

Control 1

$$s_{11} = 10, \quad s_{12} = 15, \quad s_{13} = 8, \quad L_1 = 25$$

Control 2

$$s_{21} = 10, \quad s_{22} = 15, \quad s_{23} = 8, \quad L_2 = 25$$

The system responses obtained for the rotor angle are shown in figures 1-3. From the different figures, we can see that the dynamic response of the rotor angle is such that their equilibrium position is reached.

From these figures, it can be also seen that the sliding mode controller 2 can provide better transient performances than the sliding mode controller 1. However, the transient response of the two continuous sliding mode controllers is significantly better than the one of the Hamiltonian controller. We suggest that an explanation can be found in the fact that the sliding controller 2 has no zero dynamics due to the particular choice of the sliding surface whose time-derivative corresponds to a equivalent linear system obtained via an input-output linearization technique, without zero dynamics in this case.

7. Conclusions

A nonlinear control strategy for a class of nonlinear systems has been developed and successfully applied to multi-machine power system control. Two new controllers have been designed using continuous sliding-mode techniques. This controller design has been successfully applied to a three-machine power system, where two different switching surfaces have been considered. The overall methodology can be obviously extended to a more general system made of n generators. Closed-loop performance of these two controllers appears to be better than the one obtained with a port-controlled Hamiltonian design.

References

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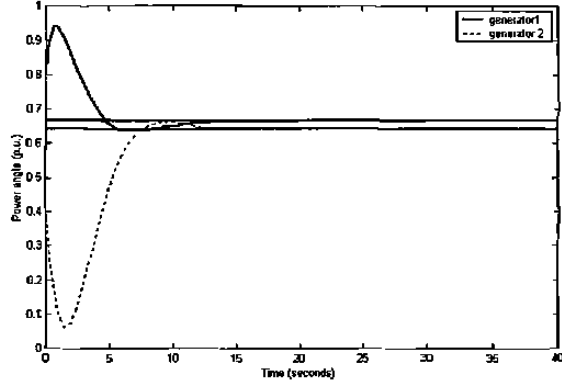


Fig. 1 Rotor angle with sliding modes 1 control

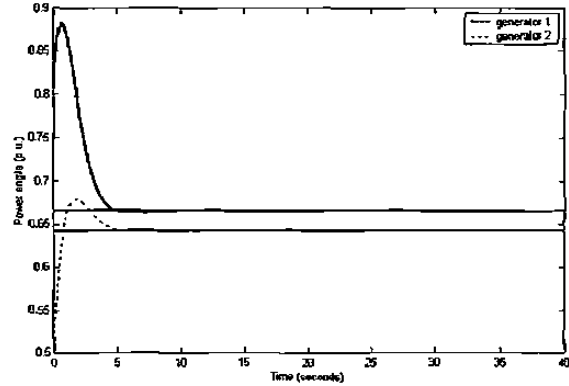


Fig. 2 Rototr angle with sliding modes 2 control

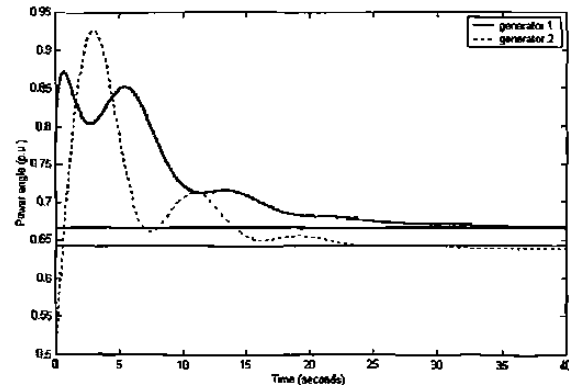


Fig. 3 Rotor angle with Hamiltonian control