INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

Relay feedback identification technique is widely used in process control industries, but its application is limited mainly to linear systems. This thesis focuses on extending the applicability of relay feedback to nonlinear system identification. For the said purpose, two nonlinear models have been studied, the Wiener and the Hammerstein model. Requirements of many tests and sometimes a complete change of set-up have been reported in the literature. This thesis work tries to resolve these issues by using the same set-up and no tedious resetting of the relay. It is also found in the literature that the nature of the linear subsystem is restricted to first-order or second-order with distinct real roots. The present work has successfully included a second-order linear subsystem with other kinds of roots. It also includes negative roots (i.e., right side poles) thereby applicable to unstable systems as well, given the condition that a stable limit cycle can be induced by the relay feedback set-up. Thus, the two nonlinear models considered in this work are somewhat more general compared to the reported literature. The identification procedure has been applied to various linear systems as well because the linear system is a special case of both the nonlinear models. Simulation studies are carried out to validate the proposed identification methodologies against some existing relay auto-tuning methods utilizing various examples from the literature. In the end, an attempt has been made to model a non-ideal buck converter as a Hammerstein model in the simulation thereby giving an insight into practical implementation.