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Gaussian Processes for Advanced Motion Control*

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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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