Optimization of pocket machining strategy in HSM

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Abstract Our two major concerns, which should be taken into consideration as soon as we start the selecting the machining parameters, are the minimization of the machining time and the maintaining of the high-speed machining machine in good state. The manufacturing strategy is one of the parameters which practically influences the time of the different geometrical forms manufacturing, as well as the machine itself. In this article, we propose an optimization methodology of the machining strategy for pockets of complex forms. For doing this, we have developed analytic models expressing the feed rate of the cutting tools trajectory. Then, we have elaborated an optimization method based on the analysis of the different critical parameters so as to distinguish the most suitable strategies to calculate the cutting time and define the machine dynamics. To validate our results, we have compared them to the experimental ones and also to those found in literature.

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Nomenclature

$V_f\,(t)$	Instantaneous feed rate
$\overrightarrow{V}$	Feed rate vector
V_{ft}	Tangential feed rate
V_{fprog}	Programmed feed rate
V_{ftcy}	Feed rate imposed by t_{cy}
V_{flsacc}	Feed rate for static look ahead imposed by the acceleration
$V_{flsjerk}$	Feed rate for static look ahead imposed by the jerk
V_{s}	Feed rate for static look ahead
V_{st}	Feed rate for modified static look ahead
$V_f\,(i)$	Feed rate of a block (i)
$V_{\max}$	Maximal feed rate
$V_{\max}i$	Maximal feed rate of axis (i)
$A(t)$,A_f	Instantaneous feed acceleration
$\overrightarrow{A}$	Feed acceleration vector
A_t	Tangential acceleration
A_n	Normal acceleration
$A_{\max}$	Maximal acceleration
$A_{\max}i$	Maximal acceleration of axis (i)
$J(t)$	Instantaneous feed jerk
$\overrightarrow{J}$	Jerk vector
J_t	Tangential jerk
J_c	Normal jerk
$J_{\max}$	Maximal jerk
$J_{\max}i$	Maximal Jerk of axis (i)
J_{curv}	Curvilinear tangential jerk
J_{tcurv}	Tangential Jerk on curvature
r_{jct}	Rate of curvilinear jerk associated of tangential jerk
t_{cy}	Time of interpolation cycle