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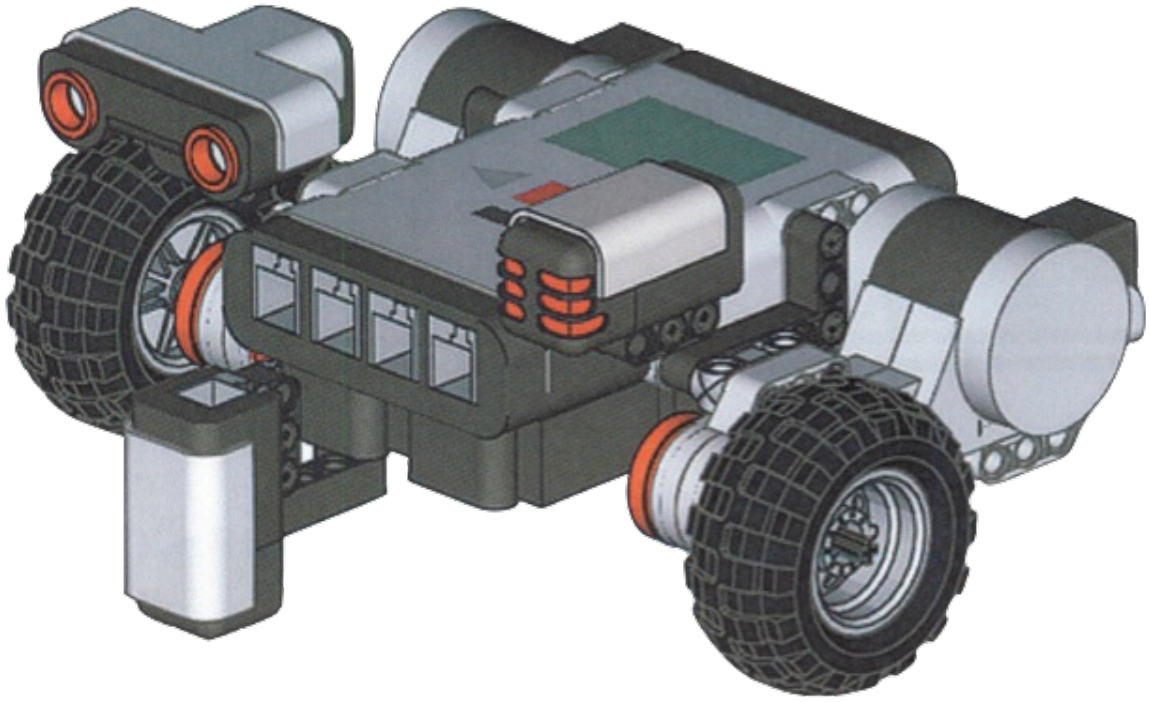
LEGO Mindstorms Workbook



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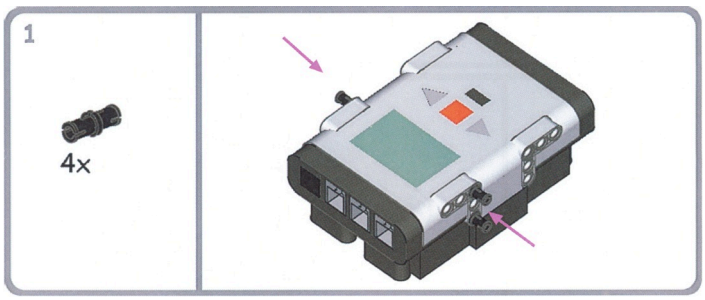
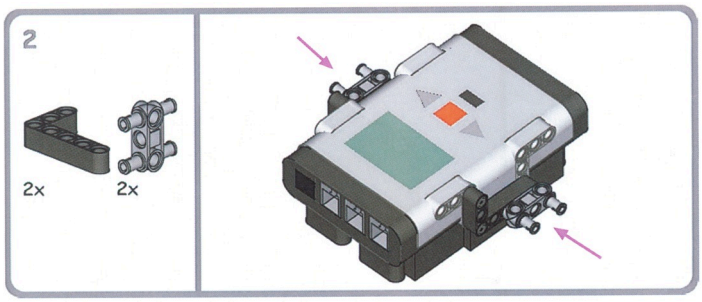
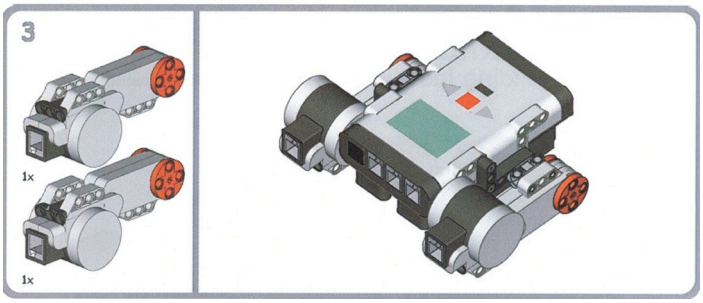
Building Instructions

