

Through the Looking-Glass: Opening Windows in the Wall

Proposal for installation in Art Centre/Gallery

Manuel Sánchez-Gestido

e-mail: Manuel.SanchezGestido@gmail.com

Molotroko@gmail.com

1 Introduction

Mirrors and projections have always played a magical role in the way we, as human beings, relate with the world around us, as long as they suggest kind of phantasmagorical and sometimes unexpected representations that although virtual, resemble and are closely connected with other real elements of our visual perception.

The current proposal combines both elements (mirrors and projections) in a simple device that offers a variety of possibilities for artistic and technical use.

This proposal is organized in the following sections:

- Section 1, this introduction.
- Section 2 presents the physical (optical) principle
- Section 3 shows an example of the above
- Section 4 presents the results achieved during the workshop Light, Space and Perception 2009
- Section 5 shows two proposals for installation in Art Centre/Gallery
- Section 6 lists the technical equipment necessary for building the installation based on the proposed elements, with a rough estimation of the costs.
- Section 7 outlines several potential applications and project extensions.
- Section 8 includes the references that are in one way or another behind the original idea of this proposal
- Section 9 includes the external references complementing the documentation of this proposal.

2 Physical principle

This proposal consists on the technical layout for a generic artificial (illusory) window, as presented in Figure 1, along with its installation and/or combination in several contexts (as an example, in a human scale in an Art Centre/Gallery, as a result of the activities in the Light, Space and Perception 2009 workshop).

