



3D Surface Reconstruction of Rills in a Spanish Olive Grove

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The low-cost, user-friendly photogrammetric Structure from Motion (SfM) technique is used for 3D surface reconstruction and difference calculation of an 18 meter long rill in South Spain (Andalusia, Puente Genil).

The images were taken with a Canon HD video camera before and after a rill experiment in an olive grove. Recording with a video camera has compared to a photo camera a huge time advantage and the method also guarantees more than adequately overlapping sharp images.

For each model, approximately 20 minutes of video were taken. As SfM needs single images, the sharpest image was automatically selected from 8 frame intervals. The sharpness was estimated using a derivative-based metric. Then, VisualSfM detects feature points in each image, searches matching feature points in all image pairs and recovers the camera and feature positions. Finally, by triangulation of camera positions and feature points the software reconstructs a point cloud of the rill surface. From the point cloud, 3D surface models (meshes) are created and via difference calculations of the pre and post model a visualization of the changes (erosion and accumulation areas) and quantification of erosion volumes are possible. The calculated volumes are presented in spatial units of the models and so real values must be converted via references.

The results show that rills in olive groves have a high dynamic due to the lack of vegetation cover under the trees, so that the rill can incise until the bedrock. Another reason for the high activity is the intensive employment of machinery.