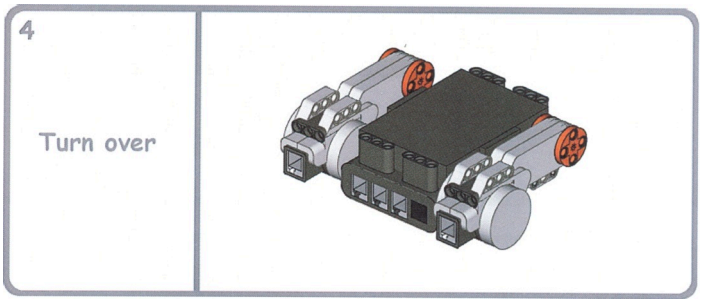
1) Building the base

We are going to begin by creating a simple robot which will allow us to add additional motors or sensors to complete certain tasks. The base design consists of two servo motors attached to wheels to allow movement and a rotating back wheel which is used to help the robot turn.



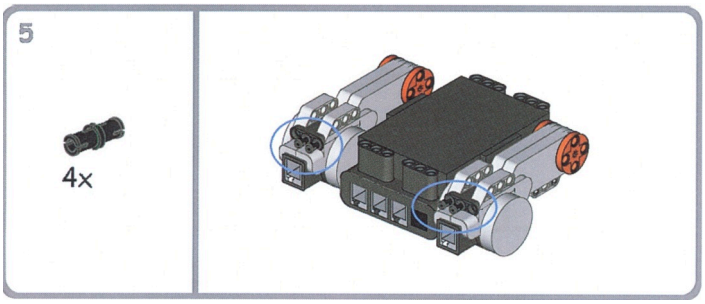


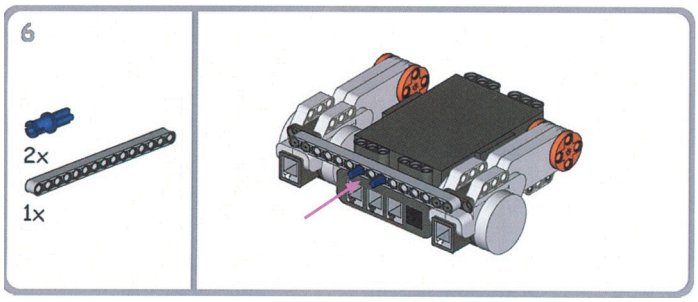




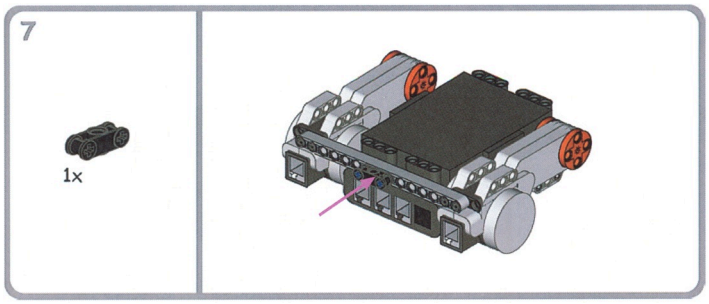
2) Adding the back wheel system

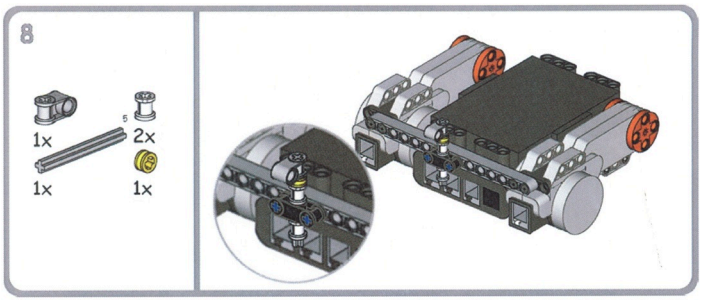
Once you have completed up to stage 4 you are ready to build the back wheel system of the robot. The back wheel allows the robot to turn freely by adjusting the speed on one of the two servo motors.