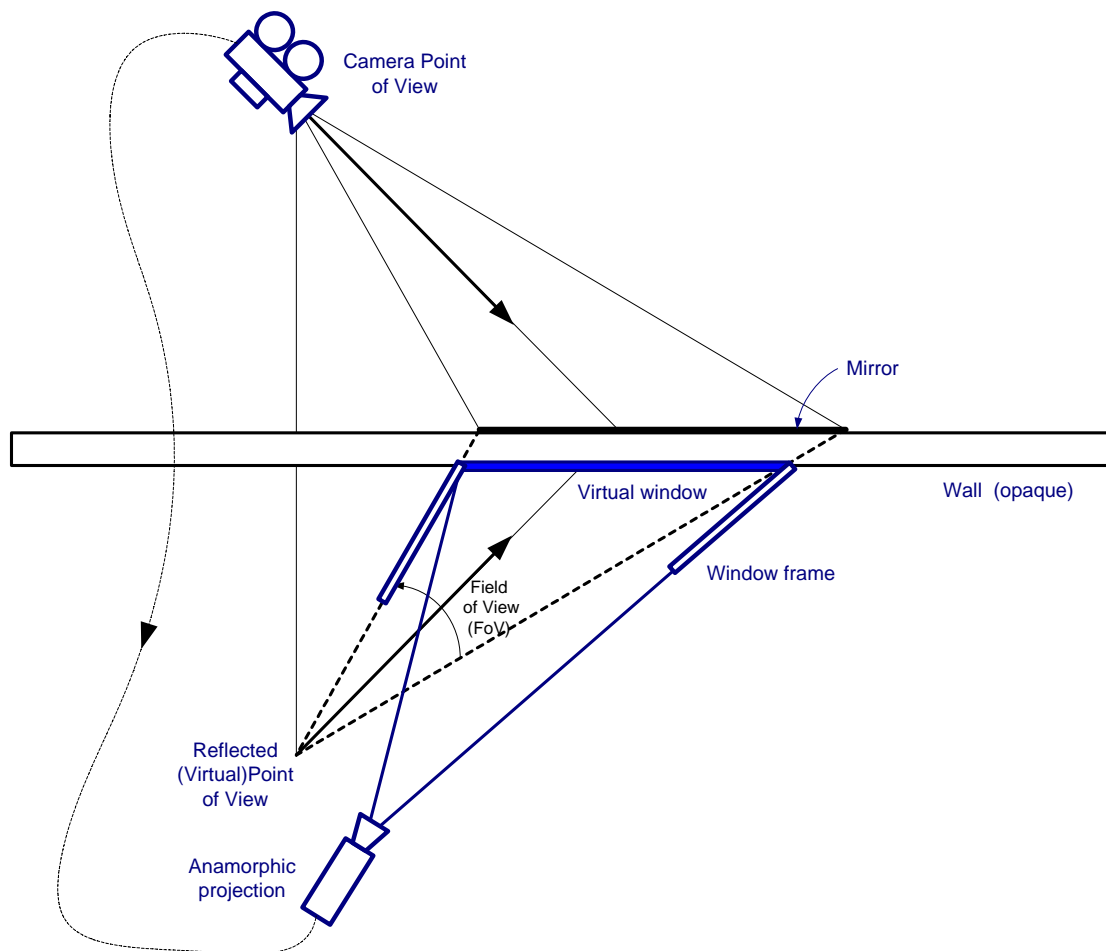


Figure 1 Creation of virtual/illusory windows (geometrical considerations)

In Figure 1, a video camera (or simply a web camera) records images reflected on a mirror on one side of an opaque wall. On the other side, a projector, taking into account the anamorphic restoration of the reflected virtual point of view (also considering the inversion left-right) produces an image that mimics the one that is reflected on the mirror. As if that image had crossed the wall or the visitor (located close to the virtual point of view) was able to look through the (visual) obstacle. A window frame is added in order to force the viewing direction of the observer so as to be in the vicinity of the Virtual Point of View and thus producing a natural impression.

In order to add some dynamic component, the lighting in the projected scene could be changing (fading and restored gradually, in cycles). For high resolution images (looking as real when viewed from a distance) it would show that it is a fake window.

Modifying slightly the set up in Figure 1 and using similar auxiliary mirrors, the position of the projector can be attached to the window frame at more convenient distances and position, like being attached to the ceiling (see Figure 2).

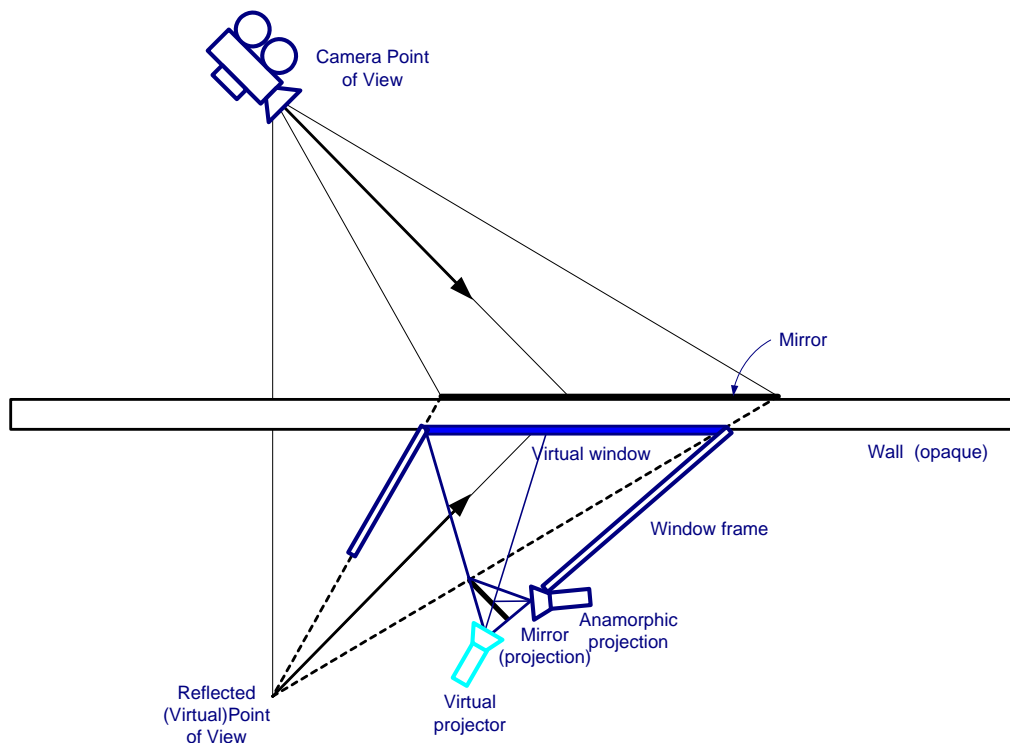


Figure 2 Modified position of the projector

3 Example: A room with (several) views

As one sample application for this proposal, Figure 3 shows a composition of photographs picturing the room of the author in an apartment in The Netherlands, on the 3rd floor, side by side with a representation of the effect of a projection, as if there were no wall, in the area enclosed by the yellow line (a translucent phantasmagorical wall).

