Implementation of a Fuzzy Logic Based Set-Point Modulation Scheme with SVC System Applications

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Set-Point Modulation (SPM) is a technique that manipulates a control system’s reference value in order to improve its transient performance. SPM was first introduced in 1957 as Posicast control [1] [2], but was not utilized in power system applications until online set-point adjustment techniques such as SPAACE were developed [3].

This research presents a novel alternative to existing online set-point modulation (SPM) schemes. This new technique utilizes fuzzy-logic to determine the timing and magnitude of set-point adjustments in SVC control systems in order to improve the controlled variable response. After first applying fuzzy-logic enabled SPM to underdamped second order systems for benchmarking purposes, the new scheme is then applied to a PSCAD/EMTDC model of an existing SVC system under various transmission operation topologies. Doing so shows that this method improves the overshoot and undershoot transient performance while simultaneously reducing settling time of the controlled voltage response to set-point changes. This research further investigates fuzzy-logic based SPM’s ability to improve the controlled voltage’s transient behavior under fault recovery and load shedding scenarios. The results are then compared to the practical SVC system performance without SPM. Utilizing fuzzy-logic enabled SPM can therefore be shown to improve an SVC controller response.

REFERENCES