

GIS Application in Seismic Hazard Estimation for a Distributed Structure

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1. Abstract

Seismic hazard estimation comprises a basic step for design of engineering structures in earthquake prone areas. Among several parameters of strong ground motion, peak ground acceleration (pga) is the most popular and widely used parameter for design

When studying the seismic hazard for an extended site, like a pipeline, one is faced with a series of sites oriented along the pipeline, instead of a single site. This spatial relation is in favor of GIS applications.

In this study, a probabilistic approach was applied for seismic hazard estimation. Pga values were estimated along an extended buried pipeline using GIS applications. Pga profile was queried out from a raster Digital Elevation Model (DEM), specifically generated for this purpose. The accuracy of the estimation was further enhanced using digital image processing techniques. Results were cross-checked with pga-estimates obtained by routine probabilistic hazard analysis at certain fixed sites along the pipeline. The estimation error was less than 10% , which is reasonably acceptable from engineering point of view.

For the methodology introduced in this study, it is not necessary to know the final route of the pipeline, a priory, while in routine single-site based analysis, this information is a crucial assumption. The mentioned point considerably speeds-up the hazard analysis in such cases where there are several alternatives for the route. In fact, the technique presented here enables the engineering seismologist to start the analysis at early stages of the project.

Key Words:

GIS, hazard analysis, pipeline, DEM model, image processing

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