NEST
Pathfinder

EXPLORING SOUND: THE NEGLECTED DESIGN DIMENSION

CLOSED

The solid click of a well-made switch enhances our enjoyment of using everyday appliances, while a whining vacuum cleaner can cause great irritation. But sounds also trigger more subtle perceptions and emotions regarding functionality and overall aesthetics, which have so far eluded measurement. The CLOSED project aims to develop innovative tools that will fill this gap in the product design loop, enabling modern technology to be deployed in tailoring sonic signatures for optimal consumer satisfaction.

Superior design is one of Europe's great strengths in the global market of consumer goods, contributing enormously to the profitability of EU enterprises and the quality of life for citizens. The region pioneered the discipline of industrial design, which has evolved over the past century to satisfy the needs and desires of customers with products that are functionally and aesthetically appealing, as well as affordable.

Until recently, the aesthetics of objects were seen primarily in purely visual terms, and their ergonomic forms were based on static adaptation to the shape and postures of the human body. Today, as computing and communication elements are increasingly embedded into the artefacts that surround us, it has become more important to determine how people interact dynamically with such objects. This has led to the emergence of 'interaction design', a field in which Europe continues to lead and innovate.

Even now, however, while tactile information is gradually entering the design consciousness, functional sound (other than in a few special cases such as vehicles and office equipment) continues to be a largely unexplored territory. With consumers showing a growing preference for products that sound well-made and functional, and which contribute to a pleasant soundscape, this represents a serious knowledge gap. The need to close that gap will become increasingly urgent as the hunger for convenience goods adds more and more devices to the sonic environment.

Emotional connotations of sound

Over the past two decades, psychophysical methods have made it possible to characterise basic acoustic preferences and aversions as values on comparative scales. But these fail to account for emotional and cognitive responses related to the functional and aesthetic aspects of a product. Most classes of everyday sound are believed to have emotional connotations that influence the way listeners perceive them. It takes a fraction of a second for a person to respond emotionally to an object, and to accept what is deemed positive and avoid the negative.

"CLOSED could form the foundation for a whole new user-centred acoustic design methodology."

A systematic approach to evaluating such phenomena would provide a means to predict human responses to new everyday products. This would enable designers armed with the latest technology to tailor sounds with the express purpose of increasing consumer satisfaction. Already, for example, Apple's iPod music player emits a 'satisfying' artificially-created mechanical sound when the scroll wheel is rotated. The objective of CLOSED is to develop the tools necessary for the realisation of this progress.

Loop process

Like the design process itself, CLOSED functions as an iterative loop, in which four European institutes are embarking on cooperative fundamental research under the coordination of IRCAM, France.

Italy's Univerona will begin by developing a series of interchangeable building blocks in the form of sound synthesis algorithms for incorporation into physically-based interactive sonic models and sounding objects. Initially based on a repository available from earlier research, the algorithms will be refined and augmented as the initiative progresses. A main goal will be to reproduce naturalistic acoustic settings.

Special prototype appliances will then be constructed at HGKZ, Switzerland, to reflect physical, interactive and sonic features relevant to selected real-life cases and scenarios. These artefacts will serve as the test-beds for trials with human volunteer subjects. They will be equipped with microelectronic circuitry capable of transmitting computer-generated sounds sent wirelessly from a PC, as well as detectors (such as cameras, position sensors and accelerometers) for real-time monitoring of users' reactions.

Psychological experimentation by IRCAM will determine the qualitative aspects of sounds at the perceptual, cognitive and emotional level. A novel goal for the methods developed here will be to investigate the relationship between identity patterns, based on functional analysis, and the corresponding emotional dimensions, in terms such as arousal, pleasure and dominance.

Germany's NIPG will define the most suitable measuring strategy, employing an array of techniques including post-Fourier analysis, computational auditory-scene analysis and unsupervised clustering to achieve an adequate representation of the sound patterns synthesised for the building blocks. Subsequently, classification and prediction systems will be developed for automatic capture and measurement of the emotional and functional-aesthetic attributes identified by the psychological experiments. The closeness of match between predictions and experimental results will provide proof of quality for the methods.

Continuous feedback around this loop throughout the three-year project (visit www.closed.ircam.fr) will permit progressive reshaping of the sonic 'appearance' of the prototypes in response to the partners' discoveries. In the long-term, CLOSED could form the foundation for a whole new user-centred acoustic design methodology, connecting beauty and function via a state-of-the-art combination of phenomenology, system modelling, mathematics and psychology.

AT A GLANCE

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Project cost
€ 1 791 712

EU funding
€ 1 417 402

Project reference
Contract No 029285 (NEST)

Function, aesthetic, and emotion guide the interaction with an object.

The sounds of everyday products are indeed able to elicit emotional responses. Designing sound often leads to the design of an emotional response that should be elicited from the listener. One of the aims of the project is to imagine the tools necessary to make such designs successful.