TETRIX with LEGO® MINDSTORMS NXT

By Diego Gálvez

Through various articles in this magazine we have learned about different robotics sets like LEGO® MINDSTORMS NXT or LEGO WeDo.

But what happens when you want to design and build prototypes that need to be especially robust due to their intended application?

When you want to build prototypes that have functionalities that are related to a "harsh" working environment, the elements that come in the aforementioned sets may be of little use as they are mostly made of plastic. The prototype will need a more robust structure that makes it look more like a real life application.

For this kind of application there is TETRIX, which works together with LEGO MINDSTORMS NXT and expands its capacities and area of application, allowing for the design of more robust prototypes.

What is TETRIX?

We could define TETRIX as a Metallic Construction System that expands the possibilities of using LEGO MINDSTORMS NXT in more demanding environments as far as robustness and size are concerned.

TETRIX pieces are made of structural aluminium with a pattern of holes that allows them to be interconnected. It has metallic gears, motors, servo motors, omniwheels, controllers, etc.
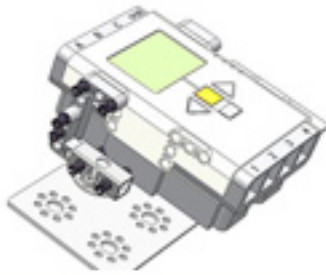

Building

Structural elements are jointed using screws and bolts, which allows for stronger and more robust builds.
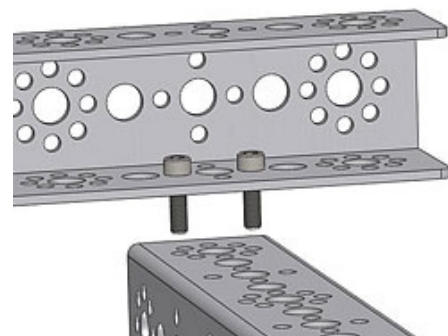
The following image shows how the NXT is attached to the metallic structure.

Electronic Elements

DC Motor
● 12 V / DC
● Torque: 21 Kg/cm

Servomotor
● 4.8 – 6V
● Torque: 7.5 Kg/cm

Battery
● 12 V
● 300 mAh

DC Controller
● Allows you to connect 2 DC motors.

Servomotor Controller
● Allows you to connect up to 5 servo motors.

Connection Cables
● These connect the electronic components.

Programming

TETRIX can't function by itself; to make the servo motors and DC motors in this set run you need to use the NXT programmable brick.

The motors included in the TETRIX set can be programmed using two different platforms.

NXT-G

The standard programming environment for LEGO® MINDSTORMS NXT allows for the inclusion of control blocks for DC and Servo motors from the TETRIX set.

Labview

The best option for programming TETRIX elements is the Labview programming software. When installing the LEGO MINDSTORMS NXT pack for Labview the programming blocks for TETRIX are also installed.
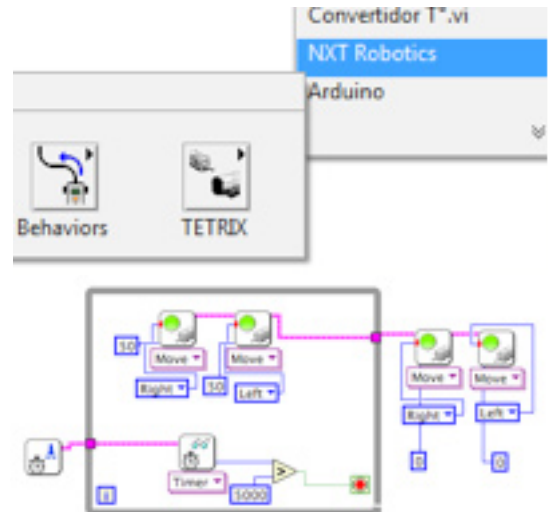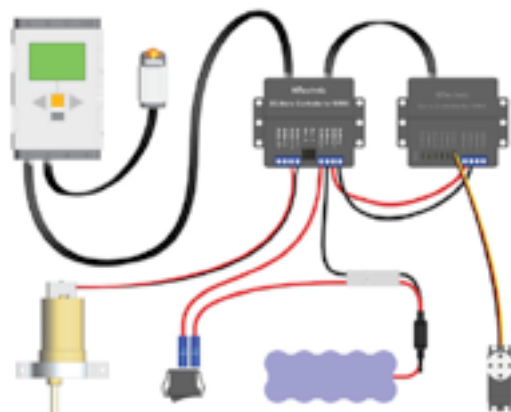

