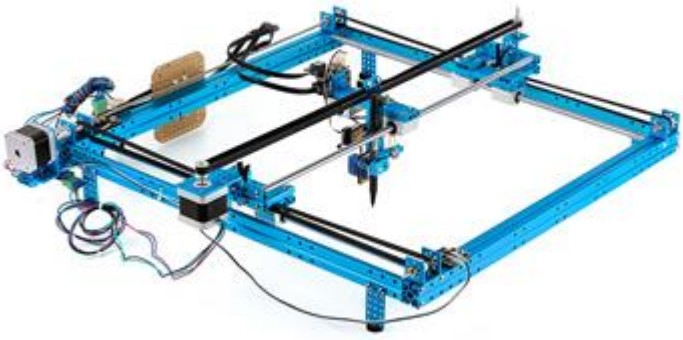
# Embedded systems project

The goal of the project is to write an LPC1549 based firmware to control Makeblock XY-plotter with laser engraver update.



The plotter ships with an Arduino compatible controller board which may be used as a reference when we evaluate the outcome of the project.

The plotter consists of frame, two stepper motors and their driver chips, a servo to control pencil movement and a PWM driven laser engraver.

The firmware receives and interprets G-codes and driver the mechanics accordingly. G-codes are fairly simple instructions that tell for example the plotter to move to a certain point or to draw an arc on the canvas. Some G codesread/write settings of the device.

Project requirements:

- Automatic printable area and limit switch detection
    - Software must be able to detect which limit switch is connected which axis automatically to prevent swapper connectors from causing problems
- Enforcement of limits (=always stop at switch, never hit an edge)
- Support for G-codes used by mDraw
- Implementation of laser mode is not mandatory. Properly implemented laser mode improves your grade

Grading is based on quality:

- Plotting quality
    - Smooth movement
    - Speed
    - Plotting accuracy
    - Consistent drawing speed if laser mode is implemented
- Software quality
    - Commented code
    - Proper formatting (indentation etc.)
    - Readability of code
- Project quality
    - Planning and implementation
    - Documentation
    - (details will be added here)

The plotter is controlled with mDraw. mDraw can be downloaded from Makeblock web site. Your LPCXpresso connects to the computer through a USB-serial port (target port). The other USB serial port that is provided by the debugger is to be used only for debugging.

The LPCXpresso add on board that will control the plotter has following connectors:

- 2 RJ-11 connectors for driving the stepper motors. Each connector is driven by two IO-pins: direction and step. The details of the driver chip can be found in that datasheet in the workspace.
- 3 RJ-11 connectors for reading limit switches and for controlling the pencil
- 1 screw terminal for controlling the laser engraver

The pencil is mounted to a servo that controls pencil's vertical position. The servo is controlled by PWM signal.

Laser engraver beam intensity is controlled by pulsing the input power of the laser module. The laser module can draw up to 500mA at 12V thus a transistor driver is provided to driver the laser. The transistor driver is also driven by PWM.