

TING SCIENCE AGENDAS FOR EUROPE

S3T

Smart Structural Systems Technologies

Smart Structural Systems Technologies (S3T)

The scientific scope of the Smart Structural Systems Technologies (S3T) is to further the state-of-the-art on theory and experiments for the integration of sensor- and system-development into mechanical, civil and other structural engineering systems in order to facilitate extensive monitoring and structural management. The programme is inherently multidisciplinary drawing on expertise from civil, mechanical, aeronautical, aerospace, electrical and computer engineering as well as material science. The main research topics promoted under S3T are: modelling of structures and machines; sensors and actuators; systems; analysis & decision making.

List of funded Collaborative Research Projects (CRPs)

Comparison of Vibration Control in Civil Engineering using Passive and Active Dampers (COVICOEPAD)

(CNR, FCT)

COVICOEPAD focuses on the assessment of vibration control in tall- and long-span civil engineering structures under dynamic transient or cyclic actions of short or long duration. Specifically, the project contributes to the development of analytical and computational techniques for vibration control; characterisation of the behaviour of control algorithms and dampers in reference structures; experimental validation on large-scale structures; optimisation of vibration control for mitigation of natural hazards.

Project Leader:

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Department of Civil Engineering, G305, Faculty of Engineering, University of Porto, Porto, Portugal

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Associated Partner:

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ELSA Unit, Institute for Systems, Informatics & Safety (ISIS), Joint Research Centre (JRC), Ispra, Italy

Material Algorithms, Finite Element Methods, Experiments (MAFESMA)

(AKA, FWO, GAČR)

MAFESMA aims at bridging the gap between extending material knowledge and the design of active machines and structures, focusing on:

- Tools for modelling the functional behaviour of Shape Memory Alloys (SMA) and Magnetically actuated Shape Memory (MSM) alloys
- Controlling the long-term behaviour of SMA/MSM actuators
- Development and control of SMA-actuated smart structures, especially smart Fibre Reinforced Polymer composite structures.

Project Leader:

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Micro-Measurement and Monitoring System for Ageing Underground Infrastructures (Underground M3)

(CNR, EPSRC, GAČR, MCI)

One of the greatest challenges facing civil engineers is the stewardship of ageing infrastructures. Underground M3 aims at developing prototype systems for condition assessment and monitoring of ageing underground infrastructures. The project focuses on the development of micro-detection tools using advances in computer vision; micro-monitoring and communication tools using MEMs and wireless communication; and advanced engineering analysis tools. Field trials are conducted in the Prague Metro, the London Underground and Barcelona/Madrid Metros.

Project Leader:

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Shape Control of Membrane Reflectors (SCMeRe)

(EPSRC, FNRS)

With the use of Gossamer structures, made of membranes or thin shells of reflecting materials, ultra large, light-weight telescopes can be envisaged. These can be several orders of magnitude lighter than the current monolithic passive mirrors. SCMeRe addresses the following scientific and technological challenges: nonlinear analysis of piezoelectric membranes subjected to buckling; inverse problem for strain distribution for a given shape error; metrology; active shape control of distributed piezoelectric shells and membranes.

Project Leader:

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Shape Memory Alloys to Regulate Transient Responses in Civil Engineering (SMARTeR) (CNR, CNRS, MCI)

Shape Memory Alloys (SMAs) have the potential to be used in structural design as a smart material able to mitigate the effects of transient loading. SMARTeR focuses on methodologies and tools for the optimal design of SMA dampers fitted for applications in civil engineering, i.e., on constitutive laws and material models; numerical tools for simulation and control of structures incorporating SMAs; experiments; and validations on cable-stayed bridges for reducing cable vibrations caused by wind.

Project Leader:

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Smart Aircraft Morphing Technologies (SMORPH)

(EPSRC, FCT)

Advances in smart structures and active materials during the last decade are likely to yield significant changes in aircraft design through the controlled change of wing shape, referred to as ‘wing morphing’. In SMORPH we investigate critical vehicle and technology issues related to morphing, such as: performance requirements; modelling methodologies; morphing design and optimisation. Wind tunnel tests and a remotely piloted vehicle are used for proof-of-concept analysis and validations of morphing concepts.

