

# HUMAN 'SENSE OF SPACE', MOVING IMAGES AND ARCHITECTURE

SCHÖNHAMMER, Rainer

Psychology of Art and Design, Faculty of Design, Burg Giebichenstein Hochschule für Kunst und Design Halle/Saale, schoenha@burg-halle.de

Paper presented at the 'International Symposium Aesthetics and Architectural Composition, Dresden, 2004'.

## ABSTRACT

The paper discusses possibilities and restrictions of the representation of built space in film and virtual reality. The presenter's approach combines phenomenological analysis, reference to traditional theories of aesthetic experience and more recent neurocognitive insights.

The 'sense of space' is constituted by multimode sensory stimulation changing according to the organism's movement relative to its environment. As a starting point, the paper considers some disturbances of the inherited interplay of vision and movement that take place while /watching cinema or being immersed in 3D virtual reality. The perceptual situation provided by moving images in many cases produces disorientation and dizziness.

The presentation will focus on the impact of the visual flow produced by 'point of view shots' in the cinema and analogue scenes in virtual reality on the human 'sense of space' and state of consciousness. Whereas the moving pictures – in a certain respect – can make appropriate use of the resulting dizziness and disorientation, these media-effects are not welcome in the context of the representation of built space.

Movie-makers (intuitively) learned how to counterbalance potentially disturbing effects that the visual flow produces by means of the movement of the camera. For several reasons the most important 'antidote' to the effect of the movement of the camera seems to be the depiction of moving objects (animals/machines) relative to the background of the scene.

The strategies used by makers of commercial fiction-films to minimize disorientation of the film-viewer hint to some possible ways of improving the design of virtual reality and films that aim to represent built space.

I. Was Sigfried Giedeon (1928) right when he postulated that (especially) film could make (modern) architecture intelligible? This paper intends to contribute to the analysis of the specific uses and limits of film and computer generated moving pictures (usually called 'virtual reality') for the comprehension of architecture.

II. Any discussion of the relation of architecture and film has to be aware of the fact that analogies between the moving pictures and built space seem to be quite appealing both for architects as well as for those working in the realm of theory (for a critical point of view cf. Rattenbury, 1994). The tertium comparationis in the postulated analogies of the experience of

film and of architecture is obviously movement (and/or sequence). – Let's take a closer look on what movement means in both cases.

III. It's a truism that the best way to experience a building is by walking. In the words of the Scottish filmmaker Murray Grigor: "To comprehend architecture, one needs to move through its spaces. After all that's how we all experience buildings, inside and outside: we walk, we look, we pass through space. Perspectives are revealed. Corners turned. Scale changes. The depth dimension is revealed. Details can be explored." (1994, p. 19)

In contrast to this condition of free exploration, the audience of a filmic promenade architecturale is restricted to selected views offering a restricted angle of view (shots taken with wide-angle-lenses fail to overcome this restriction and at the same time produce distorted views). If a film consists of a montage of takes from different points of view the observer may become disoriented. (Disconnected spaces are almost a rule in fiction films. This seems to be no grave problem because it's the plot that counts and disorientation may even contribute to the intended atmosphere of the film.)

IV. Shots taken by a moving camera are used to give audiences a sense of spatial continuity while camera movements into the depth of space reinforce the illusion of three-dimensional space.

Grigor, for example, argued in favour of "predetermined camera tracks" as a simulation of a walk and he enthusiastically greets computer-aided effects such as those used by Jacques Barsac (in his 1987 centenary series on Le Corbusier) to make the audience virtually "fly around in Le Corbusier's ultimate megapolis" (ibid.).

V. It is a fundamental certainty for human beings that visual flow of the whole field of vision takes place as part of self-motion. Based on the habitual interplay of vision and motor action such visual flow alone can produce the feeling of being in motion while being actually at rest. James J. Gibson coined the term “visual kinaesthesia” as a label for this phenomenon. In his sketch of a theory of motion-pictures presented in the last chapter of his book “the ecological approach to visual perception”, Gibson (1979) postulated that the moving pictures involve observers not so much by depicting moving objects but by visual kinaesthesia due to the movement of the camera. Gibson therefore was fascinated by the only fiction-film completely composed of in shots from the point of view of the hero, “Lady in the lake” by Robert Montgomery (see clip 1), and he saw a great future for didactical applications of point of view shots. Thus the idea of camera-walks through a built environment is supported by an eminent psychologist of perception.



