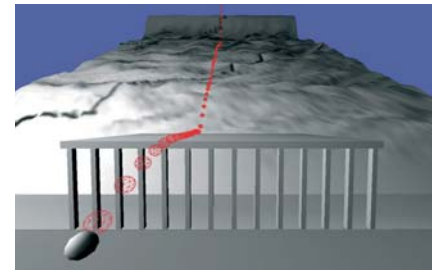


Rock Slide – Simulation for less geological risk

The institute of electronic (IfE) does simulation of rock slides to analyse and help understand geological risks.



Motivation

A number of recent rock slides have caused massive damage to protective galleries and tunnel portals in Switzerland. Some of these locations are:

- Axenstrasse gallery between Brunnen and Sisikon, 10/02/2003
- Iseltwald, Motorway A8, Chüebalm tunnel, 04/01/2003
- Rock slide near Innertkirchen (Grimsel pass road closed), 04/09/2000

On various incidents the structures were designed to withstand the impact. Still, federal construction directives concerning mentioned structures are due to be revised to include newer scientific findings.

Description

A three-dimensional virtual world encompassing all relevant physical effects will be created. This will allow statistical analysis of rock impacts on human-built structures to be performed. Existing topological data has been imported to form the basis of a high-fidelity reconstruction of real landscapes. Therefore a mesh grid size of less than one meter has been supported, subject to availability of adequate data for the landscape to be modelled. Various material properties of the underground can also be mapped onto this representation.

Four differing modes of motion have been identified which are relevant to modelling the precipitation of rocks:

- Free fall; no interaction with ground
- Saltation, i.e. rocks bouncing off the terrain structure
- Rolling motion
- Sliding / gliding

The typical trajectory of a simulated rock will include multiple modes of motion from the above list.

Results

In the first stage of the project, the actual path of the boulders will be analysed. The results of this simulation will include statistical data representing the scatter (spatial distribution of impacts on structure) as well as the distribution of impacting forces in terms both of energy and time. In the later stages, the results obtained during above analysis will be used to determine the influence on the human-built structure, taking into consideration dynamical effects (e.g. frequency / resonance analysis).

Project

Rock Slide

Project Partners

Institute for construction technique
HTA Luzern, CH-Horw

NovodeX AG, CH-Zürich
www.novodex.com

Project Duration

11 months

Project Budget

CHF 70'000

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