
Documents

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Temporal landslide hazard analysis based on a historic approach along a road corridor, using high resolution panchromatic & multispectral data within a GIS environment: A case study from Uttarakhand India

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Abstract

Slope failures are among the most frequent disasters experienced by the Himalayan terrains of India especially along the road corridors, connecting the remote mountainous destinations to the mainland. Preparation of landslide inventory maps in other words the simplest form a landslide hazard maps require accurate mapping of slope failures in terms of their morphology and size which is still a challenge to the scientific community. Modern age high resolution Panchromatic images provide an outstanding opportunity to map these events in a large scale. Further the different image processing techniques enables to obtain a spectral properties when merged with the medium to coarse resolution MS dating which helps in identifying the minute morphological details within a single slide. Most of the landslide hazard studies in India aim at spatial modeling of landslide hazard at a small scale. No attempt was made to address the temporal aspect of landslide hazard. The objective of this research was to prepare a Spatio-temporal landslide database at a large scale where almost all of the small and big size landslides can be mapped at its original location. A 15 km road stretch on National highway 108 connecting Uttarkashi to the famous Gangotri shrine which is eventually one of the worst landslide affected routes in India was selected for the study. To obtain a greater accuracy in creating a hazard model a historic approach was followed where information regarding landslide occurrence date and the road length affected by the slide was collected for past 25 years to prepare a sound relational landslide database. A part of this database of 20 years was used to predict the temporal probability of landslide occurrence in 1 year, 5 years and 10 years scenarios using Poisson probability distribution along with generating spatial probability indications for the same stretch of road. The results of temporal probability model was validated against a separate set of five years data which shows a good reliability in 5 years scenario where almost 92.9% of the slides occurred in high temporal probability zones though spatially they are less susceptible. For one year scenario the landslide occurrences showed better correspondence with the spatial susceptibility indications.

Author Keywords

High resolution image Unique condition units; Historic records; Temporal probability

Index Keywords

Accurate mapping, Big sizes, Hazard models, High resolution, High resolution image, Historic records, Image processing technique, Landslide hazard, Morphology and size, Multi-spectral data, Panchromatic images, Probability models, Scientific community, Slope failure, Small scale, Spatial modeling, Spatio-temporal, Spectral properties, Temporal aspects; Database systems, Hazards, Image processing, Probability distributions, Remote sensing, Roads and streets, Soil mechanics; Landslides

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