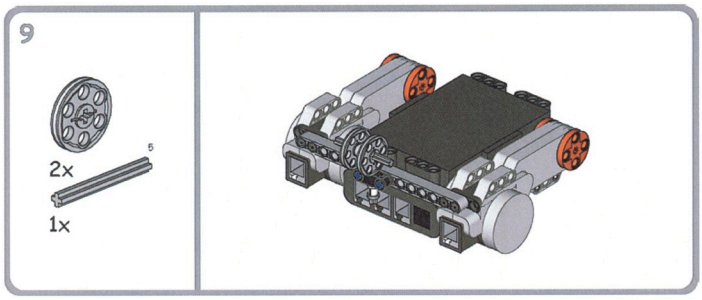


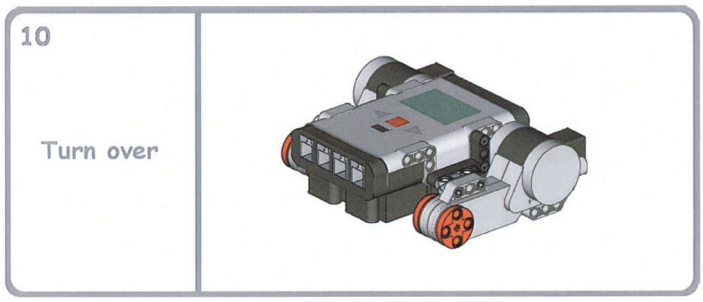


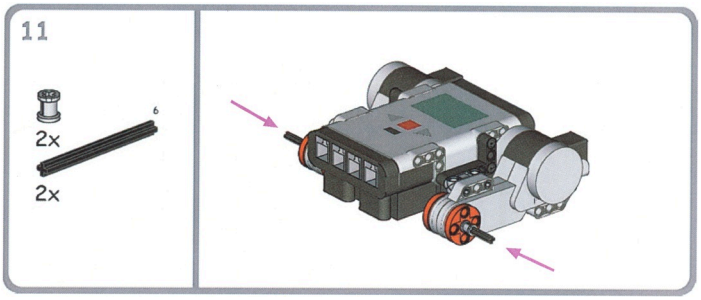
Building Instructions

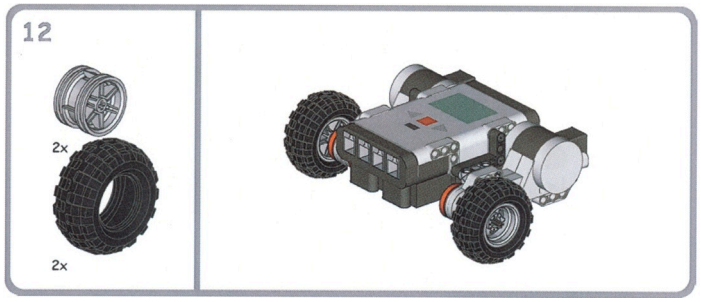






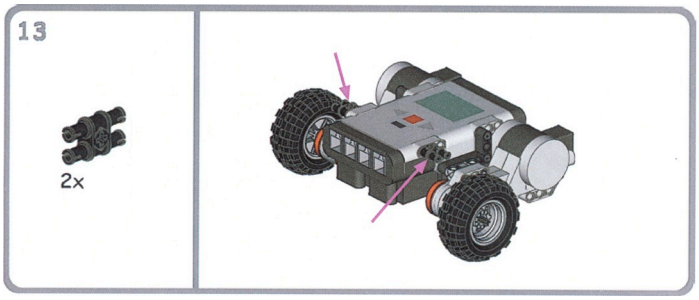


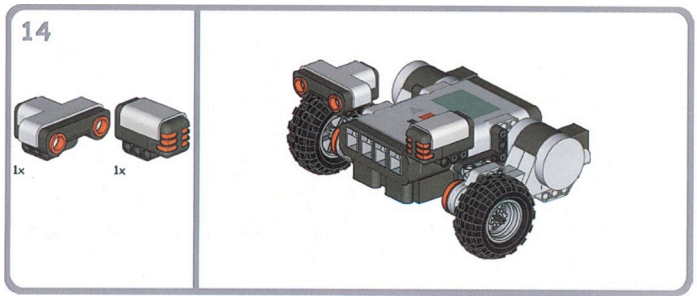




3) Adding the sensors

You have now completed the base design of the robot. There are several ways to add sensors to the robot, such as attaching them to the top of the robot or to the bottom. Below is a suggestion of how you can attach sensors to the top of the robot.



