ON QUALITATIVE BEHAVIOR OF A CLOSED-LOOP QUANTIZED SYSTEM

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ABSTRACT

This paper concerns the characterization of qualitative behavior of a closed-loop quantized system. A quantized system is a dynamical system, which instead of knowing its state $x(t)$ and its input $u(t)$ precisely, their qualitative values $[x(t)]$ and $[u(t)]$ at a discrete time set $T = \{ t_0, t_1, \ldots, t_k, \ldots \}$ are known. The qualitative state $[x(t)]$ and the qualitative input $[u(t)]$ are qualitative assessments of their precise values $x(t)$ and $u(t)$ respectively, and they can be related to each other via a non-deterministic automaton description. The aim is to characterize the state behavior of a quantized system whenever its non-deterministic automaton description is given. The first result of the paper is derivation of a representation $W(k + 1) = AW(k)$ for a non-deterministic closed-loop automaton. The second result of the paper shows that the state-behavior of a closed-loop quantized system can be characterized according to the eigenvalues of matrix $A$ in a similar manner with usual linear discrete-time systems.

KeyWords: Qualitative model, qualitative behavior, quantized system, automaton.