VI. But the shots taken from the point of view of a moving observer do not necessarily enhance orientation – on the contrary. This is true even if the ‘camera-movement’ is deliberately chosen by the observer, as in the case of computer aided design (or virtual reality): Disorientation is a common problem for users of interactive electronic simulations (cf. Biocca, 1992; Durlach, Allen, Darken, Garnett, Loomis, Tempelman & Wiegand, 2000; Murray, Bowers, West, Pettifer & Gibson, 2000; Arnold & Farrell, 2003). – It is probable that the disorientation of audiences and users is the cognitive complement to the more physiological reactions caused by pictures that move according to the movement of a camera into the depth of space.

VII. What happens if we watch films with extended sequences taken from the point of view of someone who walks through a building? – We get – more or less – dizzy. Flight-simulators or immersive virtual reality cause simulator-sickness or cyber-sickness, as the symptoms of vertigo occurring in these situations are called. Rudolf Arnheim, earning his living in the late twenties as a film-journalist, came across the precursors of these forms of motion-sickness in the cinema of that time. In “Film as Art” (1958/1932) he explained these physical effects of motion pictures as follows: “Our eyes are not a mechanism functioning independently of the rest of the body. They work in constant co-operation with the other sense organs. Hence surprising phenomena result if the eyes are asked to convey ideas unaided by the other senses. Thus, for example, it is well known that a feeling of giddiness is produced by watching a film that has been taken with a camera travelling very rapidly. This giddiness is caused by the eyes participating in a different world from that indicated by the kinaesthetic reactions of the body, which is at rest. The eyes act as if the body as a whole were moving; whereas the other senses, including that of equilibrium, report that it is at rest.” (Arnheim, 1958, p. 34) The camera hasn’t even to move “very rapidly”, as Arnheim suggested, to produce strange feelings in the body of the beholder. In “The dynamics of architectural form” Arnheim (1980/1977) consequently is sceptical of attempts to evoke insight into the structure of buildings by means of the moving camera.

VIII. It is the familiar interplay of motor action and vision that makes visual kinaesthesia possible. At the same time, visual flow without sensorimotor and vestibular sensations questions a literally fundamental experience of sensual interplay. The relation of body and environment is no longer reliable. Motion-sickness and disorientation are the physical and mental consequences.



IX. Disorientation and Vertigo, by the way, suggest alternative analogies to filmed space: trance or dream. The typical patterns of intense dreams – for example dreams of flying, falling or pursuit – may be viewed as reflections of perceived sensorimotor disturbances in the twilight between sleep and wakefulness. From the point of view of a sensorimotor theory of perception, film-dream analogies (that have a tradition of their own) indeed are more reasonable than analogies of film and architecture (cf. Schönhammer, 2004a). Film may actually produce what Piranesi's *carceri* (since Thomas de Quincey's "Opium Eater") are merely symbols of: disorientation and vertigo experienced in dreams and altered states of consciousness.

X. The promising spatial effect of the (often praised and practiced) camera-movement thus turns out to be an irritating illusion. Fiction-films may use this irritation of the observer in order to give an impression of a protagonist's state of mind. But it is hardly a means of rendering architecture intelligible (except perhaps in the case of buildings that unintentionally or intentionally – such as Daniel Libeskind's Jewish Museum in Copenhagen – produce vertigo when the beholder walks through).

XI. There is an alternative way for the moving pictures to present a vicarious walk through a building. – To film someone who actually walks may not be a very ambitious method. But it's an effective and safe way to involve the audience in a spatial exploration. In fiction-films we see people moving all the time. Celebrating their action (and themselves), the actors at the same time confirm the observer's impression of three-dimensional space. These films are not produced to make a whole building comprehensible but they draw the audience – via depicted movement – into the volume of insular spaces (think of the ubiquitous use of flights of stairs, not only in Hollywood-films, for an impressive *mise en scène* of movement and space at the same time).

That involvement in movement and its spatiality is triggered this way is a mental as well as physiological fact: Philosophers and psychologists have long since described the phenomenon whereby someone who observes the movement of someone else tends to reproduce what they see (empathy, co-motion, Carpenter-effect; cf. Lipps, 1897; Groos, 1902; James, 1950/1890); in recent years neurological research (the discovery of so-called mirror-neurons; Rizzolatti, Fogassi & Gallese, 2000) has corroborated these older concepts.

XII. Arnheim, by the way, appreciates (with a certain reserve rooted in fundamental beliefs of the gestalt school) the concept of empathy in his works on art and architecture. Early on he observed the potential of the filmic depiction of moving human bodies to evoke the impression of spatiality when, in his time as a film-critic, he wrote a gloss on “Das Kabinett des Dr. Caligari”. In “Dr. Caligari Redivivus”, first published 1925, he states that marionettes would better suit these sets than human beings (Arnheim, 1997). Later, Arnheim explained that “the ludicrous aspects of Caligari are not due to the artificiality of the setting as such. The solidly Euclidean continuity of space, revealed by the movements of the actors, appears as an embarrassing giveaway only because the scenery attempts to break up that unity of space in the manner of Expressionist and Cubist painting. There is a contradiction within the dimension of space” (1966, 185). Filmed movement of human beings makes audiences perceive the three dimensional space they are used to.

