

Robust PID tuning rule using grey prediction algorithm with optimization method

Abstract

This paper discusses an approach to tune the PID controller parameters using the optimization method and grey prediction algorithm. The method involves calculating the average of the estimated error using grey prediction algorithm. A mat lab program is developed using simulink to find the average of the estimated error for the system whose process is modeled in first order lag plus dead time (FOLPD) form. The Optimization method with mat lab software program was used to find the optimum value for the controller gain (K), (proportional time T_D) which minimizes specific performance criteria (ITAE performance criteria) to achieve most of the systems requirements such as reducing the overshoot, maintain a high system response, achieve a good load disturbances rejection and maintain robustness. The coverage of the estimated error had been calculated using grey prediction algorithm. Those two parameters were used to calculate the gain of the controller (K), integral time (g) and the derivative time (Qa) for PID controller. Simulations for the proposed algorithm had been done for different process models. A comparison between the proposed tuning rules and the traditional tuning rules is done through the Matlab software to show the efficiency of the new tuning rule.