This way a complete building interior could be made (virtually) transparent.



Figure 3 A room with views (general set-up and composition of projections)

It is possible to do something similar on individual virtual windows (projecting also an illusory frame, as a trompe l'oeil design) and even combine them with a ceiling projection. Playing with the same idea, in a cloudy day, the projection could depict the recording of a sunny weather on a previous day.

4 Results from Light, Space and Perception workshop

A basic prototype set-up was developed during the first part of the Light, Space and Perception workshop held in Madrid, in Jan-2009. The model was intended to explain the optical principle behind the project (as explained in Figure 1):

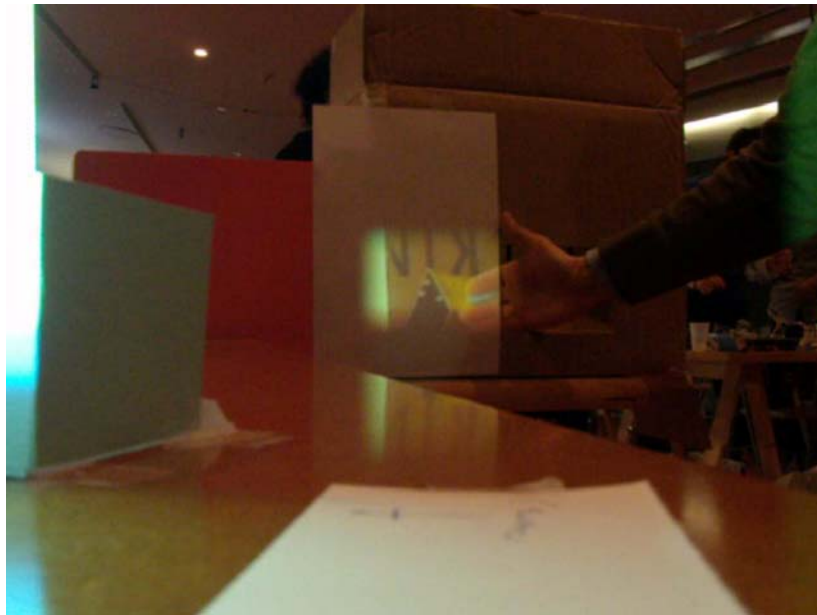


Figure 4 OpeningWindowsInTheWall: Model from 1st part of Light, Space and Perception workshop (I)

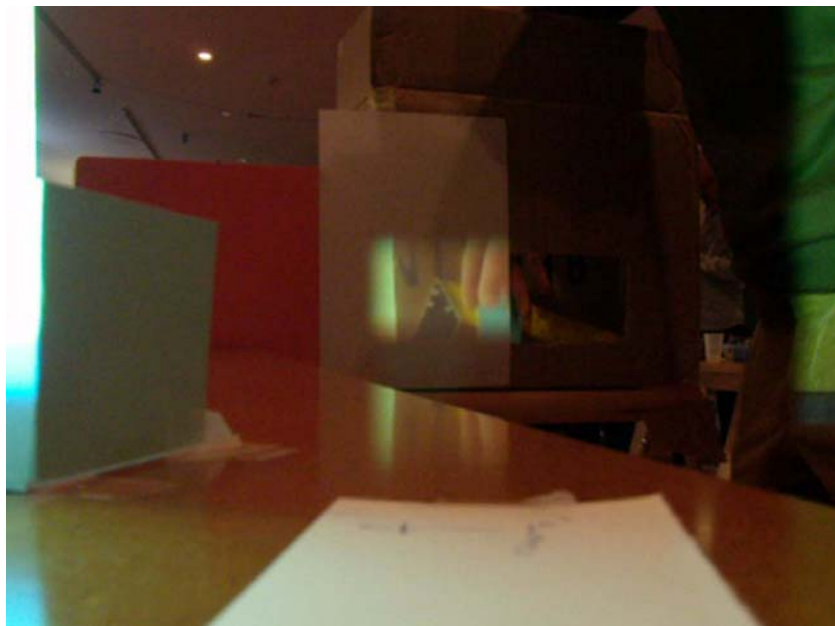


Figure 5 OpeningWindowsInTheWall: Model from 1st part of Light, Space and Perception workshop (II)

