

SATIN project

Press release – November 18, 2009

The SATIN project is a project funded by the European Commission under the FP6-IST Multimodal Interfaces program. SATIN stands for Sound and Tangible Interfaces for Novel product Design.

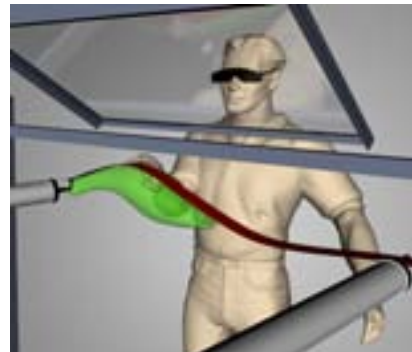
The project lasted 3 years, has received a funding of approximately 3 Million €, and has been coordinated by Politecnico di Milano.

Nine partners from six European countries participated to the SATIN project:

- 4 academic and research institutions: Politecnico di Milano as coordinator, University of Nottingham in UK, Eindhoven University of Technology in the Netherlands and INESC in Portugal.
- 2 technology providers: the Dutch MOOG-FCS company providing haptic technology and the French think3 company providing CAD tools.
- 3 end users: two Italian well-known companies of the design sectors: Italdesign-Giugiaro and Alessi, and the Slovenian company Steklarna-Hrastnik.

The **SATIN system** is a novel multimodal and multisensory system for the evaluation of virtual shapes of aesthetic products based on haptic interface, co-located stereoscopic visualization and sound.

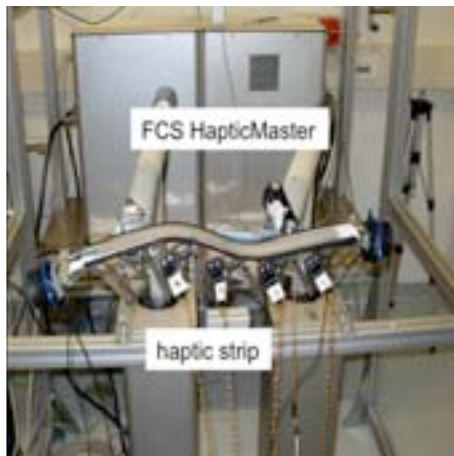
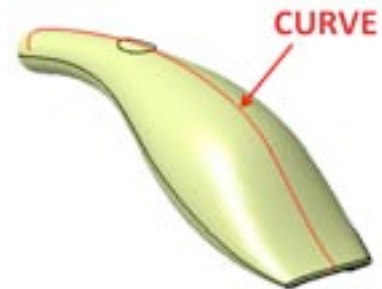
The haptic interface consists of a tangible strip, moved and oriented in space by two FCS-HapticMaster systems, that mimics the tape placed by designers on physical mock-ups for evaluating style lines. A 3D visualization of the shape is superimposed onto the physical device by means of a rear-projected stereoscopic display system.



During the system development, it has been paid attention to the ergonomic configuration of the system: the collocation of the visualization structure and of the haptic system is such that the user can comfortably reach and operate within the working space. The configuration system has been extensively tested with users, and a moving platform has been added in order to better adapt to users' height. The **stereoscopic visualization system** consists of a DLP projector that projects images alternated for right and left eye onto and through a set of mirrors and screens. The use of shutter glasses and of an optical tracking system for detecting the user's point of view enables the user to see a 3D image of the virtual object superimposed on the haptic strip.

The main issue that has been addressed in the design and development of the haptic interface was providing a tangible experience satisfying two aspects: first, have a long continuous deformable haptic surface to be touched, in order to perceive the global shape of products, as parts of car bodies; second, have the possibility of communicating and enabling the user to perceive local and very fine geometric characteristics of a curve, as curvature discontinuities.

The haptic device consists of a **force sensitive tangible strip**, positioned and oriented in space over the simulated virtual object. The user manipulates a virtual cutting plane for selecting a section, which is a curve, of the virtual model of an object.

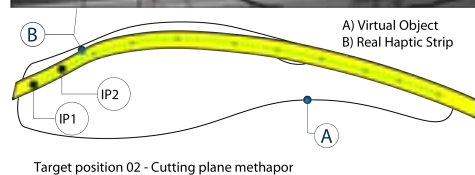


The strip actively shapes itself for representing the curve, and is placed in the appropriate position and orientation in the workspace by the two FCS-HapticMaster systems.

The haptic strip is designed as a continuous physical spline that is actuated into the desired shapes by equidistant relative actuators along its length.

Several versions of the haptic strip have been developed during the project. The first version consists of a short planar strip equipped with four servos actuating the strip.

