

# Project M2 MSIAM :

## Image processing for extracting features

### Context :

Over the last fifteen years, thousands of people were killed by rockfalls incidents all around the world. In January 1962, a total of 2,000 people died as a result of a landslide in Peru, making this natural phenomenon an international disaster that needed to be overcome. Rockfalls are quantities of rock falling freely from a cliff face causing rock cuts for highways and railways in mountainous areas. They result in disrupting road traffic in the mountainous regions creating an unsafe environment for people. Climatic and biological events are behind rockfalls: an increase in pore pressure due to rainfall infiltration, erosion of surrounding material during heavy rain storms, chemical degradation, root growth or leverage by roots moving in high winds are all in the panoply of environmental events that results in rockfalls. There are many factors that affect the severity of a rockfall such as the slope geometry, the surface material and its retarding capacity, the size and shape of the rock, the coefficients of friction of the rock surfaces and many others. Their study is therefore important as it allows us to define secure areas for building houses and roads.

### Study from experimental outcomes and acquisition of images

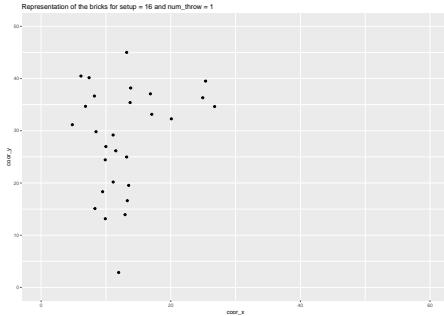
One of the way to study this rock falls is based one experimental trials done over a simple scaled model that is supposed to mimic some possible geographical topography. All the trials were realized in laboratory and in various conditions (a combination of the environmental conditions defines each setup of the experience). The experimental process is the following : a collection of  $n$  identical objects are throw from the top of the slope and a photo is taken of the deposit area. The scaled model is built as follows :



### Image processing

Up to now each photo was treated partially manually to produce a file where were collected the positions of thrown objects in a .csv file, and some other informations describing the setup of the trial.

Each photo is treated with logiciel ImageJ and when clicking over each barycenter of the objects the coordinates of each click are given. Up to now 20 differents setups where tested and for each of them 50 launches were done so that there are 50 photos to be treated in each setup. An exemple of a photo (file.jpg) and R-plot of the points given a file.csv (where are collected coordinates of the brick's centers) are given below :



The scaled model permits quite a lot of variations of the setup of the experimental trials hence it becomes necessary to develop a completely automatic process for the treatment of each photo.

### **Goal of this work and expected results**

Hence the main goal here is to built a tool that given a photo in format jpeg or JPG will automatically produce a .csv file with coordinates of the objects stopped in the deposit area.

In the following figures are shown the photo of one of the trials and the representation of the barycenter's positions of the thrown objects that have arrived in the deposit and photographed array.

Moreover it would be necessary to resize and adjust all the photos on the same rectangular pattern and possibly apply transformations to correct the parallax effects.

Some particular focus will be done over the situation where one brick is overponed on another one. Even if some objects are mixed up it is also important to know how many of them could be superimposed.

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