Extension of the ν-metric

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The stabilization problem in control theory is, roughly speaking, the following: given an unstable plant P, find a controller C, such that the overall transfer function of their feedback interconnection is stable. In the *robust* stabilization problem, one goes a step further. One knows that the plant P is just an approximation of reality, and so one would really like the controller C to not only stabilize the *nominal* plant P, but also all sufficiently close plants P' to P. The question of what one means by "closeness" of plants thus arises naturally. So one needs a function d defined on pairs of stabilizable plants such that

1. d is a metric on the set of all stabilizable plants,
2. d is amenable to computation, and
3. d has "good"properties in the robust stabilization problem.

Such a desirable metric, was introduced by Glenn Vinnicombe in 1993, and is called the *ν-metric*. There essentially the ring R of stable transfer functions was taken to be the set of the rational functions without poles in the closed unit disk or, more generally, the disk algebra. The problem of what happens when R is some other ring of stable transfer functions of infinite-dimensional systems was left open. In this talk, we address this issue, and give an extension of the ν-metric.

The talk is based on joint work with Joseph A. Ball.