

Internship project Proposal

Quantized Identification for Systems Operating in Communication Networks

With the rapid progress of computer network technologies, data are often shared and transferred via computer networks, which cause unprecedented new challenges to system identification, due to the particularities of such systems, including data quantification, network-induced time delay, and packet loss. It is then important to develop new methodologies of system identification to tackle these challenges. Such methodologies should provide reliable high-quality mathematical dynamic models for applications such as remote surgery, remote laboratory and education, e-manufacturing, and modern industrial control networks.

According to our recent review of the literature, there have been very limited studies on this important research topic. The proposed project studies one of the fundamental problems therein, the so-called quantized system identification problem, where the objective is to obtain mathematical models of dynamic systems via system identification techniques based on quantized data transferred over communication networks. In particular, we will develop identification methodologies that can deal with binary-valued observation that is a fundamental building block for communication channels. In addition, the proposed identification methodologies need to tackle new challenges arisen from communication networks including network-induced time delay and packet loss.

In a recent work¹, system identification methodologies have been proposed to deal with network-induced time delay and packet loss. More recently, we have also found out that quantized system identification can be formulated as a convex optimization problem. The main idea of the proposed project is thus to bring together these new results to develop methods for quantized system identification in communication networks.

We believe that the success of this project will contribute to frontier technologies in information and communication technology (ICT) and benefit ICT research and industries in France and China to achieve a competitive edge in network-based control and diagnostics systems, which show up great potentials and growing importance.

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¹ Wang, J., et al. Identification of linear dynamic systems operating in a networked environment. *Automatica* (2009), doi:10.1016/j.automatica.2009.09.021