

Introduction

Today modelers are used to produce physical prototypes (PMU) of products by modeling and manipulating material like clay, foam materials, wood, etc. Modelers have knowledge on shape controls in their hands and the skill they have developed is a high value to be preserved.

Unfortunately, PMUs require time to be developed, are expensive and not easy to test. Conversely designers use CAD tools to develop virtual models that are less expensive, less costly and easier to test than PMUs. Actually, designers are dissatisfied using mouse & keyboard to design 3D shapes and would like to be physically more active in the product design process. Therefore CAD tools require to be enriched with more user friendly and effective ways of interaction, not only based on mouse & keyboard, but using interaction tools allowing for the exploitation of modeler's skills.

T'nD aims at developing a novel system for shape generation and modification based on novel haptic interaction and intelligent shape manipulation operators in order to exploit existing manual skill of modelers and designers.

Designers will be able to work with they full hands, as modelers do in their daily work, using a novel haptic device for modeling product shapes.

Haptic technology will be integrated together with modeling operators for providing a working environment offering high degree of usability and acceptance, comfort of usage, flexibility for any kind of user, including inexperienced users.

Expected results

The project will provide the following technical results:

- Improvement of theoretical foundations in the field of shape modelling and haptics in respect to state-of-the-art.
- Scenarios showing the evolution and specifications for future haptic interaction methods and devices.
- Improvements of cognitive ergonomics theories, including integration of vision and haptics in human-machine interaction.
- Stand alone components:
 - new haptic manipulator, performing real time rendering of complex shapes and providing full-hand interaction;
 - new shape modeling techniques supporting easy and intuitive creation and deformation of shapes.
- Prototype of an innovative system integrating shape modeling and haptic manipulator.
- Best practice for end-users.

T'nD system will show high level performances to be daily used by designers. Thus, it will be easy and intuitive to use and will provide shape manipulation functionalities, that make designers save time and effort in complex shape design (for example, the system will provide "scraper" operators for smoothing the shape, intuitive operators for assisting the definition of constraints, and more).

One of the most innovative aspects provided by the system is that designers are not expected to know mathematics behind geometric modeling for designing complex shapes, but they can simply, directly and intuitively manipulate virtual shapes using the T'nD system.

