



Wait for It!

One of the most useful things your robots will be doing is waiting. Yep, you heard me right—waiting. Don't believe me? Okay, think about it this way:

- SPOT is moving toward a black line, *waiting* for the Light sensor to detect the line.
- SPOT is preparing to throw a ball at a target, *waiting* for the Touch sensor to be pressed and released.
- SPOT is rolling towards the wall, *waiting* for the Ultrasonic sensor to detect the wall.
- SPOT is sitting on the start line, *waiting* for the Sound sensor to hear me yell, “Go!”

Are you beginning to see that waiting is an important part of a robot's program? Your robots will probably *always* be waiting for something to happen. It may be as simple as waiting for you to press the Enter button on the Brick or something similar to the preceding examples. All this waiting is accomplished using the WAIT block, so keep reading to figure out how to program your bots to “wait for it!”

The WAIT Block

When discussing the WAIT block, you need to understand one important concept: The WAIT block will *stop waiting when specific conditions are met*.

It doesn't matter if you are using the Sound sensor, Touch sensor, Ultrasonic sensor, Light sensor, or a simple time limit. When you use a WAIT block, you must tell the WAIT block what conditions must be met before the waiting ends.

So, to show you how this works, let me give SPOT some more pseudo-code:

Me: SPOT, keep moving forward until something happens.

Vague, isn't it? What does “something happens” mean? Well, it can be anything:

- Until 5 seconds have passed
- Until the Sound sensor detects a loud noise
- Until the Ultrasonic sensor detects something 8 inches in front of it

Do you get the idea? I want SPOT to keep moving forward until a special condition is met. And with NXT-G, that condition can occur using a sensor, a timer, an NXT button, or a time

limit. I'm going to go over each of these individually, so you'll see how the conditions are configured. To demonstrate the different conditions, I'm going to have you first create an extremely simple program for SPOT (or your own bot).

Open the NXT-G software, and start a new program. Drop a MOVE block on the workspace, and configure it to spin motors B and C forward with an Unlimited Duration and a Power setting of 50 (see Figure 10-1).

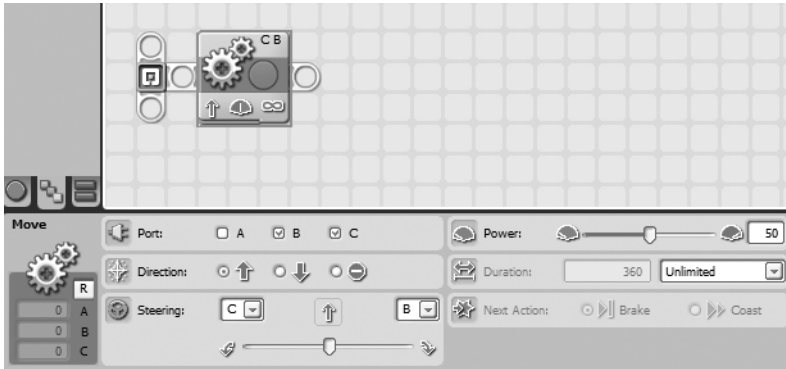


Figure 10-1. A new NXT-G program for SPOT

Now it's time to play around with different conditions that will end SPOT's forward movement. The WAIT block is our answer.

Note When I discuss the WAIT block, I'm going to put another word in front of it to tell you how I will configure it. For example, a TIME WAIT block will use time as the condition. If I want to use the Sound sensor to end the wait, I'll use a SOUND SENSOR WAIT block. OK?

The WAIT blocks are found on the Common Palette. When you move your mouse pointer over the WAIT block, a fly-out menu appears with five options (see Figure 10-2).



Figure 10-2. There are five WAIT blocks that can be selected.

Let me start with the easiest to configure—the TIME WAIT block. Figure 10-3 shows the TIME WAIT block added and its configuration panel.

