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# The Contribution of Human Cognition and Decision-Making to Understanding the Dynamics of Chemical Manufacturing Process Tasks

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## Abstract

We introduce the Cognitive Science Community to the challenges faced in human-in-the-loop (HiTL) decision-making for complex and dynamic industrial chemical processes. A microworld is presented which includes advanced dynamic simulations, an optimal control-based decision-support algorithm and a preliminary human machine interface. Three example applications are discussed, including decision-making in plant startup and shutdown, shared control using human and HiTL supervisory Model Predictive Control (MPC), and a pilot study of operator eye-tracking during a complex startup task. The paper also discusses ongoing and future experimental efforts highlighting the utility of the microworld in understanding human cognition and designing advanced operator training software for various process operation related complex tasks.