A development of self-tuning quantitative feedback theory

ABSTRACT

This paper presents a development of self-tuning Quantitative Feedback Theory (QFT) for a non linear system. QFT is one type of robust controller which deals with plant uncertainty. The performance of robust controller for any uncertain plant is guaranteed based on pre-defined specifications. Meanwhile, self-tuning controller is one type of adaptive controller which also meant to solve the same control problem, however for slower plant drift. By combining both adaptive and robust controllers, both robust and adaptive performance can be achieved. The proposed algorithm is tested on a chosen case study, grain dryer plant. Grain dryer is a non linear plant with uncertainty as the characteristics of the plant can be affected by environmental changes, manufacturing tolerance and input/output disturbance. Based on the results obtained from this case study, the superiority of the proposed self-tuning QFT has been proven. From the comparison test conducted between self-tuning and standard QFT-based controllers, the proposed method produced more desirable response in terms of faster settling time, less percentage of overshoot with reduced ringing, smaller control effort required and wider leverage of uncertainty range.

Keyword: Self-tuning; Quantitative Feedback Theory; Adaptive; Grain dryer; Non-linear; Plant uncertainty