



## Estimating surface roughness using stereophotogrammetry

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At the Department of Drainage, Irrigation and Landscape Engineering (CTU Prague) we use several mathematical models for soil erosion, sediment transport and surface runoff assessment. Here we continuously struggle for successful models parameterizations. One of the typical coefficients usually taken from literature instead of measurements is surface roughness, eg. Manning roughness (Maidment, 1993). Roughness is a key to surface runoff velocity and surface runoff depth estimation but often it is very roughly estimated.

Within the COST 22 Action research we focused on estimating actual surface roughness using stereophotogrammetry. Our aim was to set up a simple low cost system useful for roughness measurements in nature conditions – mainly on agricultural fields. Our system consists of Canon EOS 400 digital camera with angle viewfinder, two robust tripods and a horizontal bar with sliding 3D tripod head. We tested different camera heights and focal distances as well as various parallaxes to obtain reasonable results. Finally we shot the surfaces from 1600 millimeters with 24 and 35 mm lens and parallaxes close to 100 mm.

For 3D scene development we use Geomatica 10 GIS and its OrthoEngine module. Testing the proper system and many variables of the 3D scene modelling was an important part of the first year of the project. For these purposes we first prepared a calibrated and known 3D surface consisting of 70 by 70 cm grid and several geometrical objects of different sizes and shapes. Preparing the correct lighting conditions, finding the resolving power of the system and solving the problems with low contrast areas of measured surfaces was a time consuming but interesting task. After the system calibration we started with the actual terrain measurements. Our setup, system testing and preliminary results of the roughness computations are presented on the poster.

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### References

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