Title: Sugeno fuzzy PID tuning, by genetic-neutral for AVR in electrical power generation

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Abstract: We report a novel design method for determining the optimal proportional-integral-derivative (PID) controller parameters of an automatic voltage regulator (AVR) system, using a combined genetic algorithm (GA), radial basis function neural network (RBF-NN) and Sugeno fuzzy logic approaches. GA and a RBF-NN with a Sugeno fuzzy logic are proposed to design a PID controller for an AVR system (GNFPID). The problem for obtaining the optimal AVR and PID controller parameters is formulated as an optimization problem and RBF-NN tuned by GA is applied to solve the optimization problem. Whereas, optimal PID gains obtained by the proposed RBF tuning by genetic algorithm for various operating conditions are used to develop the rule base of the Sugeno fuzzy system and design fuzzy PID controller of the AVR system to improve the system's response (~0.005 s). The proposed approach has superior features, including easy implementation, stable convergence characteristic, good computational efficiency and this algorithm effectively searches for a high-quality solution and improve the transient response of the AVR system (7E-06). Numerical simulation results demonstrate that this is faster and has much less computational cost as compared with the real-code genetic algorithm (RGA) and Sugeno fuzzy logic. The proposed method is indeed more efficient and robust in improving the step response of an AVR system.