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An important landslide induced-damage assessment tool for event analysis

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Several damage-assessment approaches are profusely present in literature, mainly focused on landslide and subsidence effects. Landslides, differently to subsidence affecting only built-up areas featured by peculiar characteristics, are important natural hazards damaging structures and infrastructures in both urban and rural areas worldwide. Landslide effects also imply important economic and social impacts, e.g. relevant consequences on electrical, hydraulic and communication services, and sometimes they can provoke casualties.
The identification and description of landslide induced-damage result to be an important tool for analysing the occurred event, detecting the extension of the involved and prone to area, in addition to be a support to avoid possible recurrences of natural hazards consequences. Therefore, it is a useful tool for administrative function, urban planning, scientific investigation, engineering design analysis and civil protection purposes.
Different existing methods show several advantages and drawbacks depending on the features selected in the damage analysis and the thresholds of the parameters taken into account. A new well-structured approach for the landslide-induced damage classification of facilities has been developed in order to a better identification and a quick assessment on structures, infrastructures and ground surfaces. The method is designed in two phases: i) the first one focuses on the recognition of the damage, e.g cracks in walls and sidewalks, distortion or inclination of elements; ii) the second one aims to classify the structure in sensu stricto by partitioning it into three sectors and considering the average severity of the damage affecting every portion. In the second phase the ground fractures have not to be considered. As a result, six classes of different grade of damage and eight ranks for the entire buildings were proposed. It is worthy to note that only the cracks recognizable in the external façades are considered and the foundations damage of the structures are no taken into account. These simplifications are fundamental for a quick survey and due to the difficulties of the operator to be able to entry in private dwellings.
To test the efficiency of the developed approach it was applied to several case studies affected by different types of landslides, e.g. rock fall in Finestrat (Alicante, Spain) and complex landslide in Agnone (Molise, southern Italy), with good outcomes. Ground surfaces fractures, edifices and sidewalks were also taken into account to test and validate the designed approach.
Beside the first phase was susceptible to the subjectivity of the operator, the text and visual description of the damage with threshold values allow reducing this problem and overcoming low experience. In the sample case studies, the new approach demonstrated a high efficiency for classification of ground fractures as well as for structures and infrastructures.
The applicability on infrastructure and ground fractures, further than on buildings, increases the capacity to investigate in depth the landslide-induced effects in order to better analyse the event for prevention and planning purposes. The approach has been originally conceived for landslide-induced damage, but it could be applied on subsidence and earthquake-induced damage with slight modifications.