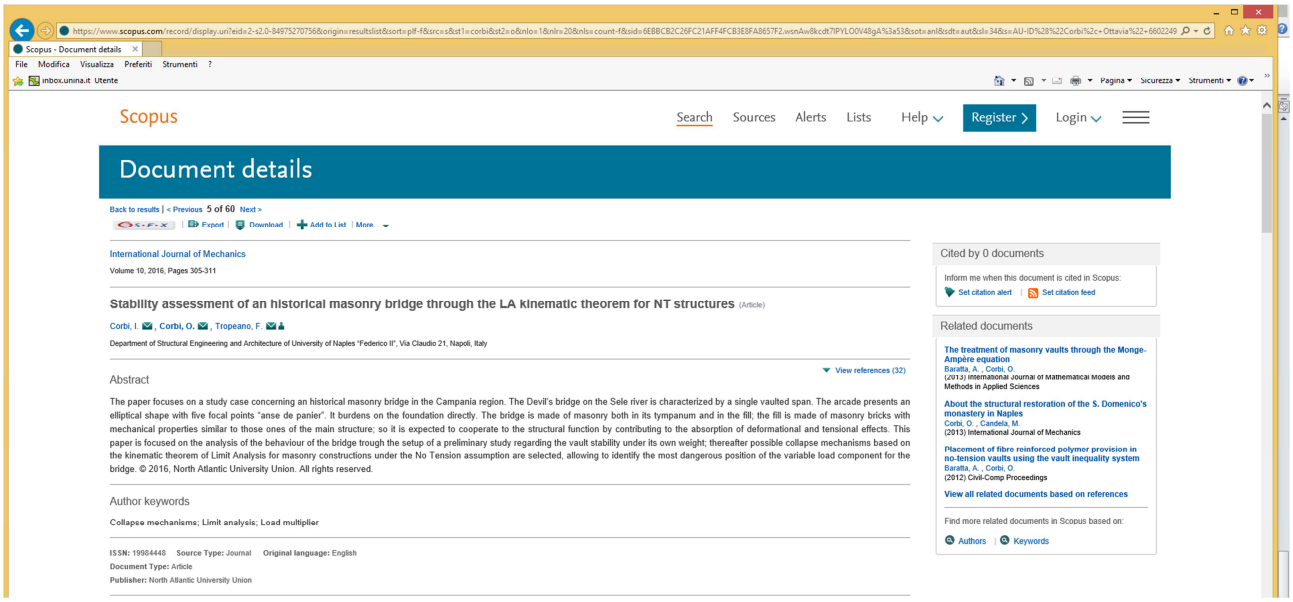
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International Journal of Mechanics
Volume 10, 2016, Pages 305-311
Stability assessment of an historical masonry bridge through the LA kinematic theorem for NT structures (Article)
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Abstract
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The paper focuses on a study case concerning an historical masonry bridge in the Campania region. The Devil's bridge on the Sele river is characterized by a single vaulted span. The arcade presents an elliptical shape with five focal points "anse de panier". It burdens on the foundation directly. The bridge is made of masonry both in its tympanum and in the fill; the fill is made of masonry bricks with mechanical properties similar to those ones of the main structure; so it is expected to cooperate to the structural function by contributing to the absorption of deformational and tensional effects. This paper is focused on the analysis of the behaviour of the bridge trough the setup of a preliminary study regarding the vault stability under its own weight; thereafter possible collapse mechanisms based on the kinematic theorem of Limit Analysis for masonry constructions under the No Tension assumption are selected, allowing to identify the most dangerous position of the variable load component for the bridge. © 2016, North Atlantic University Union. All rights reserved.