Project Leader:

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Principal Investigators:

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Associated Partner:

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Smart Sensing for Structural Health Monitoring (S3HM)

(AKA, EPSRC, FNRS, MNISW)

S3HM is concerned with predictive maintenance and lifetime extension of civil engineering structures. The specific objective of this project is to combine the most recent developments in sensor and actuator technology, networks, signal processing and computer techniques to explore new avenues in structural health monitoring (SHM). The project addresses the following issues: using smart sensing technologies for SHM; extracting features relevant to damage and immunity to variability; designing robust methods for autonomous SHM systems.

Project Leader:

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The aim of the European Collaborative Research (EUROCORES) Scheme is to enable researchers in different European countries to develop collaboration and scientific synergy in areas where European scale and scope are required to reach the critical mass necessary for top class science in a global context.

The scheme provides a flexible framework which allows national basic research funding and performing organisations to join forces to support excellent European research in and across all scientific areas.

Until the end of 2008, scientific coordination and networking is funded through the EC FP6 Programme, under contract no. ERAS-CT-2003-980409. As of 2009, the National Funding Organisations will provide the funding for the scientific coordination and networking in addition to the research funding.

www.esf.org/eurocores

THE FOLLOWING NATIONAL FUNDING ORGANISATIONS SUPPORT THE S3T PROGRAMME:

**Fonds zur Förderung der wissenschaftlichen
Forschung in Österreich (FWF)**

Austrian Science Research Fund, Austria

**Österreichische Akademie der
Wissenschaften (ÖAW)**

Austrian Academy of Sciences, Austria

**Fonds National de la Recherche
Scientifique (FNRS)**

National Fund for Scientific Research, Belgium

**Fonds voor Wetenschappelijk Onderzoek
(FWO)**

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Suomen Akatemia (AKA)

Academy of Finland, Finland

**Centre National de la Recherche
Scientifique (CNRS)**

National Centre for Scientific Research, France

Magyar Tudományos Akadémia (MTA)

Hungarian Academy of Sciences, Hungary

Enterprise Ireland, Ireland

**Irish Research Council for Sciences,
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Ireland**

Consiglio Nazionale delle Ricerche (CNR)
National Research Council, Italy

**Ministerstwo Nauki i Szkolnictwa
Wyzszego (MNISW)**

*Ministry of Science and Higher Education,
Poland*

Fundação para e Ciência e Tecnologia (FCT)
*Foundation for Science and Technology,
Portugal*

Slovenská Akadémia Vied (SAV)
Slovak Academy of Sciences, Slovak Republic

Ministerio de Ciencia y Innovación (MCI)
Ministry of Science and Innovation, Spain

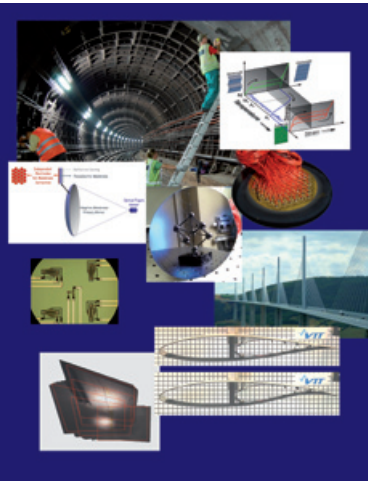
**Nederlandse Organisatie voor
Wetenschappelijk Onderzoek (NWO) –
Technologiestichting (STW)**
*Netherlands Organisation for Scientific
Research – Technology Foundation,
The Netherlands*

**Türkiye Bilimsel ve Teknolojik Arastırma
Kurumu (TÜBİTAK)**
*The Scientific and Technological Research
Council of Turkey, Turkey*

**Engineering and Physical Sciences
Research Council (EPSRC),
United Kingdom**

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