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Maximum Initial Input Allowed to Iterative Learning Control Set-up Using Singular Values

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Abstract : Iterative Learning Control (ILC) known to be a controlling tool to overcome periodic disturbances for repetitive systems. This technique is required to let the error signal tends to zero as the number of operation increases. The learning process that lies within this context is strongly dependent on the initial input which if selected properly tends to let the learning process be more effective compared to the case where a system starts from blind. ILC uses previous recorded execution data to update the following execution/trial input such that a reference trajectory is followed to a high accuracy. Error convergence in ILC is generally highly dependent on the input applied to a plant for trial 1, thus a good choice of initial starting input signal would make learning faster and as a consequence the error tends to zero faster as well. In the work presented within, an upper limit based on the Singular Values Principle (SV) is derived for the initial input signal applied at trial 1 such that the system follow the reference in less number of trials without responding aggressively or exceeding the working envelope where a system is required to move within in a robot arm, for example. Simulation results presented illustrate the theory introduced within this paper.

Keywords : initial input, iterative learning control, maximum input, singular values
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