Arnheim repeated his statement concerning the Caligari-film in “The Dynamics of architectural form” (1980/1977) but did not take into account its promising implications in respect of the cinematographic presentation of built space. (This neglect may be due to a fundamental theoretical position towards moving pictures: In “Film as Art” Arnheim insisted that film evokes the impression of a flat two-dimensional picture even if a “certain illusion of depth holds the

spectator” (1958, p.31). This, in his view, contributes to the fact that “film is most satisfactorily denuded of its realism” (ibid.). That film “is always at one and the same time a flat picture postcard and the scene of living action” (ibid.) according to the general line of argumentation in this book, is a prerequisite for art. – Without doubt: The usual monocular camera allows takes that offer surprising or enigmatic views of overlapping objects that don’t occur under the condition of binocular vision. But such illusions don’t reduce the phenomenal three-dimensional space of living action appearing behind the screen to a flat picture; Schönhammer, 2004b)

XIII. As architecture itself is the protagonist of documentaries about architecture, moving people, in the view of the majority of those who write and produce these films, seem to be unnecessary. People, on the contrary, are viewed as something that distracts the audience’s attention from what is to be (solemnly) presented. As stated by Francoise Penz (1994; cf. Sabbagh, 2000), only few makers of films about (or simulations of) architecture avoid this trap. One example is an ‘Open University’ film (written by Tim Benton and directed by Nick Levinson) about a building of Le Corbusier. Here the presenter, Tim Benton, invites the audience to participate in his own promenade architecturale (see clip 2). The impression evoked by some of these takes clearly contrasts with the spectacular but irritating point of view shots taken for a film by Jaques Barsac at the same locations (see clip 3).



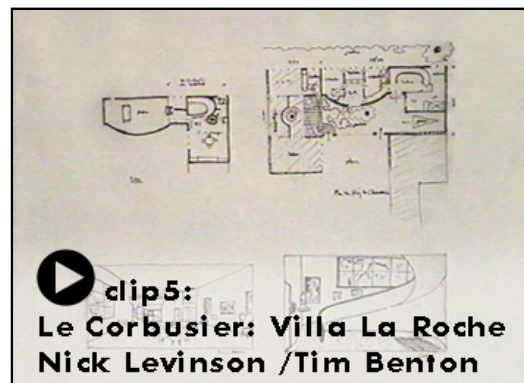
XIV. The observation of movement can work as an antidote to the irritating effects of the moving camera. Many of the frequent sequences of chase in fiction-films demonstrate that fixation on a moving object reduces the impact of the visual flow of the whole frame. The instable visual field switches from figure to ground (for a further elaboration of this point cf. Schönhammer, in press) At the same time the visual flow in the background of the tracked figure (object or person) is ‘motivated’ (rendered bodily ‘intelligible’) by the observed movement which involves the observer intentionally (and activates rudimentarily his sensorimotor apparatus; cf. XII) (see clip 4).

A further way to minimise the aversive effects of the visual flow of a camera moving forward is a montage that alternates short point of view shots with frontal takes of the person whose point of view is depicted (a method often used by Hitchcock).



XV. Designers of interactive simulations look for strategies to minimize motion-sickness and disorientation by counterbalancing isolated visual kinaesthetic perception (cf. Frery, Kelner, Moreira & Teichrieb, 2002; Murray et al., 2000). Some more recent video games, for example, implement a kind of phantom of the user who is followed through the virtual scene. This aspect of motor activation of the observer as a complement to the perceived visual flow is reflected where treadmills or stationary bikes are used for the regulation of the movement in the virtual environment.

XVI. To enable the audience to comprehend the connection of the spaces selectively presented (or in the case of interactive immersive environments: selectively explored) it is necessary to provide views from some distance. ‘Establishing shots’ (like those of Hollywood’s ‘continuity style’) may help to understand how adjacent spots are related but can’t grasp complex structures of buildings or sites. Thus to make architecture intelligible film and simulations should make use of classic media like sketches, plans and small-scale models (Whyte, 2002). Simply animated figures help to indicate the scale and again involve the observer via movement, even within the abstracted space of sketches and models (cf. Benton, 1997) (see clip 5).



