DESIGN FOR THE SYNESTHESIA.
AUDIO, VISUAL AND HAPTIC CORRESPONDENCES EXPERIMENTATION

Dina Riccò¹, Antonio Belluscio², Silvia Guerini³

¹Politecnico di Milano, Facoltà del Design, Italy; e-mail: dina.ricco@polimi.it
²Politecnico di Milano, Facoltà del Design, Italy; e-mail: antonio.belluscio@sinestesie.it
³Politecnico di Milano, Facoltà del Design, Italy; e-mail: silvia.guerini@polimi.it

Abstract: Digital communication lead us to produce pluriregistic messages, distributing contents and informations on different sensorial modalities. So the digital communication designer becomes a sort of synesthetic orchestrator, a manipulator of sensations that has the ability to work not only between texts and figures, but also between sounds, haptic stimuli and so on. The paper indicates some didactic and synesthetic basic design works and proposes the starting up of a Web site for the experimentation of interaction between visual, haptic and auditory elements. (www.sinestesie.it).

Keywords: Synesthesia, Design, Multimedia, Human-computer interaction, Human perception, Human-centered design.

1. THE DESIGNER AS A SYNESTHETIC ORCHESTRATOR

Digital communication lead us to produce pluriregistic messages, that is to distribute contents and informations on different sensorial modalities. By this time the digital world give us communications rarely visual only; they are often communications that involve directly the tactility, the gestuality, the sonority. For example the feedback received from a mouse action on the display produce an interaction, a dialogue between multisensorial informations.

However, the multisensorial offering of digital communication and the exigence of a synesthetic coherence, are in opposition with a strong project tradition of useful industrial objects that first of all pay to the eye qualities, like formal andchromatic qualities. In fact, since few years ago this visual project tradition didn’t interfere too much on aesthetic qualities or on the artifacts functions.

Especially since the introduction of specific technologies – by one side the techniques of material’s artificialization, to define the sensorial qualities (Manzini, 1986), by the other side the informatic technologies able to offer pluriregistic communications – take place a new designer figure as a synesthetic orchestrator. We mean a designer as a manipulator of sensations, who is able to work with texts, figures, but also with sounds, haptic stimuli, etc. in order to make a mutual congruence between them (Riccò, 2001). The studies on synesthesia – in their triple nature of perceptive phenomenon, metaphor and representation, artistic or not, where you have a relation between various registers - we think it represent a useful support to define interlinguistical elements that maintain an intersubjective value (Riccò, 1999). If it is true that the subjectivity is a peculiarity of synesthetic perception, as we see in the history of synesthesia - in Newton circle of colours the musical note ‘do’ was red, in the Clavecin oculaire by Castel, the same sound was blue; in the paint translations by Luigi Veronesi it was violet - for particular compositive factors and visual/auditory elements (shapes, rhythm, texture, vocal sounds, etc.) – as Gombrich said, referring to the luminosity of vocal phoneme (Gombrich, 1965, p. 450) - we can see that there are amazing agreements.

For example, in most of us high sounds suggest clear and angular images. At the opposite, low sounds suggest dark and round images, etc. (Marks, 1975)
The same associative principle is valid for musical sounds, language sounds, with comparison between sound and its visual correspondence that lies outside the specific aspects of different cultures.

2. SYNESTHESIA IN THE BASIC DESIGN COURSE

The need of a synesthetic consciousness into an artifact’s design imply contemporarily the need of a basic instruction for design, oriented to the comprehension and control of mechanisms of sensorial interaction. This fact lead us to define a program of basic design to guide students in the research of those combinations of factors (shapes, colours, rhythms, timbres, etc.) that in an artifact – useful or communicative – can be considered shareable, and therefore to aspire to represent intersubjective values.

Here below there are the texts of two exercises assigned to the students: the first (tab. 1) is dedicated to the relation between tactile qualities and their visual representation; while the second one (tab. 2) is dedicated to the search of a visual representation in movement, congruent to a specific music sequence.

