Rounding Spatial G-Code Tool Paths using Pythagorean Hodograph curves

Zbyněk Šír[1], Elmar Wings[2] and Bert Jüttler[3]

[1] *Charles University, Faculty of Mathematics and Physics,*
Prague, Czech Republic

[2] *ProCom Systemhaus und Ingenieurunternehmen GmbH,*
Aachen, Germany

[3] *Johannes Kepler University, Institute of Applied Geometry,*
Linz, Austria.

Abstract

We describe and analyse a new algorithm for rounding standard G-code tool paths. The joints of circular/linear elements are replaced by small segments of Pythagorean Hodograph (PH) curves so that the final curve is globally C^2 continuous. The PH segments are produced via a second order Hermite interpolation. We discuss some implementation details and investigate the error introduced by replacing a part of G-code by a PH curve segment. We also report results of tests within an industrial environment that demonstrate an increase in path velocity while decreasing peak acceleration.

Key words: Pythagorean Hodograph curves, CNC machining, tool path design, approximation order, Taylor expansion, error estimation.