SMARTeR
Shape Memory Alloys to Regulate Transient Responses in civil engineering

Michel Frémond

Project leader

Principal Laboratories and Investigators

- **CNR-IMATI, Ferdinando Auricchio,**
- **Polytechnical University of Catalonia, Vicenç Torra ,**
- **Laboratoire Lagrange / CNRS-LCPC,**
- **FEMTO, Christian Lexcellent ,**

and an Associated Partner,
JRC, Georges Magonette.

- *Shape Memory Alloys have important dissipative properties which are all connected to the solid-solid phase transformation between austenite (stable at high temperature) and martensite (stable at low temperature) :*
- *possibility of dissipating large amounts of energy ;*
- *good fatigue resistance and great reliability in the long run.*

SMA have the potential to be used in structural design as a smart material able to mitigate the effects of transient loading.

The proposed Project builds on these ideas : methodologies and tools for the optimal design of SMA dampers fitted for applications in civil engineering

- **Task 1** Development of adequate constitutive laws and material models (*12 months*)
- **Task 2** Development of numerical tools for the simulation and control of structures incorporating SMAs (*12 months*)
- **Task 3** Small-scale experiments (*15 months*)
- **Task 4** Large-scale experiments & Finalization (*18 months*)

The aim of the large scale experiment is the validation of a SMA damper designed to reduce the vibrations due to wind in the cables of bridges.

The large-scale tests will be performed on an actual cable-stayed bridge in the west of France.

Bridge of Iroise

Bridge of Saint Nazaire

- **Task 1 Development of adequate constitutive laws and material models (*12 months*)**
- state-of-the-art, thermomechanical and physical modelling, mathematical study of the evolution problem.

- ***Milestone 1 Delivery of material models for SMA, consistent with physical, mechanical and mathematical considerations***

- **Task 2 Development of numerical tools for the simulation and control of structures incorporating SMAs (*12 months*)**

  development of numerical algorithms, mathematical validation, control strategies

- ***Milestone 2 Validation of the models by comparison between simulation and small-scale experiments***
- *Deliverable : report on the models developed (constitutive laws, numerical algorithms, control)*

- **Task 3 Small-scale experiments (*15 months*)**
- Identification of the constitutive parameters entering the models considered, validation of the control strategies and simulation tools.

- ***Milestone 3*** *Implementation of SMA-based control strategies on small-scale experiments.*

- **Task 4 Large-scale experiments & Finalization (*18 months*)**
- true-scale validation of the methodologies developed, conclusions on the design of SMA-dampers

- ***Milestone 4 Validation of the methodologies developed on large-scale experiments***
- *Deliverable : rules and recommandations for the optimal design of SMA-based dissipators in civil engineering.*

S3T
EUROCORES PROGRAMME
EUROPEAN SCIENCE FOUNDATION COLLABORATIVE RESEARCH

SMARTeR

Shape Memory Alloys to Regulate Transient Responses in civil engineering

A Collaborative Research Project funded by European Science Fundation

kick-off meeting and brain storming session

Pavia – IMATI del C.N.R.

September, 11/12, 2006

Location

The meeting will be held at IMATI (Institute of Applied Mathematics and Information Technology) - C.N.R. in Pavia.

Accomodation

Participants are advised to make their own hotel reservation. A list of hotels in Pavia is provided for convenience.

Hotel Aurora ★★
27100 Pavia (PV) - Viale Vitt. Emanuele, 25
☎ + 39 0382 23664
🖷 + 39 0382 21248
www.albergoaurora.com
info@albergoaurora.com

Hotel Rosengarten ★★★
27100 Pavia (PV) - Piazza Golgi, 21/23
☎ + 39 0382 526312
🖷 + 39 0382 525186
www.rosengarten.pv.it
rosengartenpv@tin.it

Excelsior Hotel ★★★
27100 Pavia (PV) - Piazzale Stazione, 25
☎ +39 0382 28596
🖷 +39 0382 26030
www.hotelrizpavia.com/hotel_excelsior_pavia/ambienti.html
info@excelsiorpavia.com

Hotel Ariston ★★★ (restoration – opening sept'06)
27100 Pavia (PV) - Via Scopoli, 10
☎ + 39 0382 34334
🖷 + 39 0382 25667
ariston@aristonpavia.it
www.aristonpavia.it

Moderno Hotel Pavia ★★★★
27100 Pavia (PV) - Viale Vittorio Emanuele, 41
☎ + 39 0382 303401
🖷 + 39 0382 25225
www.hotelmoderno.it
info@hotelmoderno.it

Registration

Early registration is kindly recommended. Participants should comunicate their participation and the title of their presentation by returning the registration form. A fee of approximately 120.00 € may apply.
The fee comprises a fixed-menu lunch and social dinner plus coffee breaks.

Registration Form

The organizing committee would be grateful if participants would complete the following form and return it by fax or post mail or send the same information by email.

☐ I intend to give a presentation with the tentative title

_____

_____

_____

Authors:

_____

_____

_____

Title: ___ **First Name:** _____

Surname: _____

Organization: _____

Address: _____

_____

Code/City: _____ **Country:** _____

Phone: _____ **Fax:** _____

Email: _____

☐ I intend to participate to the social dinner on sept. 11, 2006