INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.

Thesis Title:
Performance comparison of few selected algorithms for state and parameter estimation of multi-storeyed buildings

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SHORT ABSTRACT

In this thesis, least square based techniques as well as different variants of Kalman filter based algorithms like EKF, Two-Stage EKF and UKF are used to estimate and compare the performance of these algorithms in identifying the state and parameters of 1) conventional fixed base multi-storeyed shear building and 2) base-isolated buildings supported on steel reinforced elastomeric isolator (SREI) and 3) fibre reinforced elastomeric isolator (FREI) supporting a masonry building.

Simulation based response as well as response from instrumented existing buildings are used for the study. A comparative study is carried out to study the effect of varying level of added noise on the performance of the algorithms. Additionally, the impact of limited sensors is also investigated.

The main features of the thesis comprise of the conversion of different formulation to suite the need for state and parameters of the different types of considered building systems. A mathematical formulation has been derived to deal with the problem of missing sensor at isolator level in case of base isolated multi-storeyed building. Use of FREI is a recently developed concept in base isolation. Identification of state and parameter of a selected mathematical model representing the nonlinear hysteretic behaviour of FREI have been carried out using both analytically obtained and experimentally obtained response. An index has been introduced to quantify the performance of the different considered algorithms.

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