The above still images are taken from the video available in [[http_www_youtube_com_Molotroko_video_01_OpeningWindowsInTheWall](http://www.youtube.com/Molotroko_video_01_OpeningWindowsInTheWall)]. The internal set-up within the box is shown in the next picture (a short video can also be seen in [[http_www_youtube_com_Molotroko_video_02_OpeningWindowsInTheWall](http://www.youtube.com/Molotroko_video_02_OpeningWindowsInTheWall)]):



Figure 6 OpeningWindowsInTheWall: Model from 1st part of Light, Space and Perception workshop (III)

A more elaborated model was almost finished during the second part of the workshop (held in March-2009):

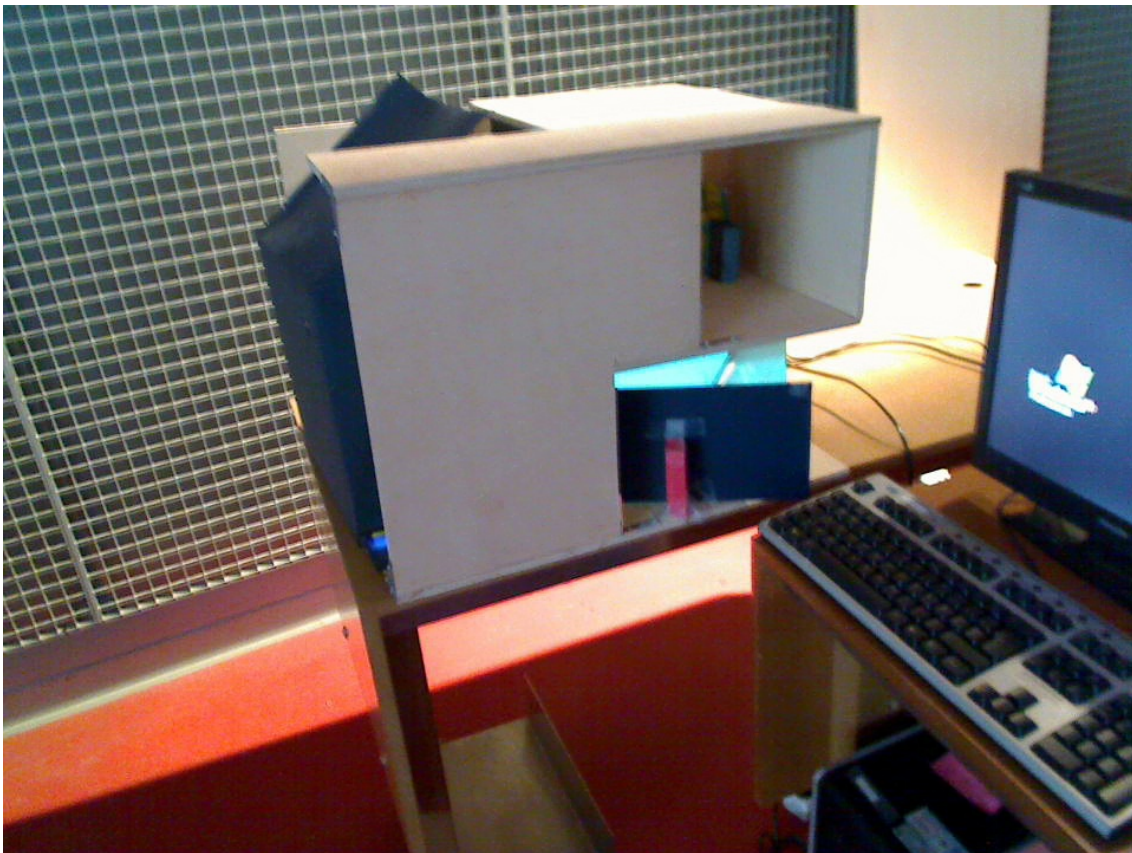


Figure 7 OpeningWindowsInTheWall: Model from 2nd part of Light, Space and Perception workshop (under construction)

Several people were contributing, in one way or another, to this project, which is considered under continuous improvement and evolution, gradually incorporating different techniques and possible applications. Apologies if somebody is missing from this list and should be there:

