Avviso di seminario: 13/5/2025 ore 16:00 Aula Albenga, DISEG, Politecnico di Torino

Dr. David Ester – Senior Lecturer – School of Natural and Built Environment – Queen's University - Belfast

"From bridge inspection toward population based structural health monitoring"

Abstract

Structural Health Monitoring (SHM) is essential for maintaining bridges, as traditional inspections are infrequent and may miss subsurface damage. However, SHM implementation faces challenges due to high costs and difficulty in obtaining damage-state data. Population-Based Structural Health Monitoring (PBSHM) addresses this by enabling data sharing across similar structures, requiring a reliable method to assess bridge similarity. Using graph theory (Fig 1) researchers established similarity scores (Fig 2) and investigated whether structurally similar bridges exhibit comparable dynamic responses (Fig 3). Modal testing confirmed alignment between PBSHM metrics and bridge mode shapes, validating PBSHM's potential for effective bridge monitoring and transfer learning.

Bio

After completing my undergrad, I worked for 8 years as a bridge designer/inspector. This prompted my interest in bridge Structural Health Monitoring (SHM) and I completed my PhD on the topic in University College Dublin. After which I was awarded a Marie Curie Fellowship with a focus on field monitoring or bridges at University of Exeter. Since joining Queen's University Belfast my research interest has been on practical ways of collecting bridge data and how to exploit this data for decision making. A particular focus has been on population based structural health monitoring can potentially assist with this. I have published extensively in the area (52 journal and 42 conference papers) with 1,800 citations and a H-index of 26. I have been PI or Co-I on grants worth over €2 million.
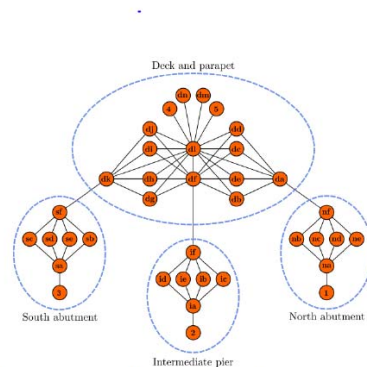

Fig 1, Representing a beam and slab bridge as a graph

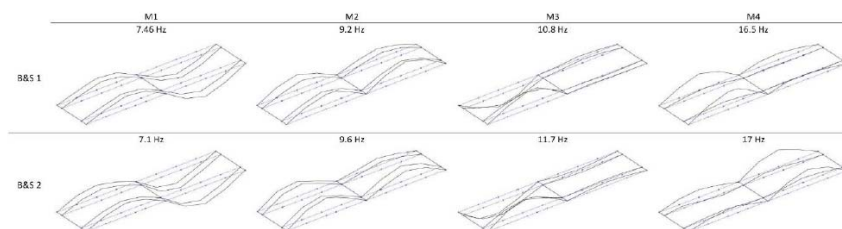Fig 2, calculating similarity scores between 4 different beam and slab bridges

Fig 3, Similarity between the modes of the first two beam and slab bridges