<table>
<thead>
<tr>
<th>Table 1 – Text of an exercise assigned into the Laboratory of visual communication (proff. G. Devecchi, D. Riccò, A. Poli), Politecnico di Milano, a.a. 2002/03.</th>
</tr>
</thead>
</table>
| **Visual restitution of tactile qualities**  
(D. Boriani, G. Devecchi, D. Riccò)  
**Objective**  
To construct a schedule of tactile values that maintain the same sensorial qualities both in an haptic exploration and in a visual one.  
**Proceeding**  
The exercise consists in the elaboration of three collage tables in A3 format paper.  
**Table A** – Collocate 16 samples of different materials in the same format (5 cm x 5 cm, of thickness, not over 3-4 mm), in a modular grid included in a square of 20 cm each side, positioned in the center of an horizontal A3 format paper.  
The choice of materials allow the construction of four different steps of tactile qualities:  
- smooth/rough  
- soft/hard  
- hot/cold  
- light/weight  
The disposition of materials into the grid (in a row or in a column) is chosen by the student and indicated on the table overlaying there an A3 format paper with the informations about the extremes tactile qualities.  

<table>
<thead>
<tr>
<th>Table B – Text of an exercise assigned into the Laboratory of visual communication (proff. G. Devecchi, D. Riccò, A. Poli), Politecnico di Milano, a.a. 2002/03.</th>
</tr>
</thead>
</table>
| **Design of a synesthetic audio-visual animation**  
(D. Riccò, A. Belluscio)  
The exercise consists in a project and its realization (with Macromedia Flash software) of a visual animation based on an assigned audio sequence.  
**Objective**  
A visual animation in which all the features (rhythm of movement, position of elements, etc.) are congruents respect to the assigned audio sequence (rhythm, harmony, melody).  
**Materials**  
The student can use, into the visual animation, a single kind of bidimensional geometric shape (triangle, square, circle) that can change in dimensions, colours and orientation. The total number of usable figures of the same kind is free. It is possible to create overlay’s figures and overlay’s compositions with different geometries.  
**Steps**  
1° step. Schematic representation and narration of the design idea with a short text (printed on A4 format paper) and a storyboard with free technique (3-4, A4 format paper).  
2° step. Drawing of the main frames of the animation.  
3° step. Realization and verification: the efficacy of the video results is verified by the suppression of a part of the initial audio event.
3. A RESEARCH ABOUT VISUAL AND AUDITORY INTERFERENCES

This work, that is a part of a degree thesis on Basic Design and sensoriality, consists in an experiment (Guerini, 2001) to discover the relation between visual and sound elements in a multimedia project, analyzing the *interferences* generated by the combination of specific elements of both categories. (Remember that *Interference* means an incongruence between two different stimuli belonging to different sensorial registers).

We choose basic and abstract visual elements to increase the legibility and to eliminate shapes ambiguity. They've been compared with opposite icon sound elements of a concrete soundscape (walking on the rough, move water, etc.) to avoid possible predictability of the results (that is when you combine too similar elements).

**Parameters.** The first step was to examine different physical and perceptive parameters for each sensorial register. We choose some of them in order to simplify our work during the experimentation and to focus our attention on few but precise elements.

For the visual register we choose shape, colour, texture and depth; for the auditory register intensity and duration.

**Experiment.** We’ve made two different tests:

Test 1: depth and colour-background of image compared with duration of sound.

Test 2: shape/texture and colour-background of image compared with intensity of sound. Images were in couples and each figures was opposite in its features respect to the other one of the couple creating five examples for each test (three couples of colours and two couples of black and white). Each couple of images had a couple of opposite sounds, about five seconds lasting. We examined two groups of participants; one with a predisposition to sounds (musicians, composers) and the other one more sensible to images (artists, designers, architects).

We submitted the test to each participant singularly; we showed them the series of images, we invited them to listen the sounds and to tell us their impressions.

**General results.** Most of various combinations in both groups were homogeneous and each class had the same results. Everyone perceived the big gap between the couples of sounds. Shapes were almost predominating on colour backgrounds. The sounds were immediately connected with a mental image.

