

## Reviews

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### **Captura fotográfica gigapíxel de obras de arte**

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The book *Captura fotográfica gigapíxel de obras de arte* by Pedro Cabezos Bernal, Pablo Rodríguez Navarro, Teresa Gil Piqueras, Juan Cisneros Vivó, and Cristian Gil Gil, published in 2022 and edited by edUPV, deals with the acquisition and processing of highly informative photographic images, called precisely gigapixels. This is an innovative technique that is gaining popularity in several international museums as a means of documenting, analyzing, and disseminating pictorial artistic heritage through very high resolution photographs. The research work in this case aimed to use different methods of photographic capture to document some important works of the Museo de Bellas Artes de Valencia and other works belonging to the Diputación de Valencia, the Fondo de arte of the Universitat Politècnica de València, as well as some early works of the Valencian painter Leopoldo García Ramón. The use of this technology makes it possible to appreciate details of a painting that the mere vision of the painting would not make one grasp: in fact, it allows, by means of a screen, to enormously enlarge the image thus being able to detect details useful to art scholars such as chiaroscuro effects, the use of color, the use of brushstrokes, and light reflections, so as to make such details appreciable even by non-art experts, in order to experience an almost immersive observation of the painting, which allows one to delve into the painting to grasp its most minute details.

The research work presented moves from the awareness that the new digital technologies represent a very effective tool not only for the results that can be obtained in the scientific field, but also for the space that these results can have in the museum and popularization field, since the images obtained are accessible to a wide audience through the web. In fact, it is enough to frame a QR code to have an image on one's smartphone that can be enlarged to capture the smallest details of the work.

There are already many museums that have taken advantage of this new technique thanks to the collaboration of Google and its high-resolution digital capture system of pictorial works, called *Arts & Culture*. However, very few are specialized in this type of digital image capture because of the technical difficulties related to the means required and the physical problems encountered during capture, such as light diffraction and image sharpness. These are in fact systems that involve the use of a pan head that keeps the position of the optical center of the camera lens fixed while the camera rotates on itself to capture individual frames that will eventually make up the final image. Since all points are in focus only when the camera's sensor is parallel to the painting, whereas when the camera is turned, as the angle between the sensor and the camera itself increases, the focus of the images decreases, the method turns out to be suitable for sampling especially small/

medium-sized works of art, since as the size of the work increases, there are drawbacks caused by the fixed position of the panning head, which does not allow for satisfactory image resolution.

For this reason, the research work of the group of authors aimed to develop a system and methodology that would allow the capture of even large works of art while avoiding problems related to image quality and color accuracy. This method consists of capturing images by moving the camera in a parallel or oblique manner, thus allowing for perfectly sharp images at all times and solving in this way one of the issues related to the use of the panoramic head. As for the problem of reflected light, which also changes as the shooting point changes, causing differences in exposure and reflections, this is solved by using an artificial light source that moves along with the camera. At this point it is possible to compose the mosaic of photos using stitching software that, through the use of certain algorithms, combines photographs even with different viewpoints.

In order to choose the best method of image acquisition and to correctly proportion the scale of the gigapixel image, it is of paramount importance to know the exact size of the painting and the desired pixel density, which is between 600 and 1000 ppp, thus being able to determine the necessary distance in which to place the camera and the number of frames that are needed, taking into consideration that between adjacent photographs there must be a minimum overlap of 30% using stitching software. At this point it is possible to choose between the different types of image capture: single viewpoint, multiple parallel viewpoint, and multiple oblique viewpoint. In the first case, a panning head is used that allows the camera to

rotate, which remains fixed at one point without moving; in the second, the movement of the camera always remains parallel to the painting while the optical axis of the lens is perpendicular to the painting; in the third, in fact a variation of the previous one, the camera can move and, if necessary, even tilt.