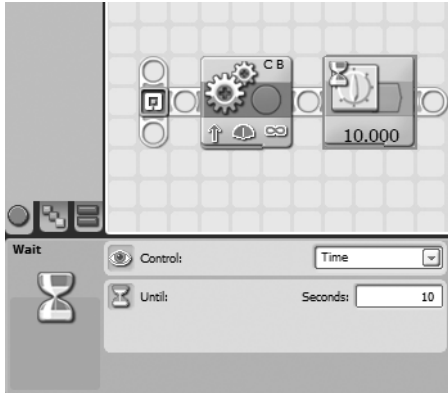


Figure 10-3. *The TIME WAIT block and configuration panel*

There are two items that can be configured on the TIME WAIT block. The first is a drop-down menu in the Control section. If you click this, you'll see that the WAIT block can be set to Sensor or Time. Don't change it yet, but be aware that by selecting Sensor you can change the TIME WAIT block to a SENSOR WAIT block. The Control section also gives you a couple of hidden WAIT blocks that I'll cover later in this chapter.

The other option in the TIME WAIT block that can be configured is the Until section. You'll notice that it expects you to enter a number in the text box for the number of seconds you wish for the WAIT block to . . . wait.

Figure 10-3 shows that I've configured the TIME WAIT block for 10 seconds. Go ahead and save the program, upload it to your bot, and then run it. What happens?

Did the motors run for 10 seconds and then stop? If not, check to make sure you configured the TIME WAIT block for 10 seconds; that's the most likely problem.

Well, that's it for the TIME WAIT sensor. Now let's take a look at the SENSOR WAIT blocks.

For the remaining WAIT blocks, I'm going to cover the configuration panels and the options available. I highly encourage you to practice these with the program you've just created: replace the TIME WAIT block with each of the WAIT blocks discussed in the following sections. Configure each WAIT block and play around with it; upload each to your bot, and see how it works.

To get started, let me give you a shortcut for changing the type of the WAIT block. Go back to your original program with the MOVE block and the TIME WAIT block (shown in Figure 10-3). Click the TIME WAIT block to access the configuration panel. Click the Control section's drop-down menu, and choose Sensor instead of Time. When you change to Sensor, you now have a new configuration panel section (called Sensor) with another drop-down menu. Click the drop-down menu, and take a look at your options (shown in Figure 10-4).



Figure 10-4. *The options available to you in the Sensor section drop-down menu*

The options provided include Light Sensor, NXT Buttons, Receive Message, Rotation Sensor, Sound Sensor, Timer, Touch Sensor, and Ultrasonic Sensor. The small triangle at the bottom indicates there are more sensors available, so click it to see them all. I'm going to cover each of these *except* for the Receive Message option; I'll cover the SEND MESSAGE and RECEIVE MESSAGE blocks in Chapter 25. So follow along as I show you each of these options and its corresponding configuration panel. Refer to Chapter 9 for details on the configuration panels for the sensors, NXT buttons, and timers.

The LIGHT SENSOR WAIT Block

Figure 10-5 shows the LIGHT SENSOR WAIT block and its configuration panel.

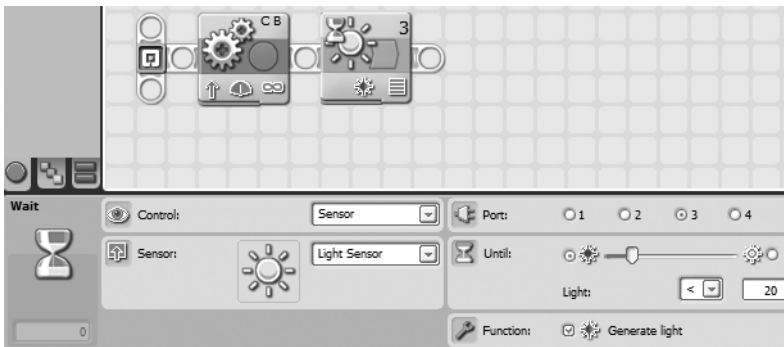


Figure 10-5. *The LIGHT SENSOR WAIT block and configuration panel*

In this example, the WAIT block has been configured to wait until the Light sensor detects a light level less than 20. When this occurs, the motors will stop spinning, and SPOT will stop moving forward.

The NXT BUTTONS WAIT Block

Figure 10-6 shows the NXT BUTTONS WAIT block and its configuration panel.

