



Hamilton Institute

QFT Non-diagonal Controllers for Uncertain MIMO Systems

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Abstract

The control of multivariable systems (multiple-input multiple-output (MIMO)) with model uncertainty is still one of the hardest problems that the control engineer has to face in real-world applications. In recent decades, a considerable amount of work has been performed on MIMO systems. As a result, useful techniques have been compiled in this field. However, the original structures on MIMO systems were performed on fixed plants, without any uncertainty in the model. The first technique that made a quantitative synthesis and took into account the plant uncertainty was the quantitative feedback theory (QFT) introduced by Isaac Horowitz in 1959.

In this talk I will intend to give a brief explanation of the QFT approach to robust control, focusing on multivariable processes. The original MIMO QFT methods take into account coupling between loops but they only propose the use of a diagonal controller to govern the MIMO plant. It is known that non-diagonal controllers allow the designer much more design flexibility in the control of MIMO plants. The problem is how to design these off-diagonal elements.

In this framework, a new sequential design methodology, recently developed in the Public University of Navarra and based on QFT will be presented. This methodology extends the classic QFT diagonal controller design for MIMO plants with uncertainty to a fully populated matrix controller design. Three different cases will be studied: (1) reference tracking, (2) external disturbance rejection at the plant input and (3) external disturbance rejection at the plant output. The impact made by the inclusion of the non-diagonal elements of the controller will be analyzed and quantified. Finally the methodology will be applied to the control of a real industrial furnace used to cure large composite pieces.

Venue: Seminar Room, Hamilton Institute, Rye Hall,
NUI Maynooth

Time: 1.00 - 2.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie