



PARTICLE FILTER ON NONLINEAR VIBRATION SIGNAL OF BRIDGE STAYED CABLE

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Abstract- For the nonlinear vibration signal of stayed cables, a new particle filter algorithm is used in this paper. Firstly, nonlinear dynamic model of the stayed-cable and beam coupling system is dispersed in temporal dimension by using the finite difference method. So the discrete nonlinear vibration equation of any cable element is gotten. And secondly, a state equation of particle filter is fitted by least square algorithm from the discrete nonlinear vibration equation. So the particle filter algorithm can use the accurate state equations. Finally, the particle filter algorithm is used to filter the vibration signal of bridge stayed cable. The vibration signal is de-noised. And from the particle filter, the vibration signal can be tracked and be predicted for a short time accurately. The simulation experiments and the actual experiments on the bridge stayed cable are all indicating that the particle filter algorithm in this paper has good performance and works stably.

Index terms: Nonlinear vibration of stayed cables, finite difference method, particle filter, noise removal, signal tracking.