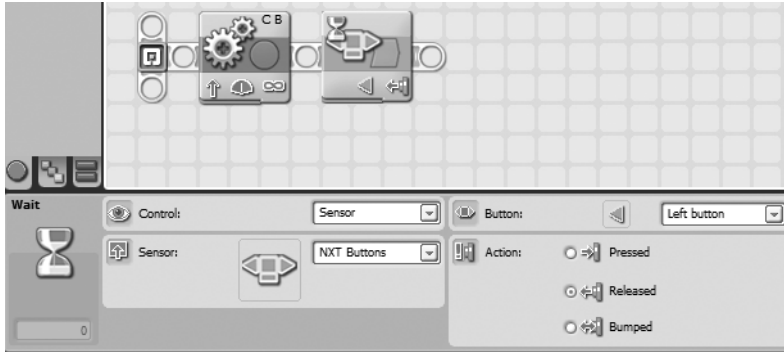


Figure 10-6. *The NXT BUTTONS WAIT block and configuration panel*

In this example, the WAIT block has been configured to wait until the Left button has been released. When this occurs, the motors will stop spinning, and SPOT will stop moving forward.

The ROTATION SENSOR WAIT Block

Figure 10-7 shows the ROTATION SENSOR WAIT block and its configuration panel.

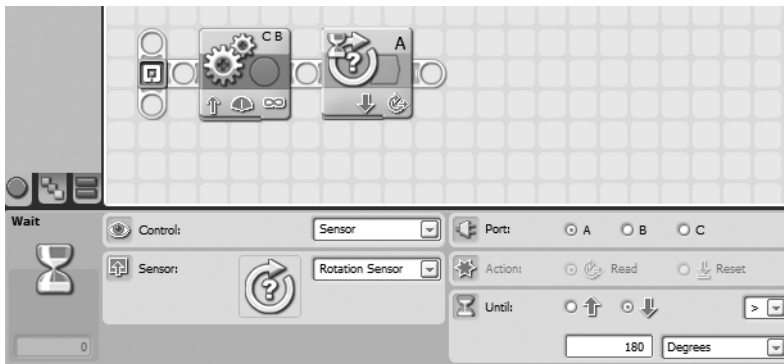


Figure 10-7. *The ROTATION SENSOR WAIT block and configuration panel*

In this example, the WAIT block has been configured to wait until motor A has spun in the Reverse direction for 180 degrees or more. When this occurs, motors B and C will stop spinning, and SPOT will stop moving forward.

The SOUND SENSOR WAIT Block

Figure 10-8 shows the SOUND SENSOR WAIT block and its configuration panel.

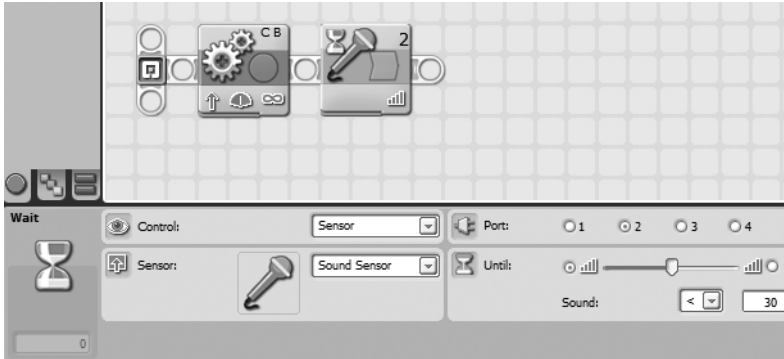


Figure 10-8. *The SOUND SENSOR WAIT block and configuration panel*

In this example, the WAIT block has been configured to wait until the Sound sensor detects a sound level below 30. When this occurs, motors B and C will stop spinning, and SPOT will stop moving forward.

The TIMER WAIT Block

Figure 10-9 shows the TIMER WAIT block and its configuration panel.

