A NEW APPROACH FOR DAM MONITORING AND SURVEILLANCE USING BLIND SOURCE SEPARATION

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Abstract. *Usually, dam monitoring systems are based on both boundary conditions (temperature, rainfall, water level, etc.) and structural responses (displacements, rotations, pore pressures, etc.). Statistical analysis tools are widely used to compare the current response of the dam with a whole set of recorded data, in order to determine eventual unwanted behaviors. The main drawback of this approach is that the structural response quantities are related to the external loads using analytical functions, whose parameters do not have physical meaning. In this paper, a new approach, based on Blind Source Separation (BSS) to find out the contributions of the external loads: air temperature and hydrostatic pressure, structure deformation and identify the irreversible component in structural response, is presented. Finally, it presented a case study whose purpose is to assess the separation of the contributions due to the external loads mentioned above without a priori knowledge of the generator phenomena or of the propagation environment, and use only the crest displacements of a concrete dam.*
Keywords: Blind source separation, Statistical analysis, Second-order statistics, SOBI algorithm, Dams monitoring

1. **Introduction.** Large hydro dams, more than other engineering constructions, have strong interactions with environmental, hydraulic and geotechnical factors (i.e., air and water temperature, water level, pore pressure and uplift, rock deformability), which influence the structural behavior [1]. In this case, the detection of significant changes of structural behavior represents a constant challenge for engineers involved in hydro dams monitoring. Although the monitoring and behavioral prediction of the hydro dams and their corresponding sites relies on the analysis of some objective information, a large number of sensors and examination modalities render the human inspection of this information very difficult, if not even impossible. Also, it is not easy to get reliable measurements by means of instruments often placed in hostile environment, where humidity, temperature change, freeze and difficult access put to the test any kind of mechanical and electronic tool. Even for good records available, the data handling issue is an essential component of obtaining a good monitoring.

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