Burglar Alarm

[Image of LEGO NXT brick and model]
Burglar Alarm

Introduction
With LEGO® MINDSTORMS® Education students can build robots and use software to plan, test and modify sequences of instructions from a variety of real life robotic behaviours. They gather and analyse data from sensors using data logging functionalities such as graph view. Robotics is an exciting way to bring science, technology, engineering and mathematics to a classroom.

Description
In this activity focus is on programming. Building is limited to attaching the sensors to your P-brick. You will make a burglar alarm that reacts on sound, movement, touch and change of light conditions.

Objectives
• Work with different sensors.
• Sensibility and configuration of sensors.
• Understand how alarm systems can be constructed.
• Work with the “Wait for ..”-blocks and loops in the software.

Vocabulary
• Automation
• Output
• Monitoring
• Input
• Triggers

Curriculum links

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<th>Inquiry</th>
<th>Students:</th>
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<tbody>
<tr>
<td></td>
<td>use critical thinking, scientific reasoning, and problem solving to make informed decisions.</td>
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<td>recognize the need for repeated experimental trials.</td>
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<th>Communication</th>
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<td>communicate verbally ideas and discuss the benefits and weaknesses of proposed solutions.</td>
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<th>Technology</th>
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<td>program a working model.</td>
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<td>design, create, and modify to improve a model.</td>
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LEGO® Materials Required
• 9797 LEGO MINDSTORMS Education Base Set
Connect

Talk about different types of alarms like personal attack alarms, car alarms, smoke detectors, car thermometers with freeze alert etc.

Discuss different ways to secure a house or a car from intrusion.
What is a burglar alarm?
How does it work?
What activates an alarm?

Now try the following:
• Make and program a burglar alarm that reacts on sound, touch, movement and light.

Here are some other ways of connecting:
Search the internet for images with alarm systems – and talk about how they work.
Or, to add some humor and talk about systems that are more or less reliable as an alarm appliance, show this TV-commercial with the clever cat and dog who guard a house: http://www.youtube.com/watch?v=ClV7meQXQWI&feature=related

Hint
Burglar- (or intrusion-), fire- and safety-alarms are electronic alarms designed to alert the user to a specific danger. Sensors are connected to a control unit. The most common security sensors are used to indicate the opening of a door or window or detect motion via passive infrared.
Construct

In this activity focus is on the use of sensors and programming. Unlike many other MINDSTORMS activities, driving base building is not required here.

Attach the sensors to the NXT brick.
• Touch sensor to port 1
• Sound sensor to port 2
• Light sensor to port 3
• Ultra Sonic to port 4

Program the burglar alarm

Program a burglar alarm that goes off if:
• Noise of a certain level is detected
• Its touch sensor is released
• Movement within 50 cm/20 inches is detected
• The light conditions change strikingly

An example of how a sensor could be programmed

Hint

If you have already built a model, you can still use it. It is just essential that all sensors are connected, the display is uncovered and the NXT buttons are accessible.
Contemplate

Explain how your alarm works, and experiment with changing the sensibility of the sensors.

Think of situations and conditions where one sensor is more suitable than another. Discuss and argue when to use which sensor.

Use your alarm system – maybe just with a few sensors - to guard e.g. a computer, a mobile phone, a pencil case etc. While another group is trying to pinch your alarm protected item, you should see if you can get to their guarded item and avoid activating the sensors on the alarm.

Continue

Improve your burglar alarm, and change your program so that you can see in the control panel’s display which of the four sensors activates the alarm.

An example of one way to display which sensor is activated.

Also create a code, using the NXT buttons, to deactivate the alarm.

One way to create a deactivating code.

If the alarm and the control panel were placed in a house, it would be convenient if the alarm didn’t go off straight away. Can you change the program, so it gives you some time to deactivate the alarm by entering your code – and thereby escape from listening to the alarm noise?