User Documentation
CNC Milling Simulator

Team:

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available on GitHub: https://github.com/SimonEndres/cnc_milling_simulator.git

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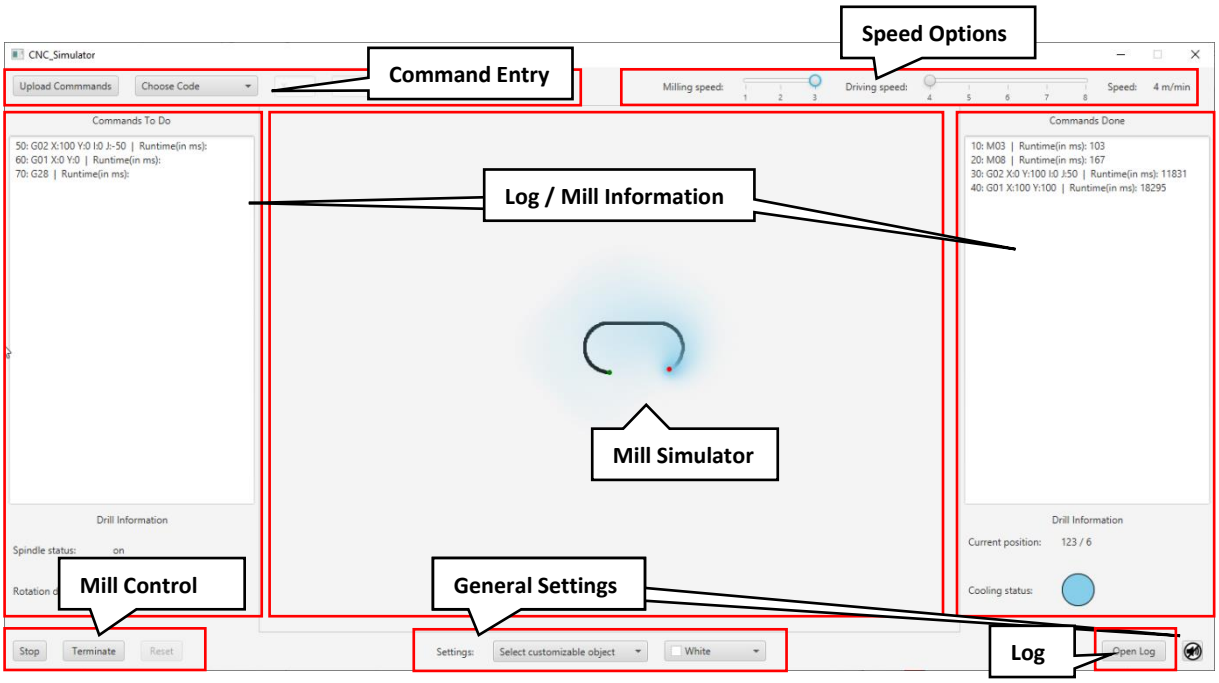
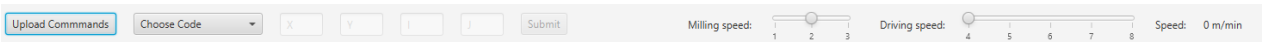
Introduction

This program is the result of a programming project in the lecture Programming II. The program CNC_Machine simulates a cnc milling machine by interpreting G-Codes/M-Codes and calculating the toolpath. The result is drawn onto the UI in a realistic manner. G-Codes/M-Codes can be inserted into the program using json or entered directly in the program.

This documentation should give an overview about the rich functionality of the program. The UI is structured in seven different parts as you can see on the graphic below:



Section Top

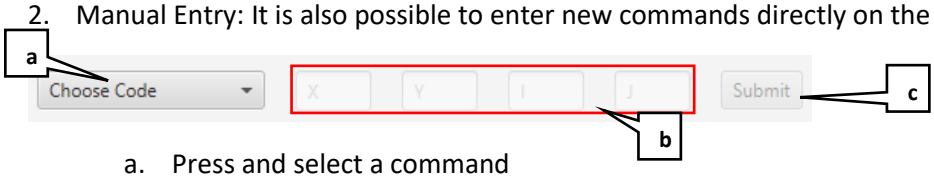


Command entry

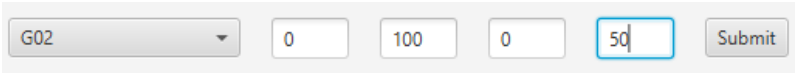
1. Upload Commands: Press the button and select a json-file containing commands you want to simulate with the cnc machine. The structure of the file should look like in this example:

