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**Abstract:**

Fixed gains proportional plus integral (PI) controller which gains are chosen by trial and error method has been implemented in industrial applications for the speed control of ac drives. But the high performance of vector control (VC) interior permanent magnet synchronous motor (IPMSM) cannot be achieved with eliminating the overshoot for step change of desired speed and disturbance load torque by using only a set of fixed gains of PI controller. Moreover, the performance of desired speed becomes unsatisfactory due to the utilization of fixed gain PI controller against the variation of load torque and parameters. The performance and robustness of conventional PI controller can be improved by online tuning of PI controller gains. Therefore, an online gains tuning method of PI controller based on fuzzy logic is proposed in this paper for speed control of IPMSM taking core loss into account. The efficacy of the proposed controller is verified by computer simulation. The simulation results show that the overshoot and steady state error can be overcome by using the proposed controller. Besides this, the proposed controller enables to provide excellent performance against the variations of load torque and parameters.

**Keywords**: Interior Permanent Magnet Synchronous Motor, Fuzzy Logic, Vector Control, Speed Control, PI Controller, Self-tuning PI Controller.