Project HELP
"Seeing" a painting by visually impaired persons

Prof Benedetto Benedetti
Consorzio FORMA-Scuola Normale Superiore di Pisa

Statement of problem

A painting is typically a 2D representation of a 3D world; more precisely, it is a 2D **visual** representation of a 3D world. To understand and perceive such a representation without vision, as is the case for visually impaired persons, one needs to address three main problems, which we will synthetically label as follows.

1. The "perspective" problem. The 2D representation shows **parts** of 3D objects in such a way (i.e. by such rules of convention) that the perceiving subject can reconstruct through his cognitive work the full 3D objects
2. The "scale" problem. In order to understand what kind of 3D objects are being represented in the 2D surface one has to understand the scale at which the representation is operating: a rectangular object can represent a box or a house depending on the scale.
3. The "color" problem. While a visually perceived 3D object can be equivalently "translated" into a tactually perceived one in so far as its form and texture is concerned, this does not apply to its color: color cannot be tactually perceived.

Some of the information concerning these three levels can be given verbally, but one should remember that linguistic description is a very poor substitute for perception, for any perception and any subject (for normally seeing people, one can think about wine tasting verbal description vs. the real tasting experience). In our approach, we will therefore try to use as much as possible perception (alternative to vision), while keeping verbal information to the role of giving the general framework necessary to interpret correctly the various non visual experiences into which the three problems will be translated.

Proposed solution

Following these lines, we will build a first working prototype that can be put to real museum test.

- Problem 1 will be solved by creating a 3D extrusion of the painting (in the style of a basrelief) which will constitute the equivalent of perspective from the tactile point of view: in fact, the subject will be engaged in recreating the full object by touching only a portion of it. Verbal comments will set up the necessary framework to narrow down the interpretation of the tactual experience.
- Problem 2 will be solved in a similar manner by having a "standard" 1:1 3D object (for example, a human face) and next to it the same object reported to the scale of the painting. Here too, verbal comments will guide the understanding of the experience, especially regarding the different scales implied by field depth,
- Problem 3, which, as we said, is intractable through this kind of equivalence, will be dealt with by exploiting synesthesia, i.e. the phenomenon where one type of perceptual stimulation evokes the sensation of another (like, for example, when the hearing of a sound produces the perception of a color).

Implementation

Given the constraint of time and budget, and the necessity of conducting a real testing phase on a working prototype before embarking into a eventual deeper, more sophisticated (and much more costly) implementation of the concept exposed, the following options will be adopted.

The prototype will be one painting (as much as possible, “typical”) of the Gemaelde Galerie. The tactual equivalents of (1) and (2) will be “real” 3D objects made by an artist. Notice, that in a mature application these equivalents could be “virtual”, i.e. simulated and offered to perception through some kind of haptic device (such as a force-feedback glove), and thus be completely integrated with the synesthetic system.

Synesthesia will be investigated both in the complete gamut of sensory experiences (i.e, sound, tactile, proprioceptive, etc. correspondences) and with special reference to its working in blind people through the help of “learned” informants (and, possibly, some testing). For practical reasons, however, this first implementation will use only one modality: sound. Tactual interfaces capable of governing sound generation on a sufficiently detailed scale are in fact commercially available (such as, touch screens), while devices for generating texture, temperature or kinesthetic perception are either experimental or should be custom built.