

# NEAR OPTIMAL LINEAR QUADRATIC REGULATOR FOR CONTROLLED SYSTEMS DESCRIBED BY ITÔ DIFFERENTIAL EQUATIONS WITH TWO FAST TIME SCALES\*

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## Abstract

In this paper a linear quadratic optimization problem is addressed under the assumption that the state space representation of the controlled system is described by a system of Itô differential equations with two fast time scales. It is well known that under some standard assumptions this optimization problem has a unique optimal control which is in a state feedback form. The gain matrix of the optimal control is computed based on the stabilizing solution of a suitable algebraic Riccati equation. The presence of the small parameters associated to the fast time scales may produce some ill conditioning of the numerical computations of the stabilizing solution. Our goal is to perform a detailed study of the dependence of the stabilizing solution of the Riccati equation with respect to the small parameters which are describing the fast time scales. In this way, we are able to obtain a near optimal control whose gain matrix does not depend upon the small parameters (which may be unknown). An estimation of the loss of the performance of the near optimal control is also done.

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