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OPTIMAL CONTROL IN UNOBSERVABLE ITO-VOLTERRA SYSTEMS

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Abstract. This paper presents solution of the optimal linear-quadratic controller problem for unobservable Ito-Volterra systems with continuous/discontinuous states over continuous/discontinuous observations. As a result, the system of the optimal controller equations is obtained, including a linear integral equation for the optimally controlled estimate and two integral Riccati equations for its cross-correlation function and a constituent of the optimal regulator gain matrix. Those equations are then simplified in the case of a dynamic plant (the internal part of a state equation) governed by a differential equation.
Keywords. Ito-Volterra system, optimal controller, filtering.
AMS (MOS) subject classification: 49K22, 93E20.

1 Introduction

This paper presents solution to the optimal linear-quadratic controller problem for unobservable Ito-Volterra systems with continuous/discontinuous states over continuous/discontinuous observations. Due to the separation principle for integral systems, which is stated analogously to that for dynamic differential ones [5], the initial continuous problem is split into the optimal minmax filtering problem for Ito-Volterra systems over continuous observations (see [1]) and the optimal linear-quadratic control (regulator) problem for observable Ito-Volterra systems with continuous states (see [2]). (Both papers [1, 2] contain the bibliography related to control and filtering problems for Ito-Volterra processes.) Based on the results obtained in [1, 2], the system of the optimal controller equations is first derived in the general case of Ito-Volterra state and observation equations, including a linear integral equation for the optimally controlled estimate and two integral Riccati equations for the estimate cross-correlation function and a constituent of the optimal regulator gain matrix. Those equations are then simplified in the case of a dynamic plant (the internal part of a state equation) governed by a differential equation, where the estimate cross-correlation function coincides with its variance (see [1]). In this situation, the estimate variance and the gain matrix constituent satisfying the Riccati equations depend on only one