

# LEGO Mindstorms NXT

## Lesson 1

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# Objectives

- Discuss an overview and history of LEGO MINDSTORMS
- Discuss LEGO TECHNIC pieces
- Discuss NXT electronics

# MINDSTORMS Overview and History

- 1998: Robotics Invention System
- 2000: RIS 2.0
- Robotics set that incorporates TECHNIC with new electronic components



# MINDSTORMS Overview and History

- 2006: NXT – Newest and current version
- Children ages 10+
- Teaches Science and Technology



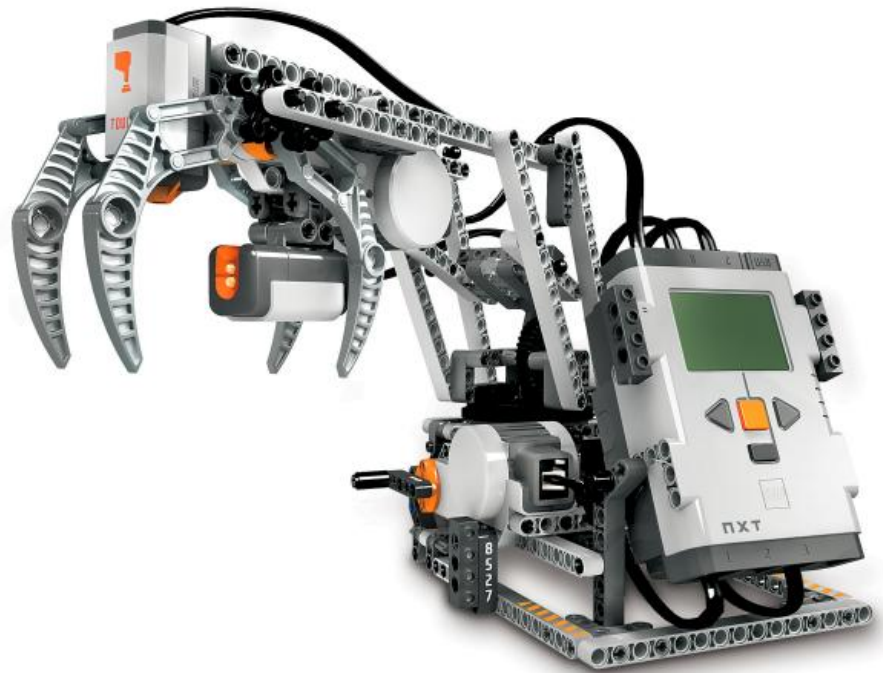
# MINDSTORMS Overview and History

- Educational version of NXT used in schools
  - Less pieces than retail
  - Rechargeable battery
  - Plastic storage case
- Education Resource Set
  - Supplemental set to Educational NXT set
  - Additional pieces



# TECHNIC Pieces

- More complicated than traditional LEGO blocks
- Beams, cross-axles, gears, connectors
- Highly flexible designs
- Online Tutorial:  
<http://technic.lego.com/technicdesignschool/>



# NXT Electronics



# NXT Electronics

- NXT Brick
  - Brain of any robot
  - 32 bit
  - 4 Input ports
  - 3 Output ports
  - Input buttons
  - LCD Display
  - USB & Bluetooth
  - 256 Kbytes storage
  - Uses 6 AA batteries or rechargeable battery



# NXT Electronics

- Input Sensors

- Enables robot to become aware of surroundings



Touch



Ultrasonic

- Four different sensors

- Touch
- Ultrasonic
- Sound
- Light



Sound



Light

# NXT Electronics

- Touch Sensor
  - Simulates feeling
  - Basic push button device
  - Three states
    - Pressed
    - Released
    - Bumped (Press + Release)
  - Common uses
    - Wall detection
    - User input
  - TECHNIC cross-axle hole built in



Touch Sensor

# NXT Electronics

- Ultrasonic Sensor
  - Simulates sight
  - More advanced input
  - Allows for object detection
  - Sends and receives ultrasonic sound waves
  - Measures in inches and centimeters



Ultrasonic Sensor

# NXT Electronics

- Sound Sensor
  - Simulates hearing
  - Simple microphone
  - Measures sound in
    - dB (decibels)
    - dBA (decibel adjusted)
  - Used to recognize sound patterns and tones



Sound Sensor

# NXT Electronics

- Light Sensor
  - Detects light intensities
  - Two modes of operation
    - Ambient light mode
      - Measures overall room or environment light
    - Reflected light mode
      - Activates LED and measures reflected light



Light Sensor

# NXT Electronics

- Interactive Servo Motor
  - Allows robots to be mobile
  - Rotation sensor
  - Flexible configurations
    - Two-way rotation
    - Speed/power
    - Time
    - Rotations
    - Degrees



Servo Motor

# Lessons 1 Overview

- Overview and History of MINDSTORMS
- TECHNIC pieces
- NXT Electronics
- Questions?