bridge sms

Intelligent Bridge Assessment Maintenance and Management System

Authors:

Dr. Eamon McKeogh, Senior Lecturer in the Department of Civil & Environmental Engineering, MaREI, School of Engineering, University College Cork, Ireland

Igor Kerin, MEng C.E., Research Assistant, MaREI, Environmental Research Institute, University College Cork, Ireland

Dr. Damir Bekić, Assistant Professor at Water Research Department, University of Zagreb, Faculty of Civil Engineering, Croatia

Dr. Vikram Pakrashi, Dynamical Systems and Risk Laboratory, Civil and Environmental Engineering, School of Engineering, University College Cork, and MaREI, Environmental Research Institute, University College Cork, Ireland

Project Partners:

University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

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Introduction

Government agencies, the public and private sectors and professional engineering sectors across Europe need to come together and proactively meet the challenge of creating a climate resilient infrastructure system [1]. The continual inspection, assessment and maintenance of bridges requires a multidisciplinary approach. Bridge inspection systems must have a knowledge and appreciation of structural engineering, geotechnics, hydraulics, hydrology, materials and transport management. BRIDGE-SMS will couple state-of-the art scientific knowledge in hydrology, river and structural engineering with industrial knowledge in infrastructure management and web based bridge management systems to develop an open source cloud based intelligent decision support system for the assessment and management bridges structural and hydraulic vulnerability of bridges over water, and also vulnerability for other effects [2,3,4,5]. Overview of existing BMS is shown in [6].

End-User - Bridge owner and network operator
- Expertise in day to day management of bridge structures over rivers
- End User perspective
- Test-bed for new system development

UniZag - Academic Experts
- River hydraulics
- Computer simulations of river and bridge modelling
- Scour protection measures

Nivas - Software Developers
- Software platfrom experts
- New software system integration
- Open Source experts

UCC - Academic Experts
- River hydrology & hydraulics
- River & bridge modelling (scaled physical modelling)
- Foundation engineering
- Scour protection design & installation
- Risk modelling and quantification
- Foundation and Structural Engineering

Intelligent Bridge Management System

BRIDGE-SMS

Project Objectives

1. Document the structure history (status, problems, maintenance, construction works)
2. Developing a new methodology and approach which will use innovative ICT technologies, computer models and monitoring equipment.
3. Conceptualisation, creation and optimisation of a decision support system (software)
4. Provide appropriate information for management, decision making, maintenance and mitigation in one place and at any time and any place.

BRIDGE SMS Key goals

BRIDGE SMS is a software application that empowers engineers and key personnel to predict, identify and prepare for potentially destructive flood events. It is robust and efficient tool designed to lower maintenance/planning costs and to provide more secured bridge management/operation. BRIDGE SMS key goals:

1. To develop standardised methods for bridge scour inspection.
2. To develop normative documents for bridge assessment and management.
3. To estimate the risk of and manage the potential effects of flood events.
4. To develop a database framework which is designed for intuitive use, encouraging participation by personnel at all levels within management authorities.
5. To develop a system that

- Supports, integrates and processes real-time data at regular intervals from weather and hydrologic sources, meters and gauges, and other sensing devices.
- will rapidly notify based on in-built intelligence and decision-making processes, relevant personnel of possible maintenance and failure issues.
- will advise in relation to current Scour Risk at bridge structures and prompt an appropriate Plan of Action (POA) which may involve various levels of maintenance and repair.
- which will prioritize and optimize the operational and maintenance budget spend for infrastructure companies.

6. Maximum use of new Information and Communications Technology (ICT) hardware such as tablets and cloud-based systems for on-site rapid communications, etc.

Future work

Future work is covered in five Work Packages. Technical work research, data collection, development of bridge management system, application design, etc will be part of WP 2 and 3. ToK is part of WP4. Project management and dissemination are part of WP 1 & 5.