Befehlscode.json

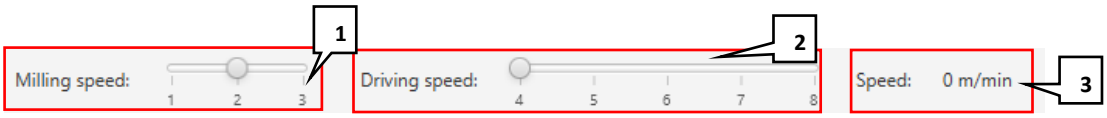
2. Manual Entry: It is also possible to enter new commands directly on the UI.



   a. Press and select a command
   b. Depending on the selected one, the input fields for the parameters are editable
   c. After all required fields are filled in, the submit button is enabled



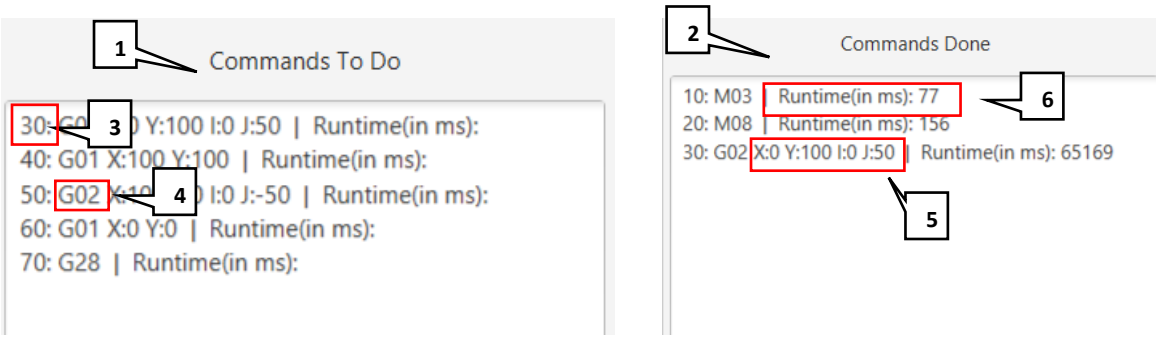
Speed



1. Milling speed: Defines the speed of the drill while milling. It can be changed at any time using the slider. If cooling is turned on via M-Command the milling speed is automatically adjusted (1 m/min higher). The user does not have to adjust by himself.
2. Driving speed: Defines the speed while not milling. Can be seen by a shadow behind the drill.
3. Speed: Shows the actual speed. When milling it shows the milling speed, when cooling is on speed is milling speed +1 and when not milling it shows the driving speed in meters per minute.

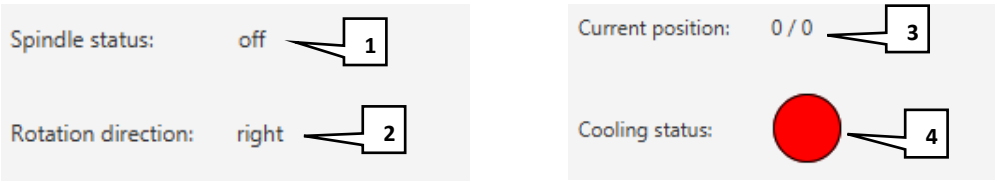
Section Left & Right

Command listing



1. List of commands waiting for execution
2. Commands which are already executed
3. Command Number
4. Command Type
5. Command Parameters
6. The running time in milliseconds at the end of the execution of the command

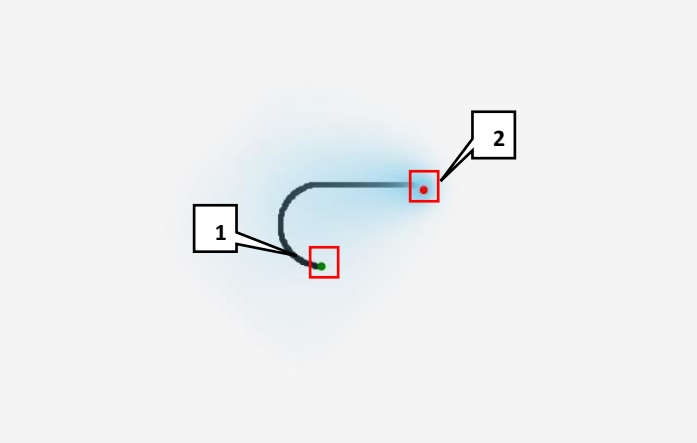
Drill information



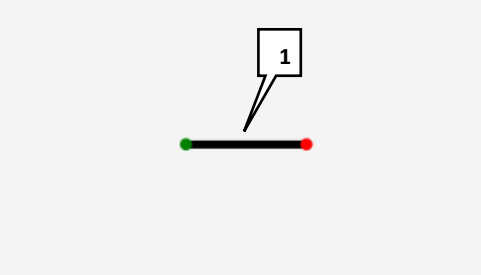
1. Spindle status: Provides information on whether the spindle is on or off (default: off)
2. Rotation direction: Stands for the direction of rotation of the spindle (default: right)
3. Current position: Shows the current position of the drill as coordinates (default: 0 / 0)
4. Cooling status: Indicates whether coolant is switched on (blue) or not (red) (default: off)

