

## **An adaptive predictive fuzzy logic for the altitude control of a micro-satellite**

This paper deals with the attitude control of a micro-satellite in space using fuzzy logic principles. A micro-satellite in space can behave in an un-predictive way due the effect of variations in its system parameters and time delay. In order to reduce the effects of this unfavorable behavior, a predictive adaptive form of a Mamdani type fuzzy logic controller (FLC) is introduced. A predictive controller is needed to compensate the effects of dead time which occurs in the microsatellite control system. The predictor estimates the required control at the next sampling time and applies to the system at the current sampling time. The adaptive portion of FLC compensates the effect of unknown variations of parameters in the satellite system by using an adaptable gain is connected in the forward path of the FLC. The response of the satellite is compared with that of a known reference model and an adaptive algorithm, derived on the basis of deviation in the responses, updates the adaptive gain. The adaptation continues until the micro-satellite attitude reaches the set-reference attitude. The performance of the predictive and adaptive satellite control system is demonstrated as stable and acceptable through a serious of simulation studies with added noises, disturbances and with measurement nonlinearities.