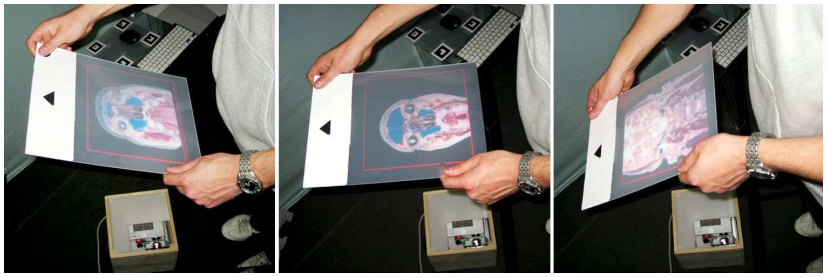
"Kicked up from Flatland: some examples of 2.5 dimensional interactive displays"
by Alvaro Cassinelli / 22 June 2009



In this talk I will elaborate on techniques to augment spatial perception (and arguably space itself) using a variety of technologies ranging from calibrated camera-projector systems, lasers, vibration and sound. I will explain why these techniques may in certain cases lead to an experience of space (immersion, presence) equally or even more compelling than what a "real" 3d holographic display could do when it comes to interaction. Theoretically, this discussion is grounded on the enactive view of perception (a revisited, modern version of Gibson ecological approach to visual perception).

Ever since the princess Leia made her glitchy holographic appearance in Star Wars, a lot of fanciful speculation as well as serious research have been devoted to the holographic display. Even today, it seems all too clear that the "holographic display" is the ultimate display, impatiently awaiting invention. The underlying assumption seems to be that, for an object or a person to appear as if it coexists in space, one must to actually reproduce every sensible quality of the object – perhaps only leaving aside its mass.

Few argue that this assumption is at best profoundly biased and at worst totally counterproductive. However, this is the stance I will take during the talk. The reason, I argue, may lie on a wrong understanding of the true nature of perception, combined with a rather conservative view of the true possibilities of human computer interaction systems (HCI). To start with, we may be suffering from the bias introduced by early computational theories of vision (and mind). Although a very useful scaffold in traditional AI research, they are misleading when it comes to explain the phenomenology of vision. In a nutshell, the problem is that they propose a line of thinking positing the existence of a mental, internal representation of the world which is updated by successive "snapshots" of the external world (taken by the eyes). Starting from this snapshot, this internal representation tends to a perfect "model" of the external world – if only using a different set of symbols which (almost by definition) give experiential content to the perceived image.

It is not my goal here to make a critique of this powerful theory/tool; my point is that this conception, as a model of phenomenology, leads almost naturally to the belief that any "realistic" display should be able to show, at any time, every single facet of what can possibly be observed (of princess Leia for instance), regardless of the actual posture or

attitude of the observer. Most experimental holographic displays and immersive virtual reality systems (such as CAVE) instantiate this conception one way or another.

The enactive view of perception explains why this may be unnecessary. As O'Regan and Noe put it, "seeing is a way of acting": perception is not for the guidance of action; perception is a kind of skillful activity in itself. Perceiving the spatial extension and shape of an object is to "know" (unconsciously) how the visual (or tactile or auditory) input changes as the object moves, or as we move with respect to it. It is also to know, how these stimuli will (or will not) change as we move around. More generally, as Gibson had put it earlier, perceiving is to be aware of the affordances – or possibilities for action- of the things that surrounds us.

And here is where the conservative view of human computer interaction fails completely: an HCI system is far from being a bunch of sensors coupled with a CG rendering station (be 2d or 3d), that shows information on a traditional display using a variety of standard representations (graphs, numbers). In fact, to generate compelling perceptual experiences, the machine needs listen more, and perhaps show much, much less.

Finally, the enactive view of perception cast an interesting light on the notion of "transparency of the interface": a perfect transparent HCI system is one that actually blends completely with the cognitive system of the user (the boundary between the user and the machine also blurs!). The HCI system lies anywhere in the action-perception loop: not necessarily at the start, not necessarily at the end. It can even reshape and invent new and stable sensori-motor patterns, creating new forms of perception.

The secret to a content-rich "augmentation of space through media" lie less on the applications of new sensors and displays, and more on the ways we understand (and manipulate) classical interactions. Kicking Flatland in certain appropriate ways may be enough to rise three-dimensional castles.

I will exemplify these theoretical viewpoints by presenting some devices and artworks I have created, including the Volume Slicing Display (a device enabling the interactive exploration of volumetric data using a piece of plexiglass or paper), the Khronos Projector (a flexible, tangible display with which one is capable of "sculpting" the space time of a movie), the Parallax Augmented Desktop, (which exploits a simple spatial metaphor to simulate a much larger desktop area on a two-dimensional displaying screen). I will also talk a little on other ways to augment the perception of space by generating new modalities of perception based on tactile stimuli (the Haptic Radar, and the yet unpublished "Virtual Haptic Radar"), light and sound ("sticky light", "scoreLight").