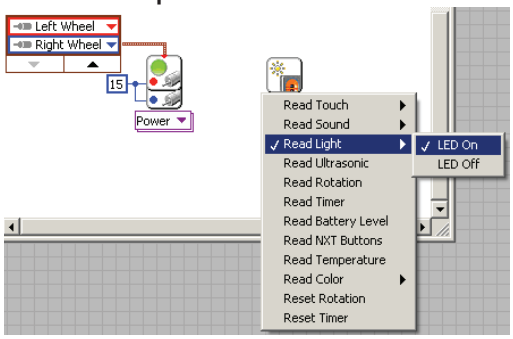
Reading Sensors:

13. Place a Sensor function to read when the Light Sensor detects the black line.

a. Under the NXT I/O palette, select the **Sensor** function and click the **block diagram** to place it to the right of the **Move Motors** function.



b. Click the **drop-down menu** at the bottom of the function and select **Read Light>>LED On**.



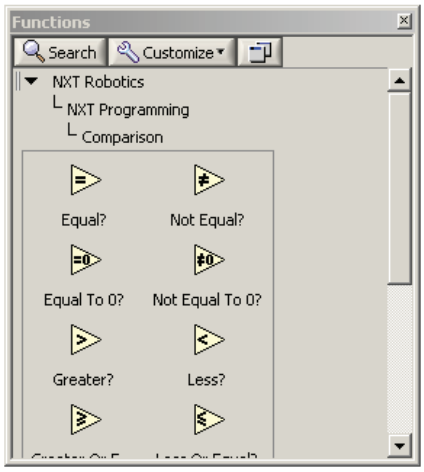
i. To select the drop-down menu, click the **Operate** tool on the **Tools** palette.

ii. Or, enable automatic tool selection and the Operate tool will be selected when the mouse hovers over the drop-down handle.

c. Right-click on the **Port terminal** and select **Create>>Constant**.

d. Click the **drop-down menu** on the constant and select **Port 3**.

e. Place a **Less?** function from the **NXT Programming>>Comparison** palette.



f. Wire the **Scaled Value** terminal from the **Sensor** function to the **X terminal** of the **Less?** function.

g. Right-click the **Y terminal** and select **Create>>Constant**.

h. Change the value of the constant to 50.

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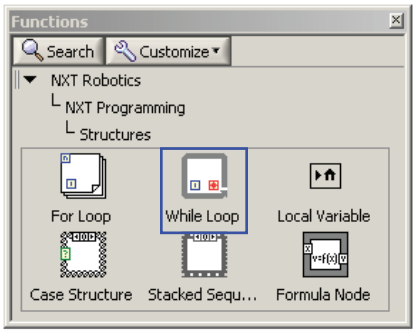
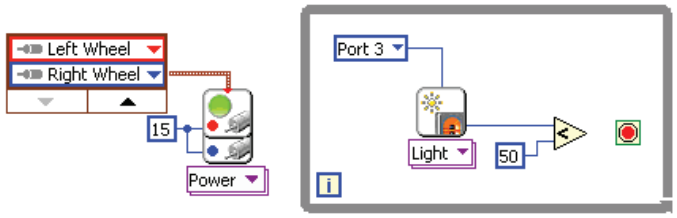
14. Create a While Loop around the Sensor function to continuously read the sensor.

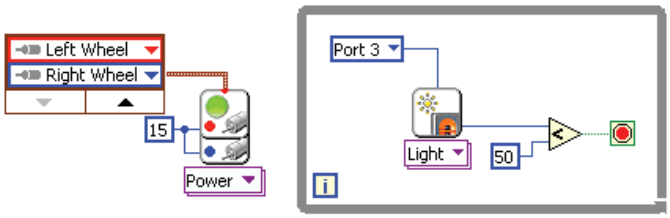
    a. Create a While Loop by navigating to the **NXT Programming** palette, then the **Structures** sub-palette, and selecting **While Loop**.



    b. Click somewhere on the block diagram above and to the left of the Sensor function and drag the **While Loop** down and to the right. This encloses the Sensor function and the **Less?** function.



    c. Wire the output of the **Less?** function to the Loop Condition terminal.

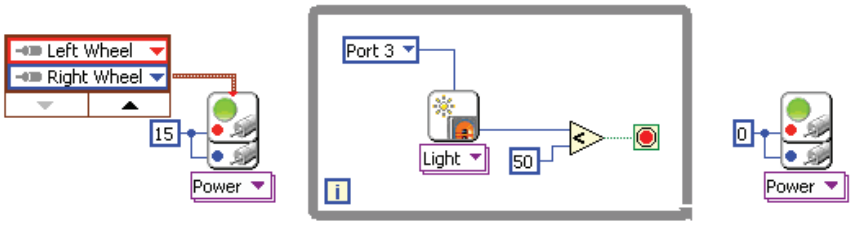


15. Tell the motors to stop after the loop has ended.

    a. Click and drag the mouse around the first **Move Motors** function to select the function and power/speed constants.

    b. Hold the **Ctrl** key on the keyboard while clicking and dragging the mouse to create a copy of this selection of code. Drop this to the right of the While Loop.

    c. Change the value of the constant to 0.



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Completing the Program:

16. Complete all the wiring.

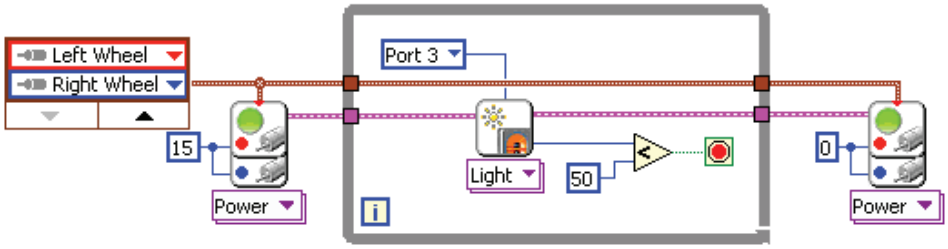
    a. Wire the output NXT terminal from the first motor function through the While Loop and into the input NXT terminal of the Read Light function. The motors will retain their motor values through the While Loop until they exit the loop and are changed.

    Note: The execution order of the code is determined when the NXT terminals are wired.

    b. Wire the output NXT terminal from the Read Light function through the While Loop and into the input of the NXT terminal of the final motor function.

    c. Wire the Motors port of the final motor function through the While Loop to the motors constant that was created in Step 5.

    Note: This wire does not have to go through the For Loop, but it can to keep the style and layout clean.



17. Save the VI and run this program to verify its functionality.