G-Code Implementation

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Contents

1 G00 - Rapid Positioning

Rapid positioning mode does not care which axis movement completes first, it just let's the stepper motors run at max speed till they reach their destination.

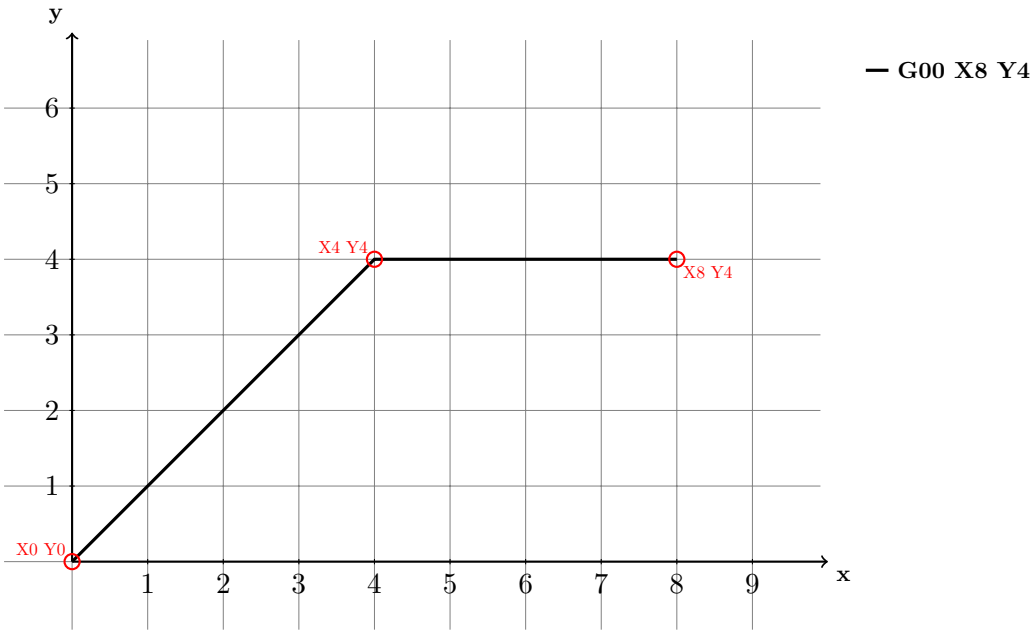

Figure 1: Rapid positioning in detail (G00).

2 G01 - Linear Interpolation

Linear interpolation is required to make coordinated movements across axis. Therefore we have to synchronize axis movement in order to have all involved axes reach destination at the same time point. X and Y represent step counts of two independent axis movements. The zig-zag-pattern tries to approximate the ideal movement.

2.1 Function

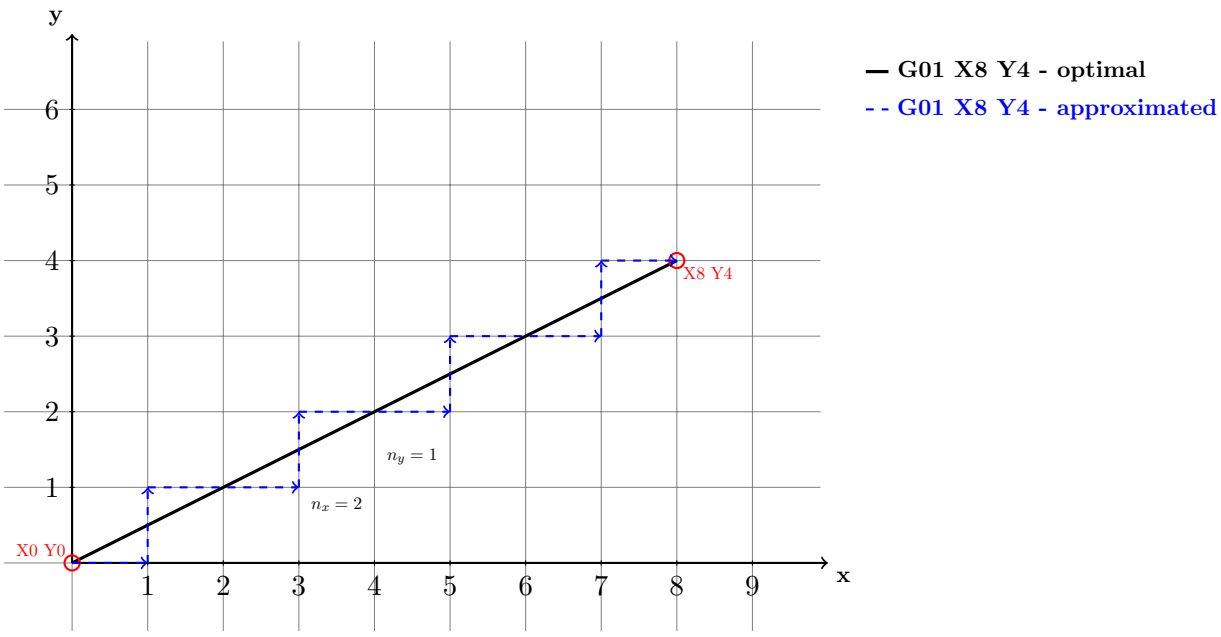

Figure 2: Linear interpolation in detail (G01).

