Performance Simulation of Different Toolpaths in 2D1/2 pocket milling

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Abstract.

Pocket milling is a common task in manufacturing of aeronautical or space use parts, but also for molds and dies. This process is time-consuming and has an important impact on the cost of the final product.

For this paper, among all the possible directions of 2D1/2 pocketing improvement, the optimization of toolpath geometry has been chosen. Most of time, the toolpaths are computed from a Computer Aided Manufacturing software using classical tool trajectories such as “zig-zag” or “contour parallel”. These trajectories show discontinuities or local high curvature, creating frequent stop and go of the tool. These toolpaths are, fundamentally, not efficient in High Speed Milling (HSM). Some authors and software designers proposed methods to tackle those problems by local modification of the toolpath to improve his higher order continuity or the choice of C^2 spiral tool path with low curvature like Bieterman’s method (this strategy propose to solve numerically a 2D PDE problem and to use the iso-curves as structure curves to build a spiral). These strategies are efficient for HSM but leads to much longer toolpaths, so it can’t be necessarily a beneficial way.

The goal of this paper is to compare, for 2D1/2 pocket roughing, the time performance of three different machining strategies: “zig-zag”, “contour parallel” and “Bieterman” used on two different rectangular pockets (one without an the other with circular island). For this purpose, VPOp software developed in the LURPA Lab from Cachan is used. With this procedure, it will be possible to predict if, for a given pocket and a given machine tool, a strategy is efficient or not.