Once the images have been acquired, it is necessary to edit them with the help of a color chart to balance the whites appropriately to the lighting conditions of the scene, eliminating any color predominance. After color balancing, the exposure of the acquired images is checked and they are saved in 16-bit color TIF format to ensure the highest quality of gigapixel image composition.

The result of this research work is the documentation of twenty-three works of art, each of which can be viewed digitally from one's device by framing a QR code or following the indicated link [1]. These works represent part of the holdings held at the Museo de Bellas Artes de Valencia, the Diputación de Valencia, and the Fondo de Arte de la UPV, plus an urban artwork has been documented. The book also presents quite detailed information about the work and the author, supplemented by the Web encyclopedia of the Museo del Prado and that of the Museo de Bellas Artes in Valencia.

An explanatory example of the result obtained is a work by master Francisco de Goya, *Retrato de Joaquina Candado* [2]. It is a painting of considerable size, 168 x 112.6 cm, depicting a female figure sitting on the trunk of a tree with her gaze turned toward the viewer. The very high level of detail in the photograph makes it possible to appreciate different aspects of the painting, from those of a purely expressive nature to those of a more technical nature, although in the final rendering for the purpose of percei-

ving the work the two aspects go hand in hand. By enlarging the image one can more truthfully notice the expression of the female figure, as well as the presence of certain elements, such as the dog and some details of her clothing, but at the same time one can observe the different treatment the painter gives to the background surfaces to the fabric of the dress and to the complexion of the subject, using more controlled and meticulous brushstrokes for the woman's face so as to give a greater intensity to the gaze, and more casual and quick brushstrokes, laden with color for some details such as the dog and the shoes, to communicate a certain vividness and rapidity, typical of Goya.

A second interesting example is the work *Figuras de casacas jugando en el jardín* [3] by Joaquín Sorolla. Again, the work has considerable dimensions, 173.4 x 135.5 cm, in a more frivolous and festive autumnal setting, rich in light and color. Indeed, these are precisely the hallmarks of Sorolla's painting, which thanks to gigapixel photography we can experience at a very high degree of detail. By enlarging the image we can see how a vigorous and fresh, albeit indefinite, brushstroke, together with the predominant chromatics of the work that revolve around yellows, ochres, greens and oranges with contrasting blue tips, give the entire work an autumnal spirit accentuated precisely by the rapid brushstrokes that make up the leaves of the trees, together with a joyful and fresh charge given by the treatment of light.

The last aspect to be considered is surely that of the disclosure of the high achievements of this research. Indeed, this is a work with incredible potential in both scientific and museum settings. However, if in research circles the interest on the part of experts is un-

doubted, in museum circles one has to wonder if perhaps the possibility of observing a painting at such a degree of detail from one's own device does not disincentivize attendance at the exhibition spaces where these works are displayed. Indeed, if it is possible to observe a work in greater detail from one's own home one has to wonder what might make a visitor still prefer to

visit the museum. Well, although these photographs allow a perception of the work of the highest quality, in any case they do not convey the same feeling as if one were physically in front of a painting, in a space set up especially for him and for other paintings or works of a different nature. Probably an interesting application would be a blending of the two experiences, the physical one to-

gether with the digital one, so that the visitor can experience both and enjoy at the same time the fascination of being face-to-face with the work, getting as close as possible, and the thrill of taking an extra step beyond the allowed limit to delve inside the work and feel infinitely small compared to its size.

Camilla Ceretelli

### Notes

[1] The catalog of acquired works can be found at <https://gpix.webs.upv.es/index.php/obras/> (accessed 23 September 2022).

[2] The painting *Retrato de Joaquina Candado* by Francisco de Goya can be found at the link <https://gpix.webs.upv.es/gpix/583.html> (accessed 23 September 2022).

[3] The painting *Figuras de casacas jugando en el jardín* by Joaquín Sorolla can be found at the link <https://gpix.webs.upv.es/gpix/132-2004.html> (accessed 23 September 2022).

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