2.2 Algorithm

Algorithm 1 Calculate interpolation

1: $x_c \leftarrow 0$
2: $y_c \leftarrow 0$
3: **if** $x >$y **then**
4: $x_s \leftarrow x/y$
5: $y_s \leftarrow 1$
6: $i \leftarrow 0$
7: **while** $i < y$ **do**
8: $x_c \leftarrow round(x_c + x_s)$
9: $y_c \leftarrow y_c + y_s$
10: $i \leftarrow i + 1$
11: **end while**
12: **else**
13: $x_s \leftarrow 1$
14: $y_s \leftarrow y/x$
15: $i \leftarrow 0$
16: **while** $i < x$ **do**
17: $x_c \leftarrow x_c + x_s$
18: $y_c \leftarrow round(y_c + y_s)$
19: $i \leftarrow i + 1$
20: **end while**
21: **end if**

3 G02 - Circular Interpolation (clockwise)

Circular interpolation is required to draw round corners and cut circle with bigger radius out of the material. To do so, we have to use the midpoint circle algorithm and follow the path with steps. However this movement is much more complicated as we have also given axis cutoff values, which influence the starting angle of our movement.

3.1 The Parameter I

The parameter I regulates the X-axis cutoff for the circular movement.

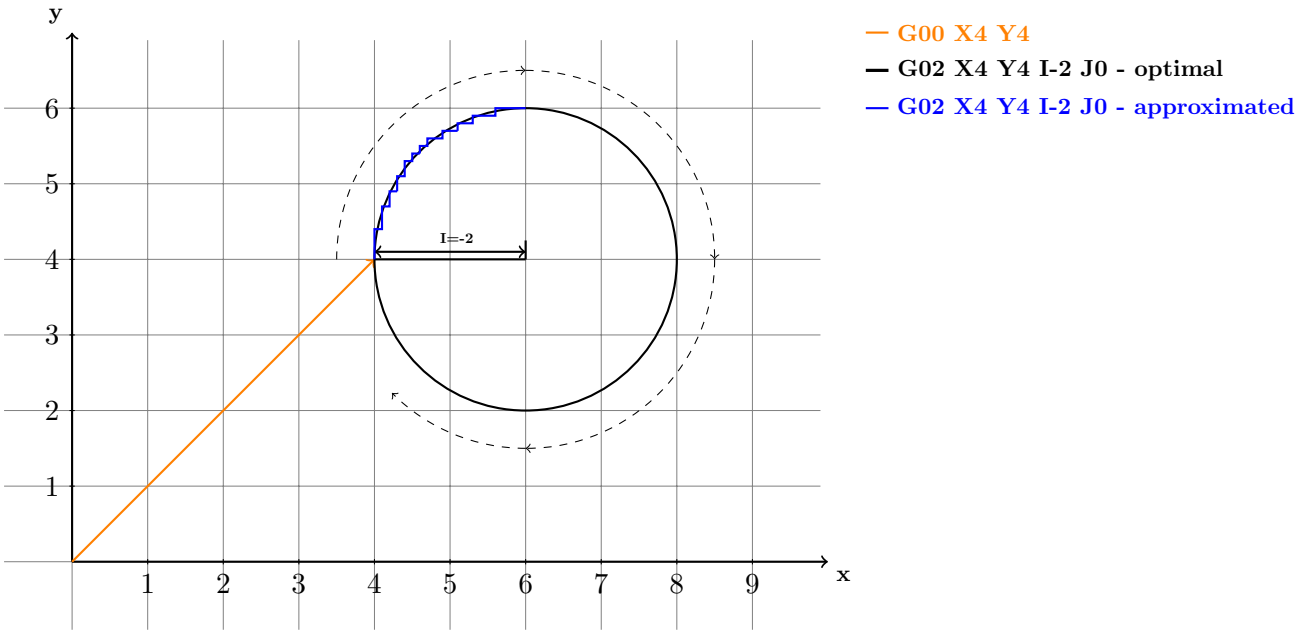

Figure 3: Circular interpolation in detail (G02, Parameter I).

3.2 The Parameter J

The parameter J regulates the Y-axis cutoff for the circular movement.

