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Gaussian Processes for Advanced Motion Control*

Maurice Poot¹, Jim Portegies², Noud Mooren¹, Max van Haren¹, Max van Meer¹, Tom Oomen^{1,3}

ABSTRACT

Machine learning techniques, including Gaussian processes (GPs), are expected to play a significant role in meeting speed, accuracy, and functionality requirements in future data-intensive mechatronic systems. This paper aims to reveal the potential of GPs for motion control applications. Successful applications of GPs for feedforward and learning control, including the identification and learning for noncausal feedforward, position-dependent snap feedforward, nonlinear feedforward, and GP-based spatial repetitive control, are outlined. Experimental results on various systems, including a desktop printer, wirebonder, and substrate carrier, confirmed that data-based learning using GPs can significantly improve the accuracy of mechatronic systems.

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¹Control Systems Technology Section, Department of Mechanical Engineering, Eindhoven University of Technology, Eindhoven, The Netherlands

²CASA, Department of Mathematics and Computer Science, Eindhoven University of Technology, Eindhoven, The Netherlands

³Delft Center for Systems and Control, Delft University of Technology, Delft, The Netherlands.