



Accurate automated assessment of cross-sections using the photogrammetric interface FreeXSapp

Carlos Castillo (1), Víctor Marín-Moreno (1), Rafael Pérez (1), Rafael Muñoz-Salinas (2), and Encarnación Taguas (1)

(1) University of Córdoba, Rural Engineering, Córdoba, Spain , (2) University of Córdoba, Department of Computing and Numerical Analysis, Córdoba, Spain

During recent years, 3-D techniques such as LiDAR and Structure-from-Motion (SfM) photogrammetry have been increasingly used for gully erosion assessment. However, innovative image-based approaches based on these advances may also be used to provide accurate cross sectional measurements which are less expensive and time-demanding.

In this work, we present the FreeXSapp methodology, a new piece of freely-available software based on existing SfM tools (MicMac and PMVS2) and augmented-reality targets (ArUco markers) which performs the automated 3-D reconstruction, scaling, orientation and analysis of gully cross-sections (XSs) from images taken from the gully margin using a smartphone camera. As a field application, the volume of a 60-m-long medium-size gully was evaluated, where a total of 10 XSs were measured and analyzed in approximately 30 min. The relative accuracy in estimating width and depth dimensions was in the order of 0.5%, with a precision ratio (relative to the camera-XS distance) of $\sim 1,500$.

Overall, using this methodology showed an excellent performance in terms of time and cost requirements when compared with typical 3-D and conventional 2-D techniques. The FreeXSapp interface is downloadable for free for Windows OSs at <http://www.uco.es/users/ccastillo/freexsapp>.