Subsequently, we have developed a **long geodesic strip** (900mm long) actuated by nine servos for rendering larger surfaces. This long strip is able to bend and twist in order to represent a broader range of curves, including geodesic curves.

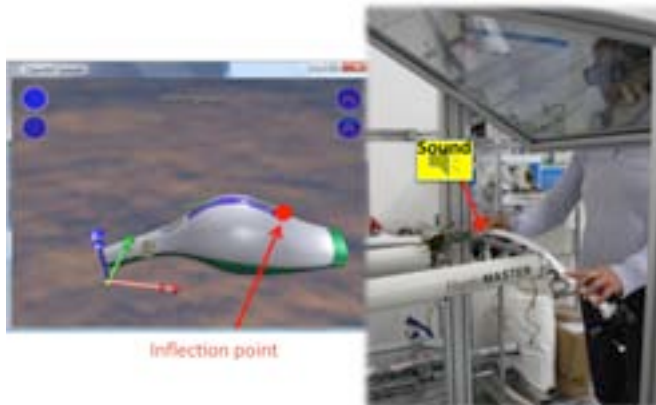


The final version of the strip is a geodesic strip of medium length (600mm) that can bend and twist, and also solves ergonomic and usability problems encountered by the users using the long version. The strip is equipped with a lighting element in order to improve the strip visibility through the mirror of the visualization system.

Being a haptic device, the tangible strip is an output device in that the strip is an **exploration device** that can be touched by the user with his full hand;



it is an **input device** as well in the sense that the strip behaves as a physical item that can be shaped manually like a physical spline. To be used as input device, the strip extremities have been equipped with sensors that can be easily manipulated by the designers for applying some modifications to the shape of the rendered curve in a natural and direct way.



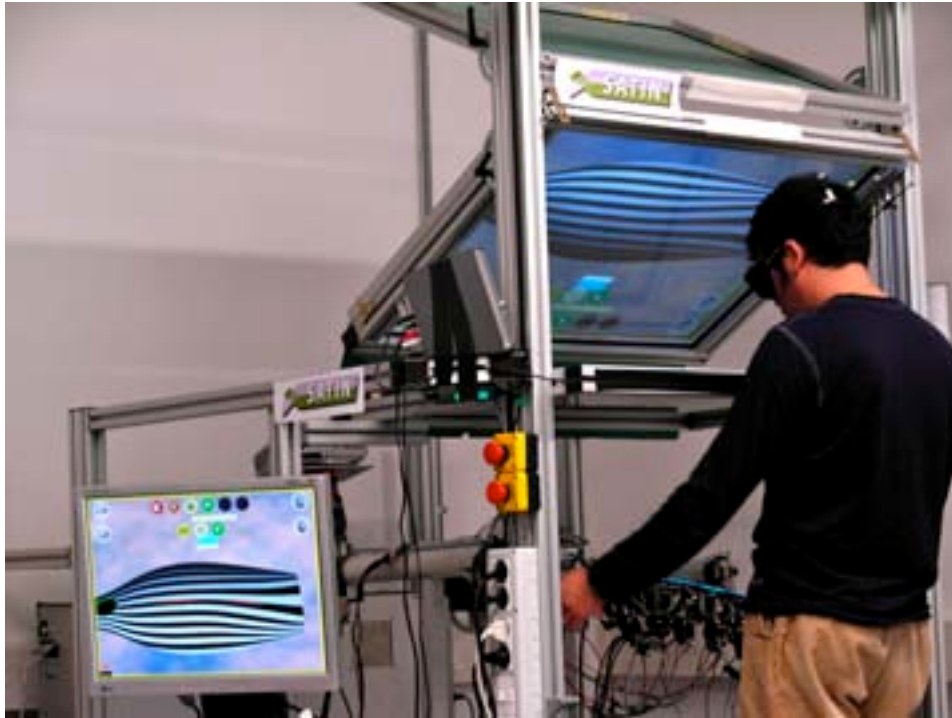
The strip interface has some limitations in representing geometric shapes. In fact, it does not allow representing the entire domain of geometric characteristics of curves, for example curvature discontinuities or inflection points. The system overcomes these physical limitations by substituting haptic cues with sounds: **metaphoric sounds** are used to render curves properties that cannot be

rendered by the haptic continuous interface. The system uses position sensors placed on the top of the strip surface as an input to geo-reference geometry properties and render them as metaphoric sounds.



The exploitation of the SATIN project will consist of a **desktop haptic strip** rendering geodesic curves, augmented with auto-stereoscopic visual rendering.

The SATIN system



For more information about the SATIN project, please visit the project web site at www.satin-project.eu, the SATINproject YouTube channel at www.youtube.com/satinproject, or write to the project coordinator Prof. Monica Bordegoni, monica.bordegoni@polimi.it