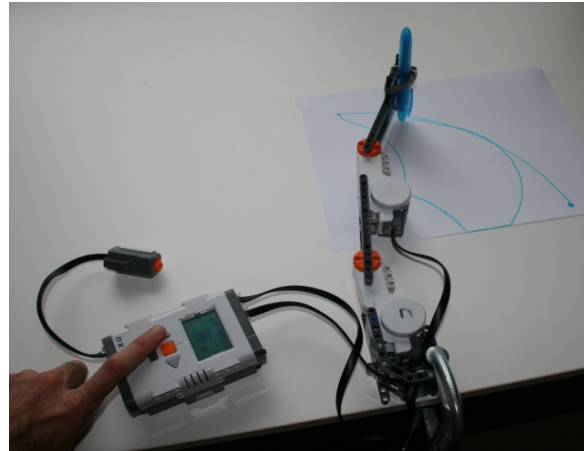


# NXT RR-Robot Controlled in Articular Space

Stefan Bracher

A Lego Mindstorms robot with two rotary joints is used to draw on paper. In this first version of the robot, the motor positions are manually controlled using the buttons on the NXT brick and an additional pushbutton to select the motor to be commanded.



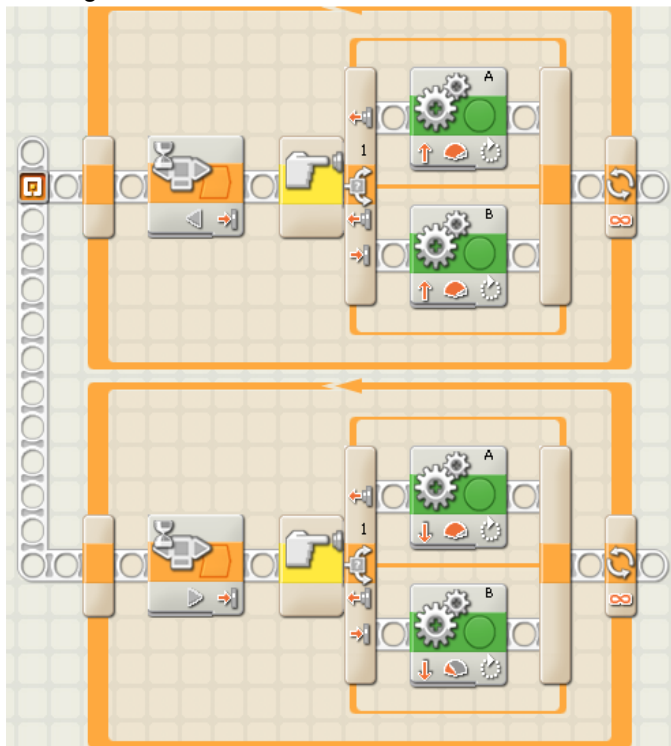
## Robot Description

The robot is built by connecting two Lego motors, forming a serial robot arm with an "RR" configuration. Each "R" stands for one of the rotational joints. At the end of the arm, a tool can be attached. In this example, a pen was used to trace the movement.

The motor angles are controlled manually, thus forming a robot controlled in articular space. A push button is used to determine which of the motors is to be moved. Then the left or right button of the NXT brick increments or decrements the motor angle by one degree.

## Articular Coordinates

Articular Coordinates can be used to determine the position of the tool-tip of a robot. Instead of using the x- and y- coordinates of the well known Cartesian Coordinate system, the angles  $\Theta_1$  and  $\Theta_2$  of the robot joints are used.



## G Code

The program consists of two endless loops running at the same time. The first loop waits until the left button is pressed. Depending if the push-button connected at port 1 is pushed down or not, the second motor (Motor B) or the first motor (Motor A) is turned one degree counter-clockwise. The second loop is identical, except that the right button is used to turn the motors one degree clockwise.

## Future work

The next step will be to determine the Jacobian Matrix of this robot in order to control the movement not in articular, but Cartesian coordinates.