

RoboARCH: An autonomous robot for analysis and documentation of historical architectures

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The Mediterranean basin has an impressive amount of millenarian urban structures which have been modelled along centuries. Unfortunately, they are sometimes damaged due to both the passage of time as well as bad preservation criteria.

In order to avoid these situations or reduce their effects, new preservation criteria have arisen in the last decades. These criteria aim to revitalize the historical value of these architectural remains from a cultural and economic perspective. In this line of research, the “Archaeology of Architecture” applies the theoretical principles of the archaeology to study buildings and streets, offering new methodologies of analysis. An important part of these methodologies incorporates new technologies, such as 3D scanners, robotic total stations, or virtual and augmented reality, to the data acquisition and processing tasks. The application of these technologies in the area of Historical Heritage results in a breakthrough in the graphic documentation of monuments and archaeological remains, which allows the development of new preservation strategies.

Among all these new technologies, this abstract proposes the use of an autonomous robot to help identifying elements inside a building. The robot navigates through the environment, collects data and compares them against well-known historical and architectural archetypes, to find a set of candidates for each perceived pattern.

The advantages of the proposed system when compared against current state-of-the-art techniques are the following: (i) the robot explores the environment autonomously using SLAM (Simultaneous Localization And Mapping) algorithms and acquires colour and depth information; (ii) no special markers, such as the targets or spheres usually employed by robotic total stations, are required; (iii) the system uses advanced image processing methods to automatically provide a first characterization of perceived borders, that will help in different identification processes, from single elements to more complex structures; (iv) obtained data are compared against historical and architectural archetypes included in a data base; (v) evaluation of the object position inside the stratigraphic sequence of the wall.

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