- Manel Castillo (Engineer/Technical consultant)
- Blendid (Interactive designers: Tim Olden & David Kousemaker)
- Greg J. Smith (Digital Artist)
- Montfragüe Fdez-Lavandera y Santos (Sculptor)
- Sergio Carrasco Martos (Engineer)
- Manuel Leirachá (Engineer)
- Francisco Torres (Aerospace Engineer)
- Pía Alejandra Gálvez (Architect)

For additional information about the project:

- Project Forum: [http://forommm_Medialab_Prado_es_OpeningWindowsInTheWall_LSP]
- Project wiki: [http://wiki_MedialabPrado_es_Opening_Windows_in_the_Wall]

5 Proposal for installation in Art Centre/Gallery

5.1 *Opening (virtual) Windows In The Wall*

As a concrete proposal for an Art Centre/Gallery space¹, Figure 8 shows a similar installation to Figure 3 with a virtual window created close to the already existing opening in the wall, so as to give continuity in the visual perspective (direct and illusory view put side by side). It should be noted that the installation is working real time and the visitor that is walking away from the room, passing by in front of the virtual window can be seen, from the other side, through that (virtual) window:

¹ The reference image for this composition is taken from [<http://www.mataderomadrid.com>]



Figure 8 Opening Windows In the Wall: Proposal for Art Centre/Gallery

The above installation develops at human scale the same concept presented in the prototypes of the Light, Space and Perception workshop (see section 4). Camera and mirror are on the other side of the wall (as it was explained in Figure 1).

5.2 Models for didactic purposes

Additionally, with a few small final adaptations, it is possible to present, for didactic purposes, the two prototypes made during the two parts of the Light, Space and Perception workshop (see section 4). This way, visitors can grasp, in a simple device

(from the first part of the project) and a more elaborated (from the second part) the physical principle used in this project.

6 Technical equipment

The necessary equipment for building the installation is very basic:

- Mirrors (can also be made of metal sheets, which allows to comb the reflecting surface): 30 eur
- Frame structure: 100 eur
- Video Web Camera (wireless or USB connection): 150 eur
- USB cables (for both cameras; optional for wireless camera): 20 eur
- Projector (although the same projector could be combined with mirrors to produce several illusory windows, one additional projector might be needed if the models from the Light, Space and Perception workshop as also presented; see section 5.2): 400 eur (cost not added to the final estimation of the costs as it is likely that it can be borrowed)
- Computer: For controlling the cameras/projector and for the computation of the anamorphic distortion: 400 eur (cost not added as it is likely that it can be borrowed)

The total budget results in about 300 eur (800 eur more if the computer and the projector cannot be borrowed).

7 Potential Project applications and extensions

There are a number of potential extensions/applications:

- A more elaborated internal structure may be used in combination with several of those virtual cameras and windows to create some confusion in the visitor (as if it were a visual labyrinth).
- Opening virtual holes in a physical wall (as from the Palestinian-Israeli one; see section 8).
- Car driving: The car frame (mainly in the front window) acts as a visual obstacle when the drivers' view is looking slightly to the sides. Projections onto the car frame of the outside objects that correspond to this part of the visual blind spot from the drivers point of view will make the car frame invisible to him/her (visually suppressing those obstacles).
- At a more evolved stage of the project it may be possible to track (using Computer Vision techniques) the observer position and change the projection accordingly (for instance when going through a corridor and projecting images from the interior of the rooms on both sides, as if walls were transparent).
- Projection on actual windows, distorting or changing the view as long as a transparent glass window is a reflecting surface for small incidence angles (see Figure 9). It can also be done in a dark window background (for instance at night).



Figure 9 Transparent window acting also as a reflecting surface

8 Project References

*“[...] they accepted what had been seen by others,
they imagined that they were living.
And naturally they couldn't see the holes.”*

*The Pursuer
(Julio Cortázar)*

In the same way Cortázar was suggesting other realities by looking through the (imaginary) holes in the wall, several artistic, technical and even political considerations had lead to this proposal.

Leaving aside some more or less obvious references to classical movies (“Rear window” from Hitchcock and the X-ray vision in “Superman”), on a serious note, Figure 10 shows the cover page of the book “Windows in the Wall” about the wall that separates Palestinians and Israelis, with a photograph of the apparently insurmountable concrete brutality, limiting the aspirations of freedom of many people. This is most of the times what a wall is all about: A political, social or psychological limitation. It is almost impossible to imagine the horizon on the other side. And a glimpse there would be like a breeze of fresh air.

