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**The making of Love Affair**

*Bernardo Schorr*  
*Luiz Velho*

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# Gigapixel Panoramas and Narratives

## The making of “Love Affair”

Bernardo Santos Schorr

Escola Superior de Desenho Industrial - ESDI  
Universidade do Estado do Rio de Janeiro - UERJ  
Rio de Janeiro, Brazil  
e-mail: schorrdesign@gmail.com

Luiz Velho

Vision and Graphics Laboratory - VISGRAF  
Instituto de Matemática Pura e Aplicada - IMPA  
Rio de Janeiro, Brazil  
e-mail: lvelho@impa.br

**Abstract**—An approach to the use of gigapixel panoramas as raw material to audiovisual narratives is presented. Through the making of the short film “Love Affair” the process is described from capturing the panoramas to the final editing of the film, considering technical and semantic aspects.

**Keywords**—component; gigapixel; panorama; narrative; photography; film

### I. INTRODUCTION

Panoramic photographs are of great expression as they can be considered a visual translation of the world from one point of view. The means chosen for their visualization (i.e. should they be seen printed or on screen, equirectangularly or spherically projected) put together another set of meaning to those images pulling viewers even further on their experience. The distance between the edges of the image or even their complete absence require a much more complex interpretation than the one needed for a regular photograph.

Gigapixel images are somehow similar to panoramas when it comes to the complexity of information. A panorama has its edges very far apart or absent, opposite to a regular photograph which has them very well defined. At the same time, the resolution of a gigapixel photograph has a much larger range than the one of a regular photograph, which is very limited [1].

When these two sets of characteristics are combined in one image we have a *Gigapixel Panorama*. Gigapixel panoramas are images of immense complexity and draw many questions on which are the possible and ideal ways of visualizing and using them. As for technical aspects, working with Gigapixel Panoramas may be very challenging, specially concerning their capture, processing, archiving and editing.

This paper presents some of the many technical and semantic aspects of Gigapixel Panoramas through the presentation of the making of the film “Love Affair”, an audiovisual narrative built from images of this kind. The film was produced during the Panoramic Narratives Project (N-PAN), which was developed by the Brazilian National Institute for Pure and Applied Mathematics (IMPA) and the Superior School of Industrial Design (ESDI) [2].

### II. THE N-PAN PROJECT

The N-PAN project was developed between April and July 2009 at IMPA and ESDI with 6 undergraduate students from the design school under orientation of Prof. Luiz Velho and Silvia Steinberg. The project also had support from photography and technology experts from both institutions.

The main goals of the project were to explore the use of Gigapixel Panoramas as raw material in the development of audiovisual narratives as well as push this technology to its limits.

The project was divided in two main parts:

#### A. Data Acquisition

In this first part Gigapixel Panoramas were produced according to research and discussions on visual and semantic interest to the project. Details on this step are described further on.

All the images produced during this step were uploaded to the N-PAN user account created at the [gigapan.org](http://www.gigapan.org) website, the largest web-based image bank for viewing and navigating gigapixel panoramas. They are now available at: <http://www.gigapan.org/profiles/16768/>

The “Capanema” panorama (Fig. 1), with 9.66 gigapixels, was among the largest ones available at [gigapan.org](http://www.gigapan.org) at the time of its publishing. In Fig. 2 a detail of xx% is seen.



Figure 1. Full “Capanema” Panorama – 204600 x 47202 pixels



Figure 2. Detail – 1024 x 235 pixels – approximately 0.025% of original panorama area

## B. Content Creation

At the same time of the data acquisition, the scripts for the audiovisual narratives were being developed. Once all planned panoramas were ready, the scripts were put to production. The result was 6 short movies, among them “Love Affair”, detailed further on.

## III. WORKING WITH GIGAPIXEL PANORAMAS

### A. Capturing Gigapixel Panoramas

For capturing the panoramas the beta version of the Gigapan Epic (from Charmed Labs) was used along with a Canon SX 100 IS, an advanced point-and-shoot camera. The Gigapan Epic is a robotic camera mount which controls the camera while it takes the photographs that will later be stitched into a Gigapixel Panorama. To set the Gigapan Epic, certain decisions and procedures are necessary.