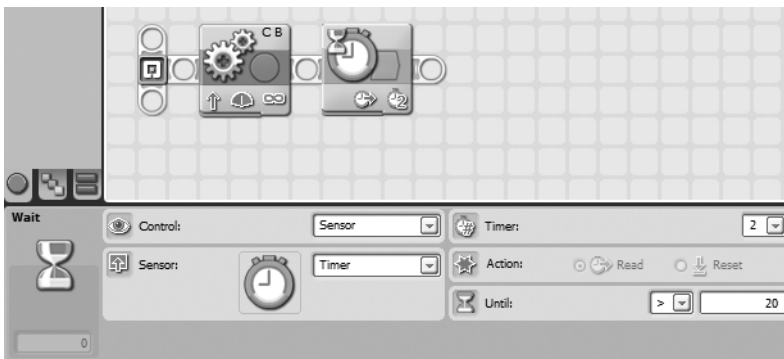


Figure 10-9. *The TIMER WAIT block and configuration panel*

In this example, the WAIT block has been configured to wait until Timer 2 exceeds 20 seconds. All timers start counting immediately when you run a program. So once you press the orange Enter button on the NXT Brick to run a program, this WAIT block will wait until the value read from Timer 2 equals 20 before the program continues. When this occurs, the motors will stop spinning, and SPOT will stop moving forward.

Later, you'll learn how to reset the timers, but for now, you just need to know that there are three timers—Timer 1, Timer 2, and Timer 3—and all start counting when a program starts.

The TOUCH SENSOR WAIT Block

Figure 10-10 shows the TOUCH SENSOR WAIT block and its configuration panel.

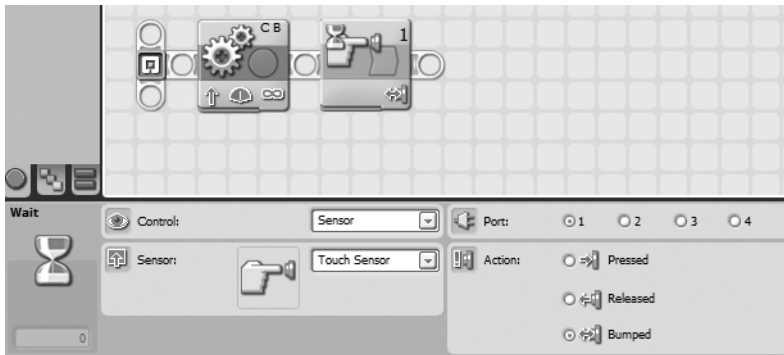


Figure 10-10. *The TOUCH SENSOR WAIT block and configuration panel*

In this example, the WAIT block has been configured to wait until the Touch sensor button has been Bumped (pressed and released quickly). When this occurs, motors B and C will stop spinning, and SPOT will stop moving forward.

The ULTRASONIC SENSOR WAIT Block

Figure 10-11 shows the ULTRASONIC SENSOR WAIT block and its configuration panel.

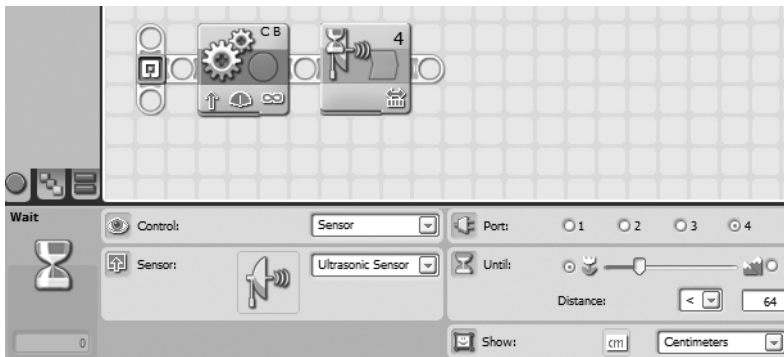


Figure 10-11. *The ULTRASONIC SENSOR WAIT block and configuration panel*

In this example, the WAIT block has been configured to wait until the Ultrasonic sensor detects an object (or obstacle) less than 25 centimeters in front of it. When this occurs, motors B and C will stop spinning, and SPOT will stop moving forward.

And that's it! Now you can configure your robots to wait for a variety of different conditions. You know how to use the sensors, the built-in timers, and the NXT buttons to trigger a WAIT block to stop waiting.

Now, let me ask you a question. You know how to make your robot wait and wait and wait—but do you know how to make your robot do something else over and over again? To do this, you'll use something called a LOOP block. I'll show you how it works in Chapter 11.