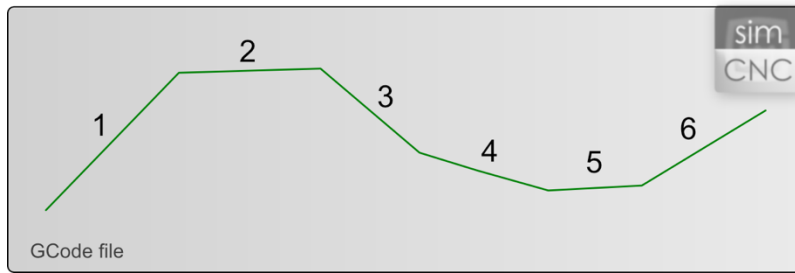




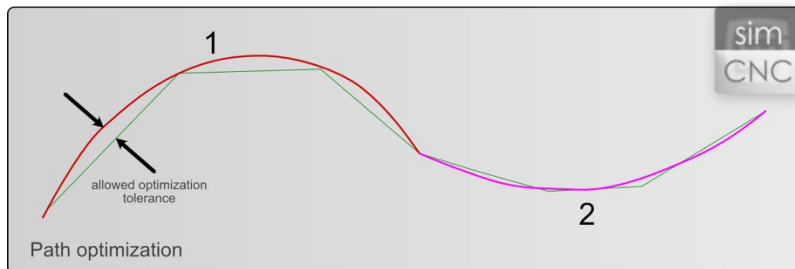
Trajectory optimization and segments joining
in constant velocity mode (CV)

1. Input data, segments from a G-Code file:

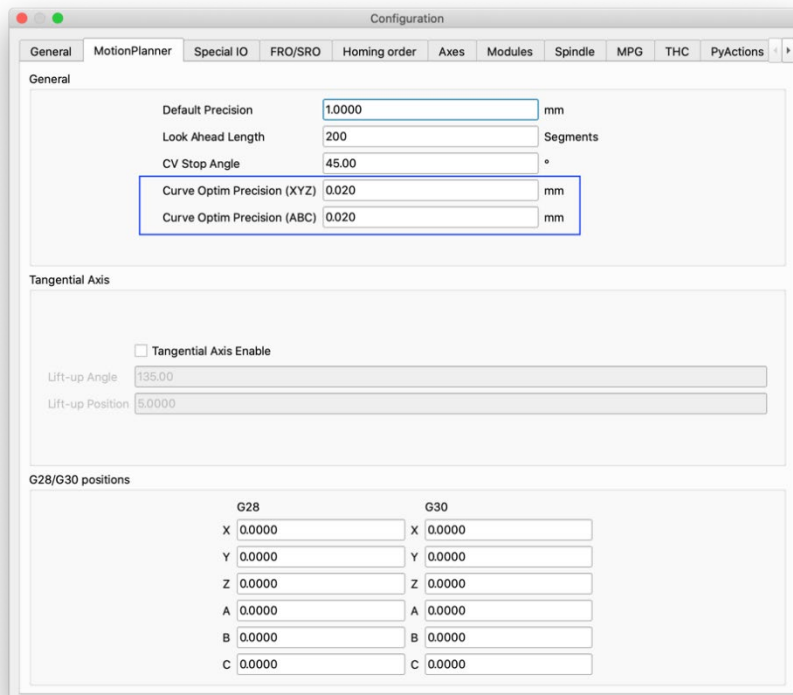


In the example above, we see 6 segments of linear-type motion (G1).

