Abstract

In order to regulate the cutting force at a desired level during peripheral end milling processes, a feedrate override Adaptive Control Constraint (ACC) system was developed. The feedrate override function was accomplished through a development of Programmable Machine Controller (PMC) interface technique on the NC controller. Nonlinear model of the cutting process was linearized as an adaptive model with a time varying process parameter. An integral type estimator was introduced for on-line estimation of the cutting process parameter. Zero order hold digital control methodology which uses pole-assignment concept for tuning of PI controllers was applied for the ACC system. Performance of the ACC system was confirmed on the vertical machining center equipped with Fanuc OMC through a large amount of experiment.

Keywords : Adaptive control constraint (ACC), feedrate override, Peripheral end milling, PI, PMC interface, Pole-assignment, Real-time, Stability

1. 서 론

절삭공정에서 적응제어는 크게 구속적응제어(Adaptive Control Constraint, ACC), 최적적응제어(Adaptive Control Optimization, ACO), 기하적적응제어(Geometric Adaptive Control, GAC)로 분류되며, 고속 고강성 가공의 경우 안정한 절삭조건에서 최적 절삭계수 추정을 통한 생산성 향상의 방향으로 ACC에 대한 연구가 요구되어지고 있는 것이 직관의 상황이다. 이에 앞서 Tomizuka 등은 모델추적적응제어(Model Reference Adaptive Control, MRAC) 기법을 이용하여 밀링공정에서 절삭력을 추종