Another option is to use ROBOTC. Contrary to the two previously mentioned programming languages which are visual, this last option is a text based programming language.
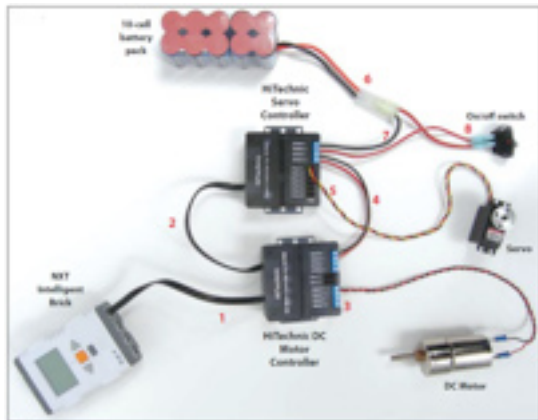
Connections
In order to be able to use the TETRIX motors (DC and Servo), these must be connected to the NXT brick, but not directly; this connection is established through the controller of each respective motor type.

Controllers can be connected to any of the sensor ports on the programmable NXT brick.
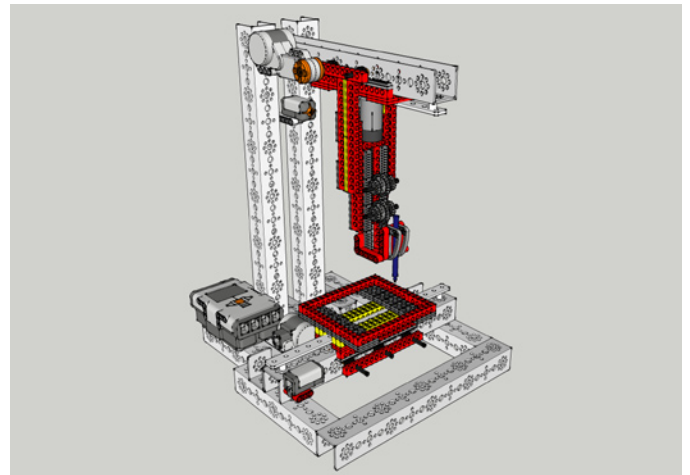
They also need to be connected to a 12V battery which the motors draw their power from.

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Applications

The following are a few applications of the TETRIX set in conjunction with LEGO® MINDSTORMS NXT.

Robotic Arm
The robotic arm you can see in the picture uses 2 servo motors and 3 DC motors. In addition it uses a Power Functions/WeDo motor to open/close the claw.

CNC Machine

Built using LEGO as well as TETRIX parts. In this case TETRIX has been used only for the structure as the movement is done with LEGO MINDSTORMS motors. You can watch a video of this machine at: http://www.youtube.com/watch?v=LPh_NTyJL9g
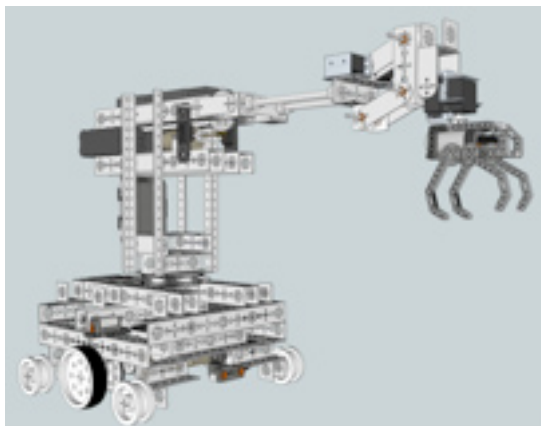

Humanoid Robot

Using the structural elements of the TETRIX set you can build much larger and more stable constructions like a life-size humanoid robot.
The program was created in Labview. 2 DC motors allow the robot to move, 3 servo motors control the movements of the joints of the arms and neck and finally a Power Functions/WeDo motor to turn the eyes.

On the website notjustbricks.blogspot.com you will find multimedia materials (images and videos) of the creations of the author, some of which come with building instructions.
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