- The frame of the camera must be set. Considering that the camera had a zoom lens, we may say that smaller frames (achieved by using longer set-ups on the lens) would generate more detailed panoramas and therefore use more single images to produce them. On the other hand, large panoramas take a long time to be captured and processed. The final files may be very heavy, making it difficult to manipulate them.
- The longitude and latitude of the panorama must be set and balanced with the amount of detail desired. If the panorama has a specific interest point, cutting off unnecessary information is also done at this step. Once again, panoramas with long latitudes and longitudes generate larger files.

According to the frame chosen, the Gigapan Epic calculates the necessary overlap between the images for the later stitching. Once the latitude and longitude are set, the robot estimates how many pictures will be taken.

The whole process of capture is highly time-consuming, which makes paying attention to some precautions very important.

- Considering that the pictures taken will be stitched together, the exposure and focus of the camera must be locked to avoid differences between the images.
- A large panorama may take up to 2 ½ hours just to be captured. The pictures are taken from up to down and from left to right, as shown on Fig. 3. This is especially important when taking outdoor pictures, due to the fact that sunlight may be very unstable depending on the time of the year.
- A large panorama may be formed by up to 1800 10-megapixel images. The storage media in the camera must be capable to fit them.
- The robot is powered through 6 AA batteries, which must not fail before the process is completed. In the N-PAN project an adapted high capacity 12V7.2AH/20HR battery was used to avoid this issue.

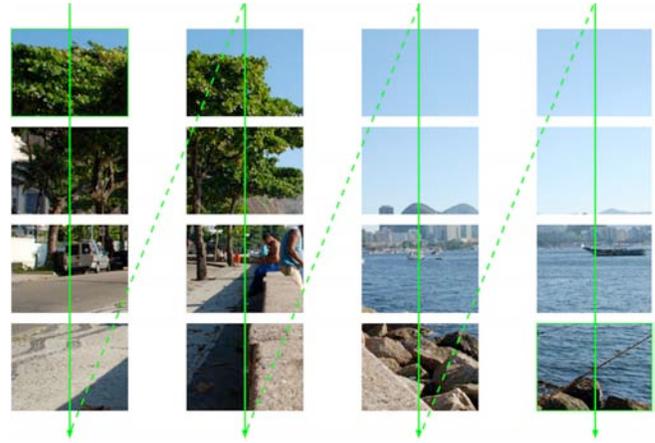


Figure 3.

### B. Processing Gigapixel Panoramas

The software used for stitching the panoramas was the Gigapan Stitcher. Some procedures were observed.

- A panorama may take up to 12 hours of stitching depending on its size and the computer used. Adding this to the time of capture and considering that only one robot unit and one computer were available for this task, it was possible to produce only one or two panoramas per workday. Thus, panoramas should be carefully planned before taken into action.
- The Gigapan Epic and the camera have no data communication between them. It is necessary to take note exactly which pictures in the camera belong to the panorama in order not to lose track of them.

### C. Storing Gigapixel Panoramas

Due to their final dimensions, Gigapixel Panoramas are not stored into a single file image (although through the Gigapan software it is possible to generate one). Instead, multiple files are generated in different resolutions, allowing the navigated part of the panorama to be viewed in screen resolution, i.e. if one wants to see the full panorama, a small resolution image will be displayed, if details are desired, only the part being viewed will be rendered in full resolution.

The multiresolution navigation is native to the local Gigapan Viewer software as well as to the Gigapan.org website, where the panoramas may be uploaded via the sema software after stitching. On the other hand, the Gigapan Viewer allows navigation in spherical projections opposite to the Gigapan.org website which displays only equirectangular projections.

### D. Editing Gigapixel Panoramas

An unique software suite was developed as part of the N-PAN project by experts at IMPA together with the company Digitok [3]. The PanoSuite was composed of 3 different programs that permitted further work and usage of Gigapixel Panoramas on audiovisual narratives, the main goal of the N-PAN project.