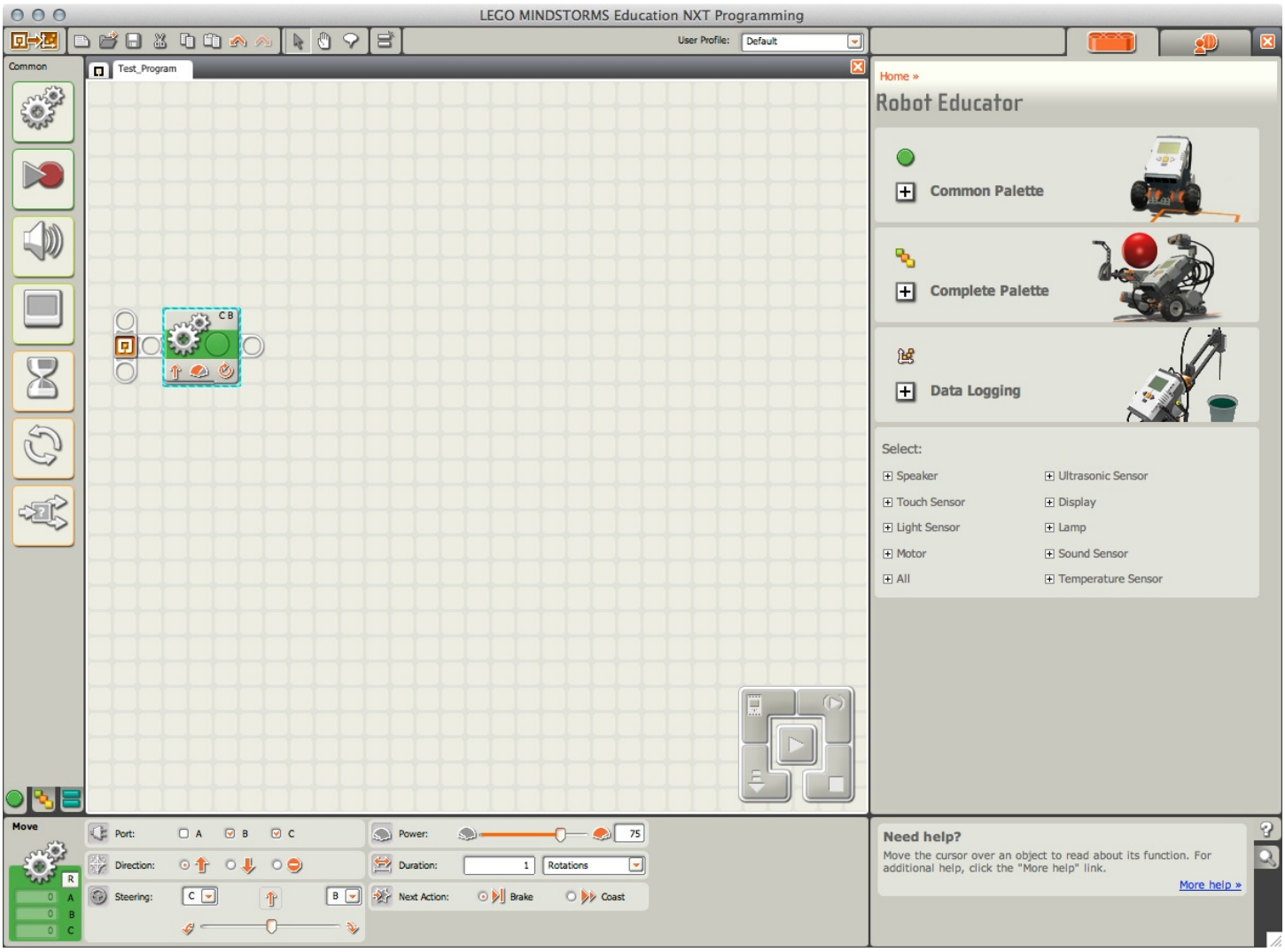


NXT Programming

4) Introduction to NXT programming

We are going to begin by creating a simple program which will move the robot forward. When you first open the Mindstorms NXT sofware you will see the following start page. To create a new program select a name under the "Start new Program" text and then click the "Go >>" button.

