QFT - Quantitative Feedback Theory*

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Abstract

Introduction to the QFT control method. QFT stands for Quantitative Feedback Theory, which emphasises the use of feedback in order to achieve adequate robust system performance tolerances despite the presence of plant and disturbances uncertainties. The robust control problem is formulated by a "quantitative means" for control design. The method is a very good introduction for students to become familiar with the idea of robust control.

* The site undergoes major re-structuring. It is expected that the new version will be published during this summer.

Quantitative Feedback Theory (QFT) developed by Horowitz (Horowitz, 1963; Horowitz and Sidi, 1972), is a frequency domain technique utilising the Nichols Chart (NC) in order to achieve a desired robust design over a specified region of plant uncertainty. Desired time-domain responses are translated into frequency domain tolerances, which lead to bounds (or constraints) on the loop transmission function. The design process is very transparent allowing a designer to see what trade-offs are necessary to achieve the desired performance.

1. BRYANT G.F. and HALIKIAS G.D., 1995, Optimal loop shaping for systems with large parameter uncertainty via linear programming. International Journal of Control, 62, 557-568.
2. HOROWITZ, I.M., 1973, Synthesis of linear Systems (Academic Press).
3. HOROWITZ, I.M. and SIDI, M., 1972, Synthesis of feedback systems with large plant ignorance for prescribed time-domain tolerances. International Journal of Control, 16, 287-309.
4. HOROWITZ, I.M. and SIDI, M., 1978, Optimum synthesis of non-minimum phase systems with plant uncertainty, International Journal of Control, 27, 361-386.
5. MACIEJOWSKI, J.M., 1989, Multivariable Feedback Design (Addison-Wesley).

An updated and more complete version will follow in the near future. You can check two papers on QFT aspects: on Optimal PID design [1] (IEE CTA Proceedings, Vol. 146, Nov. 1999) and on Optimisation of Fixed-Structure Controllers [2] (Proceedings 2002 IEEE International Symposium on CACSD). You will need Adobe Acrobat to view the above files, a free version can be found in Acrobat Reader Download[3] .

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