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Original
3D Faces reconstruction applied to some paintings of Leonardo da Vinci / Sparavigna, Amelia Carolina. - In: PHILICA. - ISSN 1751-3030. - (2017).

Availability:
This version is available at: 11583/2693931 since: 2017-12-02T17:33:51Z

Publisher:
PHILICA, Salisbury

Published
DOI:

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12 October 2024

3D Faces reconstruction applied to some paintings of Leonardo da Vinci

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Published in compu.philica.com

Abstract

In a previous article we have discussed a remarkable software which solves a difficult task, that of having a 3D facial reconstruction from a single 2D image. This software was developed by Jackson, Bulat, Argyriou and Tzimiropoulos at the University of Nottingham and Kingston University. We have also shown that the software can be applied to painted portraits of persons or to pictures of marble busts. Here we apply the software to a 3D reconstruction of some faces obtained from paintings of Leonardo da Vinci (La Gioconda, John the Baptiste, Bacchus and the Salvator Mundi). We discuss in particular the Salvator Mundi.

As we have discussed in a previous article [1], the reconstruction of a 3D surface from a 2D map is a problem that can be of general interest for several applications. One of these applications is the 3D reconstruction of a face from a single 2D image. A remarkable software exists for this complex task [2]. This software has been developed by Aaron S. Jackson, Adrian Bulat, Vasileios Argyriou and Georgios Tzimiropoulos, at the University of Nottingham and Kingston University. The researchers are also providing a site for experiments, at the address http://www.cs.nott.ac.uk/~psxasj/3dme/index.php . Let us call here this software as "3DME". For experiments, a frontal image is required. After the image is uploaded, the site brings us to the corresponding 3D model, which is easy to move by means of the mouse. An OBJ file of the 3D model is also given.

In [1], we have experimented 3DME on a painted portray to have a 3D face; Benjamin Franklin portraited by Joseph Duplessis ca. 1785 had been used. We have also experimented on a picture of a marble bust. It was the bust found in the Rhone River near Arles. Some scholars consider it a portrait of Julius Caesar [3]. Thanks to two images of this bust, a cortesy of Butko for Wikipedia, we concluded that the result of the method proposed in [2] is excellent.

Here we apply 3DME to a 3D reconstruction of some faces obtained from some paintings of Leonardo da Vinci (La Gioconda, John the Baptiste, Bacchus and the Salvator Mundi). The reconstruction is very interesting in the case of the Salvator Mundi, because gives us the possibility to compare this face to a self-portrait of Leonardo.

In the Figures 1, 2 and 3, we see the results of the software applied to the Gioconda, John the Baptist and Bacchus.

Figure 1: The Gioconda, in her 2D image and in two 3D faces.

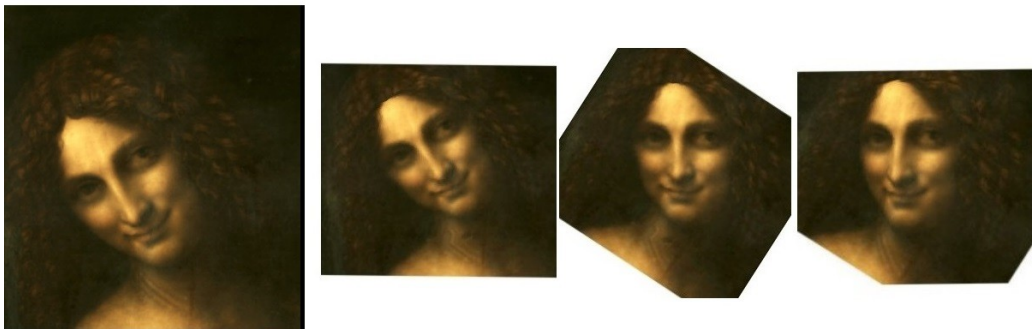

Figure 2: John the Baptist.

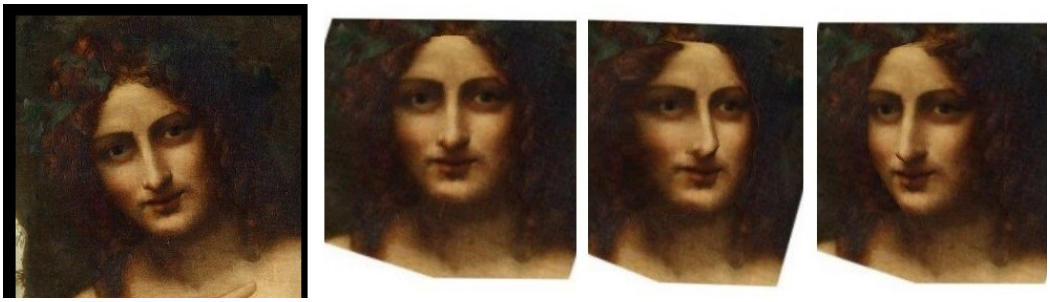

Figure 3: Bacchus.

Let us consider also the Salvator Mundi (Figure 4). The image is a frontal image and therefore is a perfect one for applying 3DME. The result is given in the Figure 5.

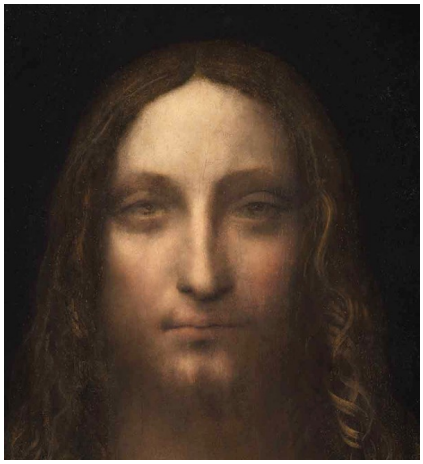

Figure 4: The Salvator Mundi.

Figure 5: 3DME results on Salvator Mundi.

One of the results given in the Figure 5 is quite interesting. We can compare it to a self-portrait of young Leonardo. The comparison is given in the Figure 6. The self-portrait was obtained from a page of Leonardo da Vinci's Codex on the Flight of Birds, as discussed in [4,5]. We can see a remarkable similarity between the two faces. Let me conclude with a question. Is the Salvator Mundi a self-portrait of Leonardo?

Figure 6: One of the 3DME reconstruction compared to a self-portrait of young Leonardo [4,5].

References

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Information about this Article

Published on Wednesday 22nd November, 2017 at 19:47:56.

The full citation for this Article is:

Sparavigna, A. C. (2017). 3D Faces reconstruction applied to some paintings of Leonardo da Vinci. *PHILICA Article number 1168*.