WP	Work package title
WP 1	Management
WP 2	Technical Research
WP 3	Development of Bridge Scour Management System
WP 4	Knowledge Transfer and Training
WP 5	Dissemination and Commercialisation

Research Methodology and Approach

- Development of Standardised Methods for Bridge Scour Inspection (WP2)
- Develop normative documents for bridge assessment and management (WP2, WP4)
- Incorporate a system that calculates the risk of and manages the potential effects of hydraulic events
- Develop a database framework which is designed for intuitive use, encouraging participation by personnel at all levels within management authorities (WP3)
- Develop system which rapidly notifies relevant personnel of possible maintenance and failure issues (WP4)
- Set-up operational system for selected pilot study/es. This requires:

Basic data gathering: Compile the data available for the selected bridges, parameters such as identifiers and location co-ordinates, historic reports and photographs, structural data.

Detailed data gathering: Identify all elements associated with each bridge structure and the hydraulic behaviour of the associated waterway. The elements will include bridge structures, waterways, catchments, gauges and radar stations.

Hydrological-hydraulic study will calculate threshold values for water flow volumes and heights. This may require detailed hydraulic surveys of bridge sites (Figure 2).

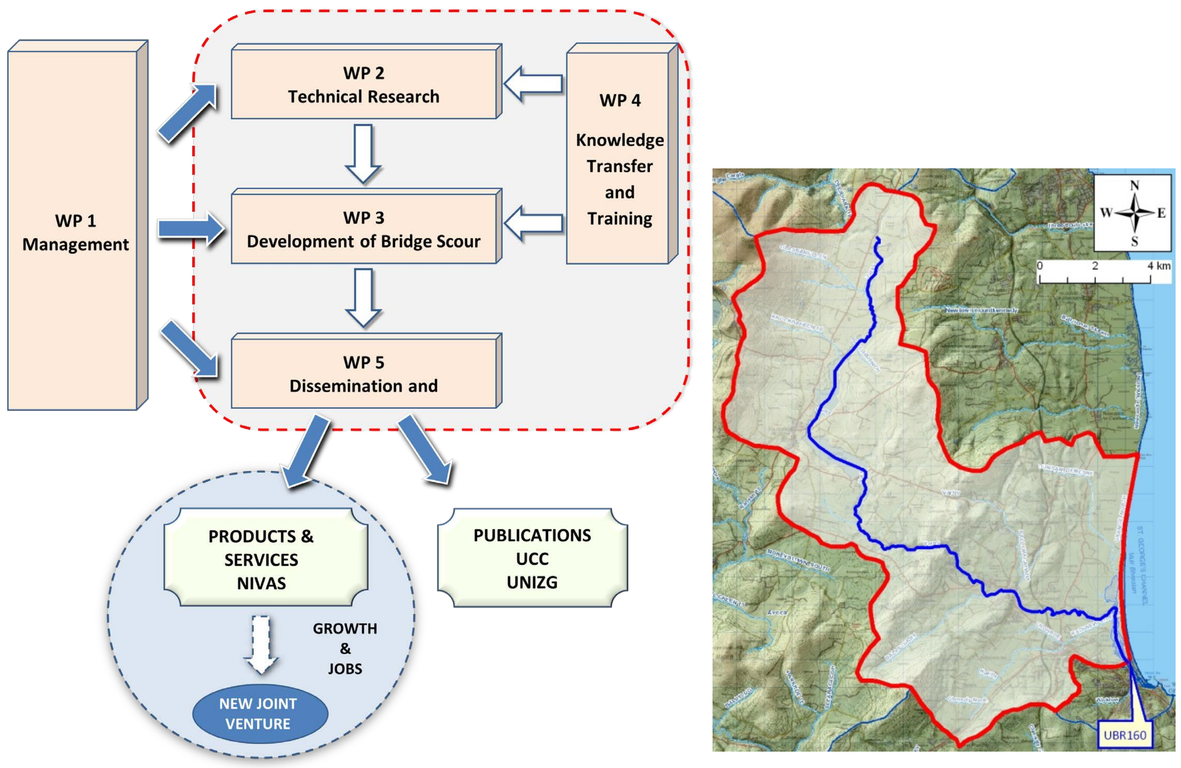

Figure 1. Work package Structure

Figure 2. A Bridge catchment data

References & Acknowledgment

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Supporting institutions:

Cork County Council
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