Research Findings (PhD)

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Name of Topic- Power System Stability Enhancement by Soft Computing Based Optimization Techniques

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The research findings are as follows:

An innovative control scheme is developed to damp the low-frequency oscillations and voltage deviations of a multi-machine power system using an ACO (Ant Colony Optimization)-based STATCOM (Static Synchronous Compensator). The control scheme incorporates two different PI (Proportional-integral) controllers to control the gate signal in the STATCOM. The gain parameters of which are tuned using a metaheuristic swarm-based optimization technique called Ant Colony Optimization.

A STATCOM is used to encounter the potential SSR (Subsynchronous resonance) observed by IG (Induction Generator)-based series compensated wind farms. An idea of a unique meta-heuristic swarm-based optimization technique called BFOA (Bacterial foraging optimization algorithm) based optimal-controller is introduced for optimal parameter selection of the basic controller used in the control scheme of the STATCOM.

Merits of a metaheuristic swarm-based optimization technique, WOA (Whale optimization algorithm) is exploited, to alleviate the low-frequency torsional oscillations called SSR (Sub-synchronous resonance). The demonstration has been performed using the modified IEEE FBM (IEEE first benchmark model) aggregated with Type-2 WPP (Wind power plant). The use of WOA for the optimal tuning of the controller suggested in the literature to control one of the degrees of freedom, i.e., Pitch angle and external resistance connected to the rotor, has been demonstrated.

A Nature-inspired meta-heuristic swarm-based optimization technique BFOA (Bacterial foraging optimization algorithm)-optimal control-based SVC is used to alleviate the sub-synchronous torsional oscillations in a series compensated IEEE-FBM power system.