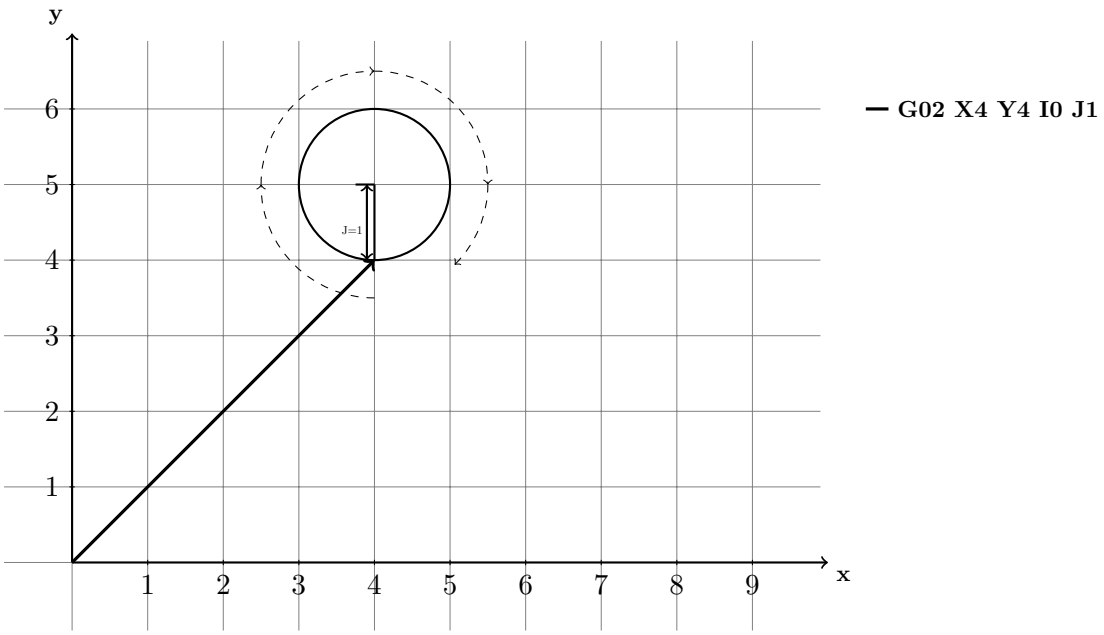

Figure 4: Circular interpolation in detail (G02, Parameter J).

3.3 The Parameter R

The parameter R regulates the X-axis cutoff for the circular movement.

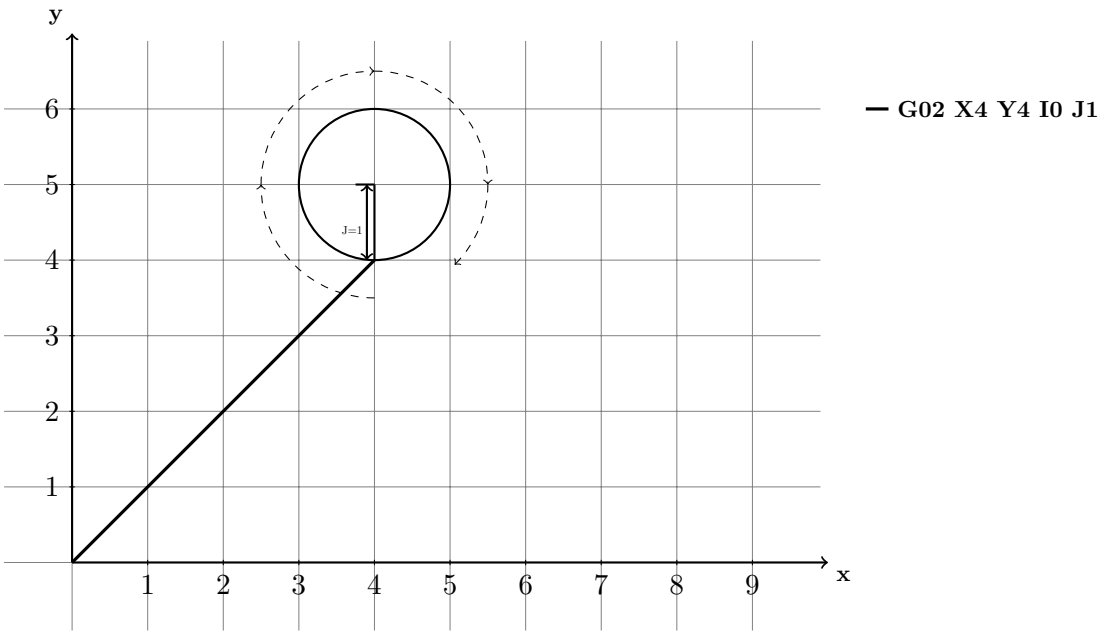

Figure 5: Circular interpolation in detail (G02, Parameter R).

4 G03 - Circular Interpolation (counterclockwise)