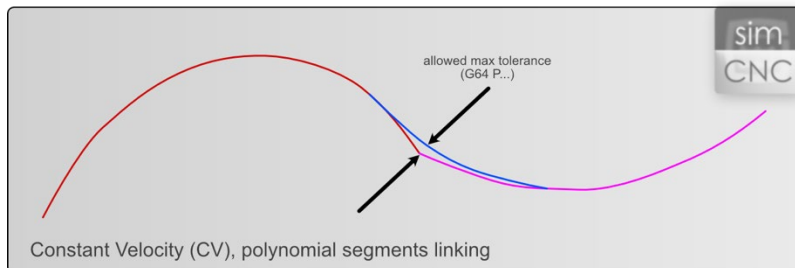
2. Initial trajectory optimization and preparation for CV mode, i.e. optimization of curves:



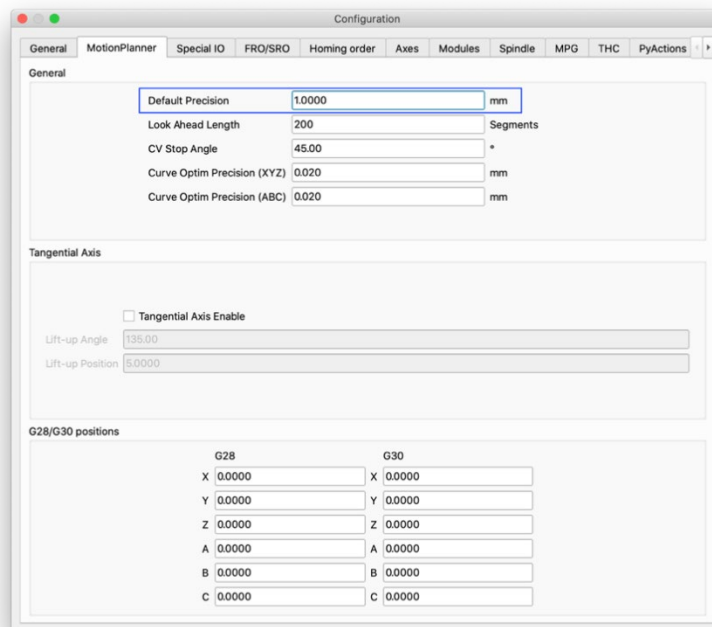
At the optimization stage, the 6 input segments were replaced with two arcs. The "smoothness" of the trajectory has been improved, including the maximum allowable deviation from the input data. The algorithm can create arcs in 3D space. The tolerance can be set separately for X, Y, Z and A, B, C axes.



- At the connection point of the two segments that resulted from the optimization, there was a sharp point that would force the deceleration to the speed of $V = 0$ at this point to change the direction of movement. Constant velocity mode calculates vector curves joining the segments during machining to allow smooth movement without stopping.

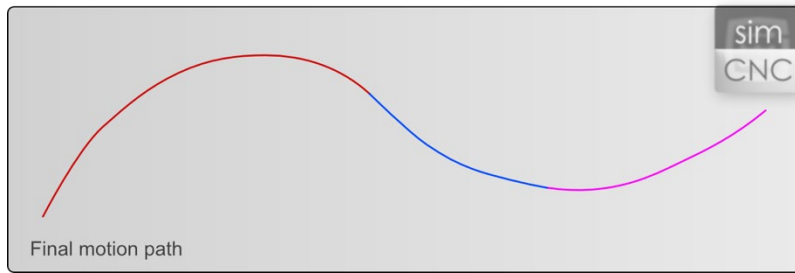


In the picture above, you can see the blue segment that connects the other two. The maximum deviation allowed when joining segments is set by the G64 P... command. For example, G64 P0.5 will allow a maximum deviation from the vertex of 0.5mm (or inch, depending on the units selected). If the machining speed and settings of drives allow it, the joining segment will be created with greater accuracy than the given maximum deviation. You can also set the default tolerance value in the simCNC settings. It will be set after starting the simCNC software. However, you should remember that if we load a file that sets a different parameter value, and then a file that does not contain the G64 command, it will be executed with the last set tolerance. Therefore, it is best if each file contains the G64 command and sets the desired tolerance.



It is also worth paying attention to the "CV Stop Angle" parameter, which allows you to specify the angle below which the CV mode will not generate joining segments. As a result, there is an exact approach and processing of the vertex. The angle specified in the parameter is an oblique angle, i.e. less than 180 degrees.

4. The resulting trajectory



The picture above shows the resulting motion trajectory. Curve optimization reduced the number of segments and smoothed the shape, while CV mode added a smooth transition between the segments to allow for quick and smooth movement.