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Digital Geology from field to 3D modelling and Google Earth virtual environment: methods and goals from the Furlo Gorge (Northern Apennines - Italy)

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A new map of the Furlo Gorge was surveyed and elaborated in a digital way. In every step of work we used digital tools as mobile GIS and 3D modelling software.

Phase 1st
Starting in the lab, planning the field project development, base cartography, forms and data base
were designed in the way we thought was the best for collecting and store data in order of producing a digital n-dimensional map. Bedding attitudes, outcrops sketches and description, stratigraphic
logs, structural features and other informations were collected and organised in a structured database using rugged tablet PC, GPS receiver, digital cameras and later also an Android smartphone with some survey apps in-house developed.
A new mobile GIS (BeeGIS) was developed starting from an open source GIS (uDig): a number of
tools like GPS connection, pen drawing annotations, geonotes, fieldbook, photo synchronization and geotagging were originally designed.

Phase 2nd
After some month of digital field work, all the informations were elaborated for drawing a geologic map in GIS environment. For that we use both commercial (ArcGIS) and open source (gvSig, QGIS, uDig) without big technical problems.

Phase 3rd
When we get to the step of building a 3D model (using 3DMove), passing trough the assisted drawing of cross--sections (2DMove), we discovered a number of problems in the interpretation of geological structures (thrusts, normal faults) and more in the interpretation of stratigraphic thickness and boundaries and their relationships with topography.

Phase 4th
Before an “on-armchair” redrawing of map, we decide to go back to the field and check directly what was wrong. Two main vantages came from this: (1) the mistakes we found could be reinterpreted and corrected directly in the field having all digital tools we need; (2) previous interpretations could be stored in GIS layers keeping memory of the previous work (also mistakes).

Phase 5th
A 3D model built with 3D Move is already almost self-consistent in showing the structural features of the study area. The work was not so straightforward, but the result is more then satisfying, even if some limitations were not solved (i.e. visualisation of bedding attitudes).

Geological maps are fundamental for knowledge transfer among experts but, if combined with the
innovative digital methods from survey to 3D model, this knowledges could reach a much larger number of people, allowing a cultural growth and the establishment of a larger awareness of the Earth and Environment.