Title Heuristic Tools for Preliminary Design and Response Prediction of Tall Buildings

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Abstract

The need for high-rise building is increasing in order to meet the challenges posed by rapid urbanization and exponential growth in population. With recent advancements in computing technologies, innovative materials and new structural systems, the need of prior knowledge regarding proportioning the geometry and configuration of structural members are also increasing. A relatively quicker and reliable estimation of approximate sizes of members can greatly facilitate the preliminary design and feasibility of the project. This thesis propose a Heuristic approach to directly determine some key design parameters based on experience gained from previous designed buildings. It uses ANN based ELM algorithm using concept of S-ELM with online sequential learning. The model developed selects best network architecture on its own to provide fast and reliable results along with option of sequential learning. ANN models are trained using architectural parameters to estimate structural design indicators of tall buildings. The design teams can make key decisions based on similar data with assistance of the proposed model. The objective of this project is to provide a tool to assist in quick design estimation of building. The tool can even be used to compare code based & performance based design quickly. This research compares the performance of two ANN based model i.e. 1. ELM networks and 2. MLP-BP networks.

The approach is proposed on basis of sample networks trained on various case study on high-rise buildings based on Philippines through its architectural and design report

Keywords Machine Learning, Artificial Neural Network (ANN), Extreme Learning Machine (ELM), Sparse-ELM (S-ELM), Online-Sequential Extreme Learning Machine (OS-ELM), Multi-Layer Perceptron (MLP), Back Propagation (BP), Tall buildings, preliminary design..