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A New Structural Health Monitoring System to Assess Bridge Scour

Panagiotis Michalis[1,2], **Manousos Valyrakis**[3], and Elissavet Vintzilaiou[4]
[1]National Technical University of Athens, School of Civil Engineering, Athens, Greece (pmichalis@mail.ntua.gr)
[2]INNOVATEQUE, Athens, Greece (www.innovateque.com)
[3]School of Engineering, University of Glasgow, Glasgow, United Kingdom
[4]National Technical University of Athens, School of Civil Engineering, Athens, Greece

Scour action still remains the leading cause of numerous bridge failures each year and is considered one of the most destructive flood related hazards occurring around underwater foundation elements [1]. Undetected erosion related processes are therefore the cause of major disruptions to the transportation network with significant socio-economic losses and disruption to users, maintainers and asset owners. Recent cases of bridge failures due to extreme climatic events have highlighted the need for a reliable scour monitoring and early warning system to assess flood and geo-related hazards in real-time, providing advanced key info for repair and maintenance actions. Despite the past efforts to provide such a system for scour assessment, most of these instruments have not managed to realise a solution for scour monitoring due to technical and cost issues. The existing practices to assess, manage and maintain transportation assets are mainly based on visual inspection procedure which is also considered to be insufficient [2]. As a result there currently exists a gap in the knowledge and understanding of scour mechanism during flood incidents.

This study presents the architecture of 'Climatic Hazard Monitoring and Bridge Scour Early Warning System' (CliHaMoS) project, which is expected to significantly assist towards the optimisation of bridge performance against scour issues with a real-time data driven approach. CliHaMoS platform comprises of a new structural health monitoring system based on a novel bio-inspired sensing system aiming to deliver key information under different hydrodynamic events for real-time and forecasted assessment of flood hazards at bridges. The sensing solution is coupled by an early warning system, with advanced interoperability characteristics, to provide a holistic interactive platform and ensure that risks associated with flood hazards are properly and timely communicated to end-users. The obtained information is expected to enable stakeholders to plan adaptation strategies and proactively manage and maintain transportation infrastructure.

[1] Michalis, P., Saafi, M., and Judd. M. (2013) Capacitive sensors for offshore scour monitoring. Proceedings of the ICE – Energy, 166 (4), pp. 189-197

[2] Michalis, P., Saafi, M. and Judd, M. (2012) Wireless sensor networks for surveillance and monitoring of bridge scour. Proceedings of the XI International Conference Protection and Restoration of the Environment - PRE XI. Thessaloniki, Greece, pp. 1345–1354.

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