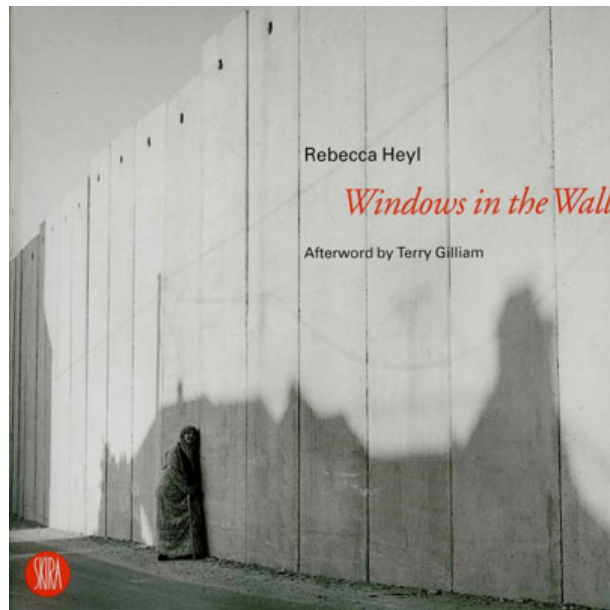


Figure 10 Windows in the Wall (cover page; from [<http://www.windowstheWall.com>])

The same picture in Figure 10, portraying a dark scenario (shadows from the houses projected on the wall) suggests a more enriching possibility, with a performance or temporary installation (see section 7) where projections on one side of what could be seen from the other side would virtually suppress the wall, or opening temporary emotional doors connecting the areas at this moment separated. It will not get the (physical) wall down as long as there are some other political differences that need some softening first.

In the same way Banksy re-acted against that wall (see Figure 11), a dynamic projection could be showing in real-time the life on the other side, using an illusory hole in the wall (or even with a travelling vertical strip that were giving the impression of opening the wall continuously, like a moving door).



Figure 11 Banksy in the Palestinian-Israeli wall (from [http://news.bbc.co.uk/Bansy_PalestinianIsraeli_Wall])

Figure 12 and Figure 13 show two still images from [<http://PhilipsDynamicDaylight.YouTube>] were a virtual and interactive window produces an atmosphere that is in line with the user mood and needs.



Figure 12 Philips Dynamic Daylight virtual window and blinds (from [http_PhilipsDynamicDaylight_YouTube])



Figure 13 Philips Dynamic Daylight configuring shapes in virtual window (from [http_PhilipsDynamicDaylight_YouTube])

The applications of the proposal may be extended in relation to the above references.

9 References

[http_www_windowsinthewall_com] <http://www.windowstheWall.com/> (visited on 30-Nov-2008)

[http_news_bbc_co_uk_Bansky_PalestinianIsraeli_Wall] <http://news.bbc.co.uk/2/hi/entertainment/4748063.stm> (visited on 30-Nov-2008)

[http_PhilipsDynamicDaylight_YouTube] <http://www.youtube.com/watch?v=Xki9SboDn4Y> (visited on 30-Nov-2008)

[http_www_mataderomadrid_com] <http://www.mataderomadrid.com/> (visited on 28-Apr-2009)

[[http_www_youtube_com_Molotroko_video_01_OpeningWindowsInTheWall](http://www.youtube.com/watch?v=4H9sOA_0XvE)]
http://www.youtube.com/watch?v=4H9sOA_0XvE (visited on 26-Apr-2009)
[[http_www_youtube_com_Molotroko_video_02_OpeningWindowsInTheWall](http://www.youtube.com/watch?v=ffIO670sNos)]
<http://www.youtube.com/watch?v=ffIO670sNos> (visited on 26-Apr-2009)
[[http_wiki_MedialabPrado_es_Opening_Windows_in_the_Wall](http://wiki.medialab-prado.es/index.php/Through_the_Looking-Glass:_Opening_Windows_in_the_Wall)] [http://wiki.medialab-prado.es/index.php/Through the Looking-Glass: Opening Windows in the Wall](http://wiki.medialab-prado.es/index.php/Through_the_Looking-Glass:_Opening_Windows_in_the_Wall)
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<http://forommm.medialab-prado.es/viewtopic.php?id=205> (visited on 4-May-2009)