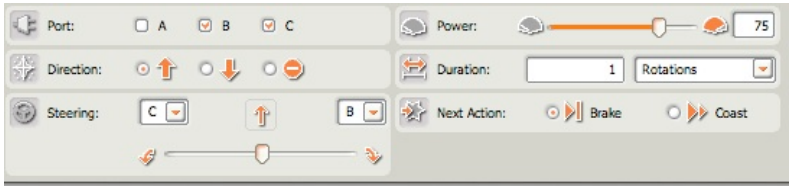
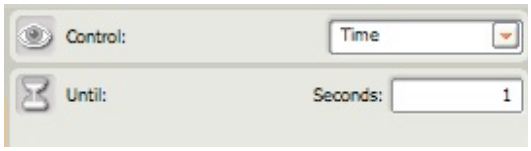
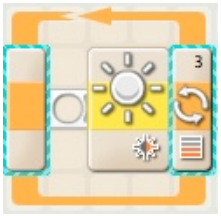
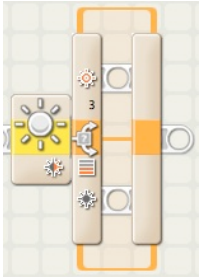
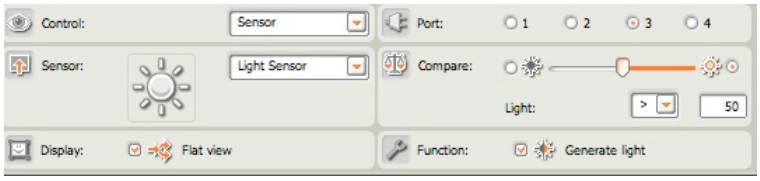
The NXT programming environment is a visual programming language where each function is represented by a block. You can add a new block to the program by dragging a block from the left hand tool bar onto the LEGO chain. The picture below shows a program with one move block, when the block is selected we can change the options in the bottom tool bar. To download the program to the NXT click the down arrow.

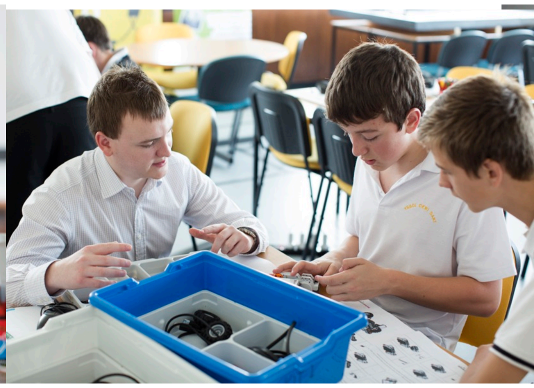


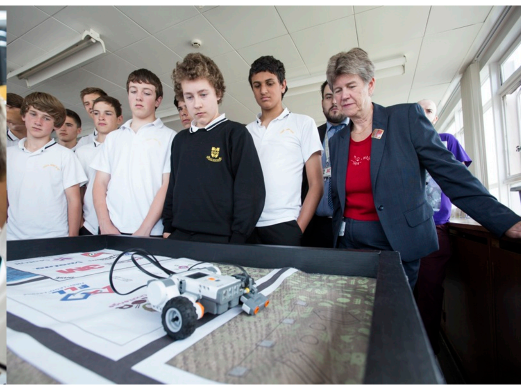
NXT Programming

5) Choosing blocks

There are several different blocks available to program your robot. Below is a table of some of these blocks with the different options available for each of them.

Block	Options
Movement Block 	 The options on the movement block allow you to: select which ports the motors are connected to, the direction you want the motors to travel, the steering direction, the power of the motors, the duration of the movement and whether the motors should brake or coast after moving.
Wait Block 	 The options on the wait block allow you to: select which type of control you want to use to decide how long to wait for (i.e. time or for a sensor value) .
Loop Block 	 The options on the loop block allow you to: select which type of control you want to use to decide when to break the loop and provides individual options for each of the different control types.
Switch Block 	 The options on the switch block allow you to: select which type of control you want to use to decide which path to take and provides individual options for each of the different control types.





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