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GPR application to historical buildings structural control

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Preservation of historical buildings requires particular care, as any intervention must conducted in a way which does not alter or damage the style, structure or contents of the edifice. In order to properly plan the restoration of a building, non-destructive techniques can be extensively used to detect structural elements and weaknesses. Ground Penetrating Radar is particularly well adapted to this type of work, as the method is non-invasive, rapid, and provides high resolution images of contrasting subsurface materials.
In the present work we show three case-histories on three historical buildings – different in age, structure and geometry – in which GPR technique has been successfully used. To obtain 2D time slices of the investigated area, high frequency bistatic GPR (900 MHz and 1GHz antennas) was applied in each site, acquiring data along several parallel profiles.
The first case presented here, is the GPR detection of the fractures and the internal lesions in the architrave of the Porticus Octaviae, a Roman building partially restored, located downtown Rome.
The second case shows the application of the GPR to detect the internal structure of the floors above the vaulted ceilings that houses a series of 16th century frescos in the important Zuccari Palace, also located in Rome.
Finally, the third case illustrates the application of GPR to reconstruct the geometry and the reinforcement structures of the floors and the inside walls of the Provincial Palace of Pescara, dated back to the Fascist age.
These three examples show that GPR technique is a valid support which, in exhaustive way, can highlight the state of conservation of historical buildings. In particular, this technique can produce fundamental information for the restorers, in terms of location, dimension, and geometry of the internal lesions in the structure, helping them in developing the best possible protection plan for an historical building.

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