Author keywords
Collapse mechanisms; Limit analysis; Load multiplier
ISSN: 19984448 Source Type: Journal Original language: English
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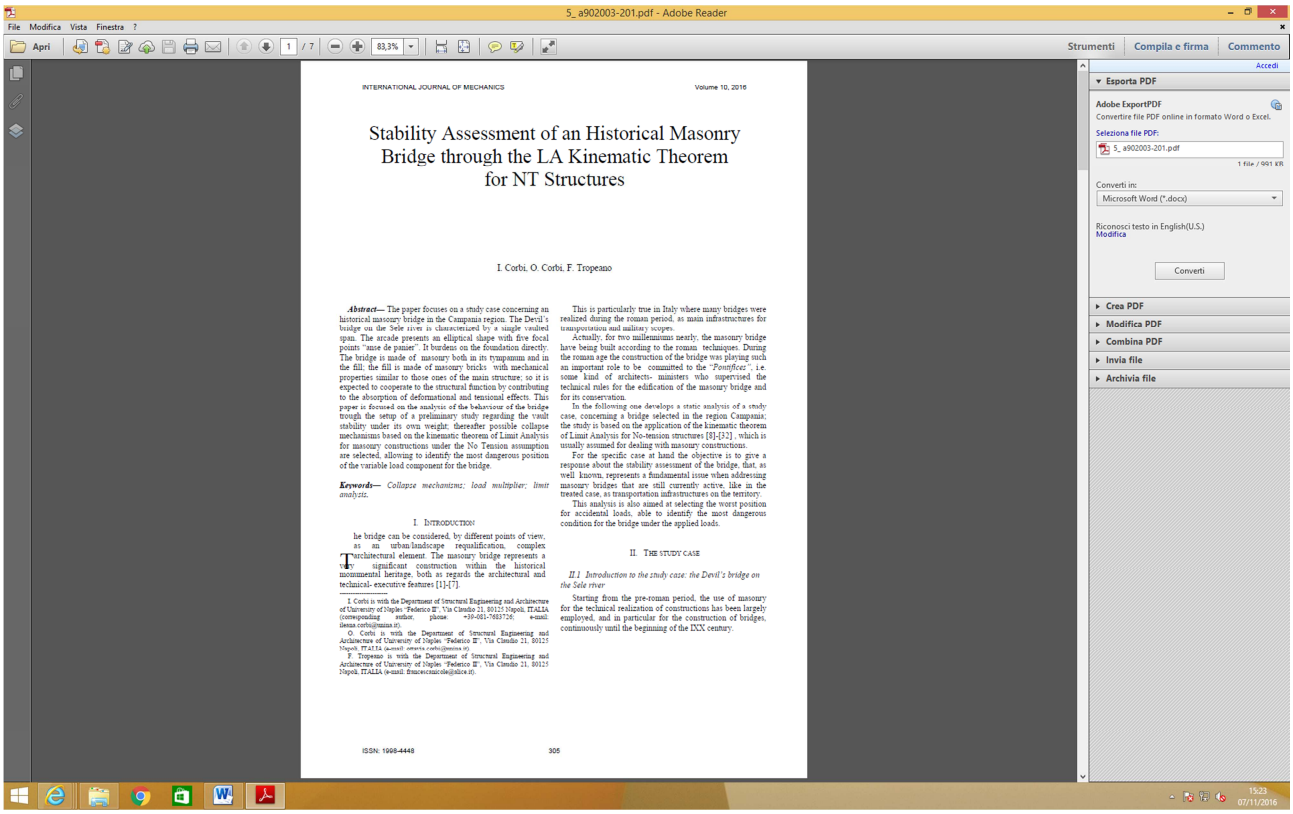
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INTERNATIONAL JOURNAL OF MECHANICS Volume 10, 2016
Stability Assessment of an Historical Masonry Bridge through the LA Kinematic Theorem for NT Structures
I. Corbi, O. Corbi, F. Tropeano
Abstract— The paper focuses on a study case concerning an historical masonry bridge in the Campania region. The Devil's bridge on the Sele river is characterized by a single vaulted span. The arcade presents an elliptical shape with five focal points "anse de panier". It burdens on the foundation directly. The bridge is made of masonry both in its tympanum and in the fill; the fill is made of masonry bricks with mechanical properties similar to those ones of the main structure; so it is expected to cooperate to the structural function by contributing to the absorption of deformational and tensional effects. This paper is focused on the analysis of the behaviour of the bridge trough the setup of a preliminary study regarding the vault stability under its own weight; thereafter possible collapse mechanisms based on the kinematic theorem of Limit Analysis for masonry constructions under the No Tension assumption are selected, allowing to identify the most dangerous position of the variable load component for the bridge.
Keywords— Collapse mechanisms; load multiplier; limit analysis.
I. Introduction
The bridge can be considered, by different points of view, as an urban landscape requalification, complex architectural element. The masonry bridge represents a very significant construction within the historical monumental heritage, both as regards the architectural and technical- executive features [1]-[7].
This is particularly true in Italy where many bridges were realized during the roman period, as main infrastructures for transportation and military scopes.
Actually, for two millenniums nearly, the masonry bridge have being built according to the roman techniques. During the roman age the construction of the bridge was playing such an important role to be committed to the "Pontifices", i.e. some kind of architects- ministers who supervised the technical rules for the edification of the masonry bridge and for its conservation.
In the following one develops a static analysis of a study case, concerning a bridge selected in the region Campania; the study is based on the application of the kinematic theorem of Limit Analysis for No-tension structures [8]-[32], which is usually assumed for dealing with masonry constructions.
For the specific case at hand the objective is to give a response about the stability assessment of the bridge, that, as well known, represents a fundamental issue when addressing masonry bridges that are still currently active, like in the treated case, as transportation infrastructures on the territory.
This analysis is also aimed at selecting the worst position for accidental loads, able to identify the most dangerous condition for the bridge under the applied loads.
II. The Study Case
II.1 Introduction to the study case: the Devil's bridge on the Sele river
Starting from the pre-roman period, the use of masonry for the technical realization of constructions has been largely employed, and in particular for the construction of bridges, continuously until the beginning of the XXX century.
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