- Panoview – allows fast and efficient navigation through Gigapixel Panoramas.
- Panosingle/Panomulti – Panosingle breaks the panoramas into single full-resolution image files of a previously set size. This makes it possible to edit parts of a Gigapixel Panorama as a single file image using regular image editors (e.g. Photoshop, GIMP). Panomulti can then be used to build the edited parts back into multiresolution structure. The modifications will appear in all levels of the multiresolution pyramid.
- Panoauthor – produces snapshot sequences from Gigapixel Panoramas that can be animated into motion pictures.

#### IV. AUDIOVISUAL NARRATIVE: “LOVE AFFAIR”

The film “Love Affair” is almost entirely built from the panoramas produced during the N-PAN project. The goal was to explore deeply the possibilities of using Gigapixel Panoramas in Audiovisual narratives, as well as combining them with differently generated images to enhance semantic possibilities. The story is built over the homonymous song “Love Affair”, by Regina Spektor.

Three panoramas were used and can be explored in the Gigapan.org website in the following links:

- Capanema Jardins Fig. 04 – <http://www.gigapan.org/gigapans/23531/>
- Biblioteca ViverCidades Fig. 05 – <http://www.gigapan.org/gigapans/27374/>
- De Paoli-1 Fig. 06 – <http://www.gigapan.org/gigapans/23708/>



Figure 4. Capanema Jardins



Figure 5. Biblioteca ViverCidades



Figure 6. De Paoli-1

Observing the panoramas it is possible to notice that the three of them are views on buildings from different points. The first one has the building, Palacio Capanema, a modernist jewel in Rio de Janeiro downtown as its main focus point, the second one is the view from the top of another building and the last one is a view from the interior of a library. None of the buildings are the same.

Semantic relations between the panoramas were to be created after their production and among the panoramas chosen from the previously produced collection. There was not yet a film script at the time of the shooting. The challenge was to dominate the visual complexity of such images and turn them into an interesting and coherent story, taking advantage of their nature and pushing their technical aspects to the limit when transferring them to film language.

It is important, however, to be faithful to cinema principles and look for the best takes when it comes to aesthetics rather than displaying how deep or wide the panorama is or how much information it contains, otherwise there would be no need to transform them into audiovisual narratives. A transfer into this new language can be seen in the first take of the film, when the image zooms out from a detail and not the opposite, giving different approaches on how to present a Gigapixel Panorama for the first time.

“Love Affair” can be understood as the story of an observer seeking something or someone. The audio hints that it is one of the parts involved in a love affair. References to the film “Blow Up” from Italian director Michelangelo Antonioni are visually made and are part of the narrative. They reflect how different the techniques of getting detail out of a photograph have become over time (Fig. 07).



Figure 7. Sequenced screenshots of “Love Affair”

All the motion takes in Gigapixel Panoramas were made possible by the previously cited PanoSuite software. Once the image sequences were turned into video files, they were edited in regular video editing programs.

“Love Affair” can be watched at:

[http://www.visgraf.impa.br/videos/love\\_affair/](http://www.visgraf.impa.br/videos/love_affair/)

The other videos made during the N-PAN project can be watched at:

<http://www.visgraf.impa.br/npan/videos.html>

## V. CONCLUSION

Bulding audiovisual narratives from Gigapixel Panoramas takes, at least, two particularly different steps: producing the panoramas and editing them into videos. These steps might be taken several times during the production of a single film.

Unlike filming with a regular film camera, the recordings from a panorama are made only after the scene is fixed, i.e. after the panorama is ready. Semantically, this opens up new possibilities for photography and cinema and draws questions on what might be their future.

“Love Affair” is a first step into these new possibilities. It is a successful attempt to merge the universes of gigapixel panoramic photography and audiovisual narratives.

Further possibilities of Gigapixel Panoramas can be foreseen, e.g. their use in new media supports such as mobiles, web 2.0 and games. Also, the development of new forms of usage should stimulate research on technology, turning necessary hardware and software more efficient, less expensive and widely available.

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