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FAULT-TOLERANT STABILIZATION FOR TIME-DELAYED POWER SYSTEMS

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Abstract. *Dynamic stability enhancement of power systems can be achieved using power system stabilizer (PSS), applied either to excitation or governor or both. This paper presents a novel method to design fault tolerant excitation and governor controllers, taking into consideration the time delay in the later. With the available states, fault tolerant PSS ensures stability when both controllers act together (no failure) and when either one of them fails (equivalently, an actuator failure). The feedback for excitation controller (F_1) is the main optimal controller satisfying a desired degree of stability, while the redundant one for governor (F_2) is designed using pole placement and particle swarm technique to stabilize the system when F_1 is either on (failure) or off (failed). Although the problem is too complex, it has been solved using such evolutionary programming approach. A single machine infinite bus (SMIB) system is considered to demonstrate the suggested fault tolerant control. Effectiveness of the proposed stabilizers is checked under different operating conditions.*

Keywords: Power system stabilizer, Fault tolerant control, Time delay systems, Particle swarm optimization

List of Symbol

X_e	Transmission line reactance
$K_1 - K_6$	Linearized model constants of the synchronous machine
$T_{do}^{\backslash}$	D-axis open circuit field time constant
M	Inertia constant
T_m	Mechanical torque input to the machine
δ	Torque angle
ω	Angular velocity
E_{fd}	Field voltage
T_g	Governor time constant
R^*	Speed regulation
$E_q^{\backslash}$	Q-axis voltage behind transient reactance