The collective comparison of all the works made by students – you see an example in fig. 1 and 2 (see also: Riccò, 2000) – help us to notice the recurring correspondences between visual/tactile elements (tab. 1) and visual/auditory elements (tab. 2) and to define those correspondences that take intersubjective values. From their comparison emerged that the *qualitative features* (for example colour or sound timbre) answer to subjective values exclusively; on the contrary the *quantitative features* (for example the image size or the sound intensity) take easily intersubjective values.
Specific results.

Test 1 - Combination choices: irregular sounds/low intensity with round shapes/irregular depth; regular sounds/high intensity with angular shapes/uniform depth. Colour is subjective and its choice is different and various between the participants. The strong preference for black and white explains that colour is a sur-plus value; moreover the absence of colour allows people to focus on shape features.

Test 2 - Combination choices: irregular/low intensity sounds and round shapes with regular texture and vice versa. Colour is more important than before, increasing the expressivity of sound, that is more irregular: ‘roughs’ or ‘fragmented’ sounds are related to dark colours, whereas ‘smooth’ or ‘fluid’ sounds are related to light colours.

Conclusions. In this experience, the sound register had an important perceptive and evocative role; sound reminded to multiples informations transforming radically the visual message. In addition to the pure perceptive factor, there was the influence of other aspects (physiological, psychological, emotional, cultural and ideological) that are often determinant on our way to perceive, establishing relations with objects all around us.

4. A WEB SITE FOR SYNESTHETIC EXPERIMENTS

This early didactic experiences, where the knowledge on synesthesia is applied and verified into the basic design activities, bring us to the design and realization of a proper Web site, conceived as a research and shareable experimentation place.

The Web site at www.sinestesie.it (most part of contents is still under construction), is made by the founders group D. Riccò (scientific responsible), A. Belluscio and S. Guerini (web content editors), is a part of the activity of the Unit Research GaMS (Graphic and Multimodal Systems) directed by professor Giovanni Anceschi (IUAV, Venice, Italy).
interdisciplinary knowledges (projectual, psychological, linguistic, literary, esthetic, musical, etc.);

2. a collection of synesthetic products (design products, multimedia products, artworks, etc.);

3. a laboratory as a place – with primarily didactic finality – in which is possible to experiment the relation between sensations and to verify the phenomenal effects.

Fig. 5. Interface for the access to experimentations. It’s represented the model with the possible combinations between the categories of sensations (6 for each sensorial system), correspondent to the three sensorial systems we considered (visual, haptic and auditory). At the top: the initial situation; at the bottom: the condition that show, as an example, the access to the experiments that combine visual textures, haptic textures and auditory intensities.

For example one of the actual experiments for this last point, the laboratory, consists in a phenomenal demonstration to visualize how changes the haptic resistance at the mouse action with variations that concern the visual response mutations that concern the visual response of the cursor (fig. 6a); and mutations of the explored surface (fig. 6b).

In general, this section of the laboratory, that take more importance for us, is conceived as an instrument of control and anticipation of the sensorial qualities that are involved in a multimedia communication: the auditory qualities (pitch, intensity, timbre, duration, position and distance of the source), the visual qualities (colour, shape, texture, dimension) and the haptic qualities (rigidity, temperature, weight, texture, shape and dimension). (fig. 5).

Fig. 6a-b. Four steps of the experiment on visual perception of the haptic resistance. At the top: the variation of the cursor’s behaviour on a white and smooth surface. At the bottom: the same on two surfaces with different texture, soft (to left) and rough (to right).

Moreover, the Web site wants to be a place of interdisciplinary collaboration, therefore is open to all of them who would like to present into it their research works, their design or multimedia products, artworks, musicworks or any other thing that deal with synesthesia.

(For informations: info@sinestesie.it)

Paragraphs 1, 2 e 4 written by Dina Riccò, paragraph 3 and english translation written by Silvia Guerini, interaction design of the experiments (fig. 6) and the Web site www.sinestesie.it (figs. 4-5) by Antonio Belluscio.

REFERENCES


