

# DEVS Framework for Modelling, Simulation, Analysis, and Design of Hybrid Systems

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## Abstract

We make the case that Discrete Event System Specification (DEVS) is a universal formalism for discrete event dynamical systems (DEDS). DEVS offers an expressive framework for modelling, design, analysis and simulation of autonomous and hybrid systems. We review some known features of DEVS and its extensions. We then focus on the use of DEVS to formulate and synthesize supervisory level controllers.

## 1 Introduction

Formal treatment of discrete event dynamical systems is receiving ever more attention[5]. Work on a mathematical foundation of discrete event modeling and simulation began in the 70s [13, 14, 16] when DEVS (discrete event system specification) was introduced as an abstract formalism for discrete event modeling. Because of its system theoretic basis, DEVS is a universal formalism for discrete event dynamical systems (DEDS). Indeed, DEVS is properly viewed a short-hand to specify systems whose input, state and output trajectories are piecewise constant[17]. The step-like transitions in the trajectories are identified as discrete events.

Recently, interest in hybrid systems (mixed discrete-continuous) systems has been growing. Such systems are prominent in such areas as intelligent control [1, 7] and reactive system design [3]. This article proposes that DEVS-based systems theory provides a sound, general framework within which to address modelling, simulation, design, and analysis issues for hybrid systems.

Fig. 1 shows the basic approach to hybrid systems research proposed here. We briefly address the ideas raised in this figure.