NXT Technology Overview
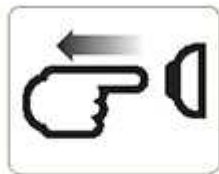Rollover a NXT element to learn more about it.

TOUCH SENSOR

The Touch Sensor gives your robot a sense of touch. The Touch Sensor detects when it is being pressed by something and when it is released again.

PRESSED   RELEASED   BUMPED

Suggestions for use
You can use the touch Sensor to make your robot pick up things: a robotic arm equipped with a Touch Sensor lets the robot know whether or not there is something in its arm to grab. Or you can use a Touch Sensor to make your robot act on a command. For example, by pressing the Touch Sensor you can make your robot walk, talk, close a door, or turn on your TV.

Try Me

The NXT comes with a Try Me function. Connect a Touch Sensor to port 1 of the NXT and select the Try Me submenu on the NXT to test your Touch Sensor. You'll get a fun reaction.

SOUND SENSOR

The Sound Sensor makes your robot hear!

The Sound Sensor can detect both decibels [dB] and adjusted decibel [dBA]. A decibel is a measurement of sound pressure.

dBA: in detecting adjusted decibels, the sensitivity of the sensor is adapted to the sensitivity of the human ear. In other words, these are the sounds that your ears are able to hear.

dB: in detecting standard [unadjusted] decibels, all sounds are measured with equal sensitivity. Thus, these sounds may include some that are too high or too low for the human ear to hear.

The Sound Sensor can measure sound pressure levels up to 90 dB – about the level of a lawnmower. Sound pressure levels are extremely complicated, so the Sound Sensor readings on the MINDSTORMS NXT are displayed in percent [%]. The lower the percent the quieter the soundFor example:

- 4-5% is like a silent living room
- 5-10% would be someone talking some distance away
- 10-30% is normal conversation close to the sensor or music played at a normal level
- 30-100% are people shouting or music being played at a high volume

Test it!

Test the Sound Sensor's ability to read sound volume:

Connect the Sound Sensor to the NXT.
1. Select the View submenu on the NXT's display. Select the Sound Sensor icon and the port where you have connected the sensor.
2. Make some sounds into the Sound Sensor and watch the readings displayed on the NXT. Use the sensor to read some sounds around you.
3. How loud do your parents speak? How loud is your front doorbell?

Try Me

The NXT comes with a Try Me function. Connect a Sound Sensor to port 2 of the NXT and select Try Me submenu on the NXT to test your Sound Sensor. You'll get a fun reaction.

LIGHT SENSOR

The Light Sensor is one of the two sensors that give your robot vision [The Ultrasonic Sensor is the other]. The Light Sensor enables your robot to distinguish between light and dark. It can read the light intensity in a room and measure the light intensity of colored surfaces.

This is what your eyes see

This is what your eyes see

This is what your robot will see, using the light sensor.

This is what your robot will see, using the light sensor.

Suggestions for use
You can use the Light Sensor to make a burglar alarm robot: when an intruder turns on the light in your room the robot can react to defend your property. You can also use the Light Sensor to make a line-following robot or a robot that can sort things by color.

Detecting ambient [surrounding] light
Test the Light Sensor's ability to read ambient light by measuring the light level in different locations of the room. For example, first hold the sensor against the window. Then hold it under the table. Watch how the readings differ.

Test it!
Test Light Sensor readings. Here's how:

1. **Connect** the Light Sensor to the NXT.
2. Select the **View** submenu on the NXT display. **Select** the **Light Sensor** icon and the port where you have connected the sensor, and press the orange **Run** button.
3. Hold the Light Sensor up to the different colors on the test pad that came with your kit and **see the different readings.**

Try Me

The NXT comes with a Try Me function. Connect a Light Sensor to port 3 of the NXT and select the Try Me submenu on the NXT to test your Light Sensor. You'll get a fun reaction.

ULTRASONIC SENSOR

The Ultrasonic Sensor is one of the two sensors that give your robot vision [The Light Sensor is the other]. The Ultrasonic Sensor enables your robot to see and detect objects. You can also use it to make your robot avoid obstacles, sense and measure distance, and detect movement.

The Ultrasonic Sensor measures distance in centimeters and in inches. It is able to measure distances from 0 to 255 centimeters with a precision of +/- 3 cm.

The Ultrasonic Sensor uses the same scientific principle as bats: it measures distance by calculating the time it takes for a sound wave to hit an object and return – just like an echo.

Large sized objects with hard surfaces return the best readings. Objects made of soft fabric or that are curved [like a ball] or are very thin or small can be difficult for the sensor to detect.

*Note that two or more Ultrasonic Sensors operating in the same room may interrupt each other's readings.

Test it!
Test the Ultrasonic Sensor's ability to measure distance:

1. **Connect** the Ultrasonic Sensor to the NXT
2. Select the **View** submenu on the NXT. **Select** the **Ultrasonic Sensor** icon and the port where you've connect the sensor.
3. **Measure** the distance to an object. For example, move your hand closer to the sensor and watch the readings change.

Try Me

The NXT comes with a Try Me function. Connect an Ultrasonic Sensor to port 4 of the NXT and select the Try Me submenu on the NXT to test your Ultrasonic Sensor. You'll get a fun reaction.

⚙ SERVO MOTORS

The three Servo Motors give your robot the ability to move. If you use the Move block in the LEGO MINDSTORMS NXT software to program your motors, the two motors will automatically synchronize, so that your robot will move in a straight line.

Built-in Rotation Sensor
Each motor has a built-in Rotation Sensor. This lets your control your robot's movements precisely. The Rotation Sensor measures motor rotations in degrees or full rotations [accuracy of +/- one degree]. One rotation is equal to 360 degrees, so if you set a motor to turn 180 degrees, its output shaft will make half a turn.
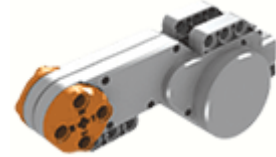
The built-in Rotation Sensor in each motor also lets you set different speeds for your motors [by setting different power parameters in the software]. Try running the motors at different speeds.

Test it!
Test the built-in Rotation Sensor's ability to measure distance:

1. Connect a motor to the NXT
2. Select the VIEW submenu on the NXT
3. Select the Motor Rotations icon.
4. Select the port where you have connected the motor
5. Attach a wheel to the motor and measure the rotations as you roll the wheel along the floor

Try Me

The NXT comes with a Try Me function. Select the Try Me submenu on the NXT display and test your motors. You'll get a fun reaction.