## References

- (1) Arnheim, R. (1958/orig.1932). *Film as art*. London: Faber & Faber.
- (2) Arnheim, R. (1980/orig.1977). *Die Dynamik der architektonischen Form*. Köln: Dumont.
- (3) Arnheim, R. (1997/orig.1925). *Dr. Caligari Redivivus*. In R. Arnheim, *Film essays and criticism* (pp. 111-112). Madison, Wisconsin: The University of Wisconsin press.
- (4) Arnheim, R. (1967/orig.1963). *Melancholy unshaped*. In R. Arnheim, *Toward a psychology of art. Collected essays* (pp. 181-191). Berkeley & Los Angeles University of California Press
- (5) Arnold, P. & Farell, M. J. (2003). *Embodiment and spatial behaviour in virtual environments: Comments on Durlach et al. (2000)*. *Presence*, 12 (6), 658-662.
- (6) Benton, T. (1997). *Representing Le Corbusier. Film, exhibition, multimedia*. In F. Penz & M. Thomas (Eds.), *Cinema & Architecture* (pp. 114-117). London: British Film Institute.
- (7) Biocca, F. (1992). *Will simulation sickness slow down the diffusion of virtual environment technology?* In: *Presence*, 1 (3), 334-343.
- (8) Durlach, N., Allen, G., Darken, R., Garnett, R. L., Loomis, J., Tempelman, J. & Wiegand, T. E. v., (2000). *Virtual environments and the enhancement of spatial behavior: Towards a comprehensive research agenda*. *Presence*, 9 (6), 593-615.
- (9) Frery, A. C., Kelner, J., Moreira, J. & Teichrieb, V. (2002). *User satisfaction through empathy and orientation in three-dimensional worlds*. *CyberPsychology and Behavior*, 5 (5), 451-459.
- (10) Rizzolatti, G., Fogassi, L. & Gallese, V. (2000). *Cortical mechanisms subserving object grasping and Action recognition: A new view on the cortical motor functions*. In M. S.

- Gazzaniga (Ed.), *The new cognitive Neuroscience* (Second Edition) (pp. 539-552). London: Bradford.
- (11) Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin Company.
- (12) Giedion, S. (1928). *Bauen in Frankreich, Bauen in Eisen, Bauen in Eisenbeton*. Leipzig: Klinkhardt und Biermann.
- (13) Grigor, M. (1994). Space in time. In: *Architectural Design*, 64 (11/12), 17-21.
- (14) Groos, Karl (1902). *Der aesthetische Genuß*. Giessen: J. Ricker'sche Verlagsbuchhandlung.
- (15) James, W. (1950/orig.1890). *The principles of psychology*. New York: Dover Publications.
- (16) Lipps, T. (1897). *Raumästhetik und geometrisch-optische Täuschungen*. Leipzig: Barth.
- (17) Murray, C. D., Bowers, J. M., West, A. J., Pettifer, S. & Gibson, S. (2000). Navigation, wayfinding, and place experience within a virtual city. In *Presence*, 9 (5), 435-447.
- (18) Penz, F. (1994). Cinema and architecture. *Architectural Design*, 64 (11/12), 38-41.
- (19) Rattenbury, K. (1994). Echo and narcissus. *Architectural Design*, 64 (11/12), 35-37.
- (20) Sabbagh, K. (2000). Building films. *Architectural Design*, 70 (1), 78-81.
- (21) Schönhammer, R. (2004a). *Fliegen, Fallen, Flüchten. Zur Psychologie intensiver Träume*. Tübingen: dgvt-Verlag.
- (22) Schönhammer, R. (2004b). Mit Arnheim im Kino. In Ch. Allesch & O. Neumaier (Eds.), *Rudolf Arnheim oder die Kunst der Wahrnehmung* (pp.87-96). Wien: WUV.
- (23) Schönhammer, R. (in press). Der Raumsinn angesichts bewegter Bilder. In M. Ott. (Ed.), *Denken des Raumes in den Zeiten der Globalisierung*.
- (24) Whyte, J. (2002). *Virtual Reality and the built environment*. Oxford: Architectural press.

#### **Quoted films:**

*Lady in the lake*. USA 1947, directed by Robert Montgomery; camera: Paul C. Vogel.

*Le Corbusier: Villa La Roche*. GB 1991, directed by Nick Levinson; written and presented by Tim Benton, camera supervisor: Jacky Peschard, camera: Jean-Paul Faure.

*Le Corbusier par lui-même (I)*. F 1987, written and directed by Jaques Barsac.

*The fall and rise of Mackintosh*. GB 1991, written and directed by Murray Grigor, camera: Douglas Campbell, Paul Harley.

**Thanks** to Steffen Göbel, Halle, (for editing the videos) and to Douglas Henderson, Berlin, (for correcting my English).