Section Middle

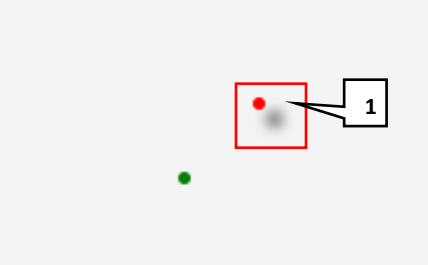
The middle section shows the simulation of the milling process:



1. Homepoint: default green
2. Drill: default red
3. Blue simulates water from cooling function

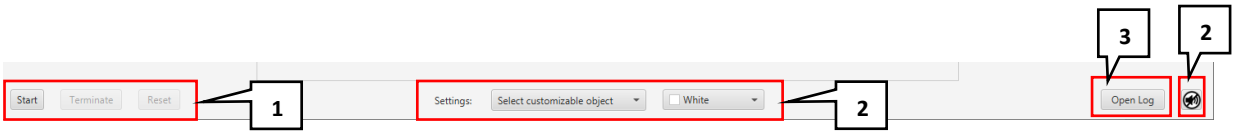


1. Basic example with cooling off



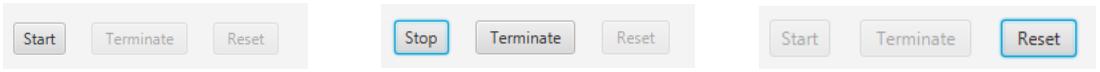
1. When drill is lifted of the surface a shadow appears

Section Bottom



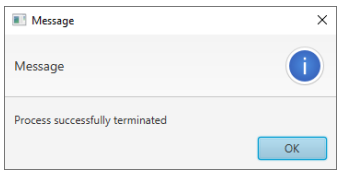
1) Buttons to control the simulation process of the mill.
2) Settings to adjust the simulator.
3) Button to open the log file.

1: Control buttons



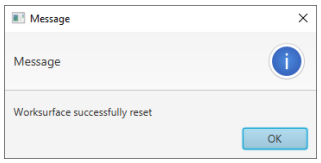
1. Start/Stop: Click “Start”/”Stop” to run/pause the simulation process on the worksurface. After starting the process, the button changes to stop. “Start”/”Stop” is enabled after the user inserted or uploaded commands.

2. Terminate: By clicking “Terminate” the current process gets interrupted and canceled. The commands to-do log gets cleared. “Terminate” is enabled after the user pressed the “Start” button. After terminating the user gets a success message, looking like this:



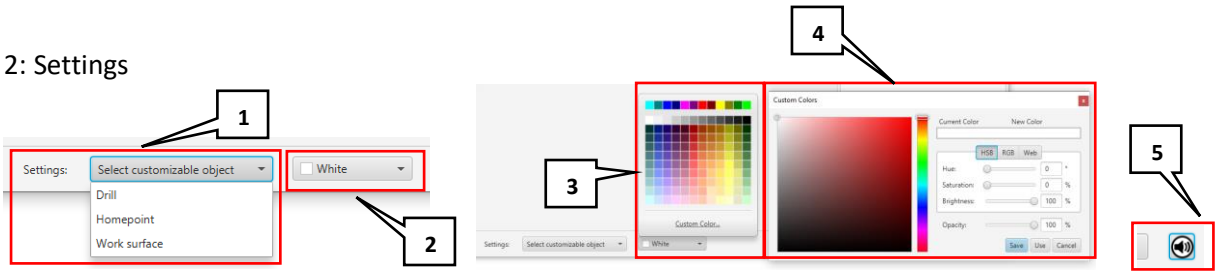
Press “OK” to go on.

3. Reset: To clear the worksurface and the log on right side, press “Reset”. “Reset” is enabled after the user pressed the “Terminate” button or when the process ended.
After terminating the user gets a success message, looking like this:



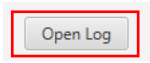
Press “OK” to go on.

2: Settings



1) Selection of customizable object: Please select which object on the UI you want to customize.
2) Changing color: Click the selection button to open the color picker.
3) Color picker: Now you can select a color by using the default colors. If you want to use custom colors.
4) Custom colors: Click custom color to use the rich functionality of the color picker.
5) Sound on/off: Click the Icon to turn on/off sound. Sound is only playing when a milling process is running.

3: Log



Press the “Open Log” button in the lower right corner the open the cnc_simulator_log.json file in the default text editor of your operating system.