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VIRTUAL MICHELANGELO
DIGITAL SURVEY OF THE PLASTER WORKS OF THE FINE ARTS ACADEMY "PIETRO VANNUCCI" OF PERUGIA

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Abstract

The Michelangelo plaster works of the Fine Arts Academy of Perugia represent an unsolved enigma of art history. Formally they echo the sculptures *Day*, *Night*, *Dawn* and *Dusk*, molded by the Italian Renaissance genius for the Medici tombs of the Sagrestia Nuova of the Basilica of San Lorenzo in Florence, but, at the same time, they don't follow exactly the lineament of the Florence sculptures, and they express an original poetic due to the autonomous dimensional and expressive characteristics. In the past centuries and up to the contemporary, the scholars have proposed interpretative hypotheses on the origin and historical events of the plaster works, so as to making the famous architect and historian Ugo Tarchi exclaim: "se fosse possibile trasportare i calchi perugini accanto alle statue della Cappella Medicea!". The paper aims to investigate the relationship between the Perugia plaster works, donated in 1573 by Vincenzo Danti, and the Florence marble sculptures, carved around 1530 by Michelangelo Buonarroti.

Keywords

Michelangelo, Academy of Perugia, digital survey, photomodelling, surveyor-detective.

The four Michelangelo plaster works moved to Perugia in 1573 by "Cecchino viturale"[1] on behalf of Vincenzo Danti as trusted servant for the "vertuosa schiera di pittori et architetti" (able crowd of painters and architects) affiliated to the fledgling "Academia del Dissegno" (Academy of Drawing)[2], currently preserved at the plaster casts gallery at the Fine Arts Academy Museum of Perugia, embody a historical-artistic enigma still unsolved. Because they, though formally echoing the Times of Day (*Day*, *Night*, *Dawn*, *Dusk*) sculpted around 1530 by Michelangelo to seal in a monumental manner the tombs pertaining to the Medici family of Giuliano, duke of Nemours, and Lorenzo, duke of Urbino, in the Sagrestia Nuova of the Florentine Basilica of San Lorenzo, don't reproduce that features faithfully: neither from the compositional point of view, nor, least of all, from the dimensional point of view. But also because their location in the first academic seat remains unknown: that church of Sant'Angelo della Pace where Orazio Alfani and Raffaello Sozi (XVI century) "facevano essercitare gl'Academici in fare dissegni" (made the Academics train making drawings).

[1] "I magnifici academici di contro deveno havere sino a dì primo di agosto 1575 scudi sette baiocchi 12 di moneta prestatigli per pagare Cecchino viturale, che portò le statue da Fiorenza, e per altri bisogni de l'academia, e per loro a mastro Giammaria Bisconti pittore conservator dell'academia videlicet scudi 15" (The magnific academics on the other hand must have had until on 1 August 1575 seven ecus 12 doughs money lent them to pay "Cecchino viturale", who moved the statues from Florence, and because of other academy needs, and 15 ecus for them to mastro Giammaria Bisconti painter academy keeper *videlicet*). Archivum Romanum Societatis Jesu, Fondo Gesuitico, 1490, s. 318v. The document, which reports the transport to Perugia of the four Vincenzo Danti's plaster works inspired by the Michelangelo's original ones, was published by Francesco Federico Mancini (2011) for the first time. About Vincenzo Danti cfr. Fidanza (1996). About Giovanni Maria Bisconti cfr. Mancini (1992).

[2] In addition to the Sozi's handwritten (Sozi, XVI century), about genesis of the Academy of Drawing of Perugia cf. Montesperelli (1899); Cecchini (1954); Boco (1989); Mancini (2011) and Belardi (2012a).

Fig. 1: Digital survey of the Michelangelo plaster works of the Fine Arts Academy of Perugia, 2015, *Dawn*: photographic view, point cloud, mesh, textured mesh

The art historians interest to the Perugian plaster works, however, has always been great and has never diminished[3]. Starting from 1597, when Cesare Crispolti (1597) attributes to Vincenzo Danti the donation: an hypothesis confirmed by Annibale Mariotti (1788) in 1788 and by Baldassarre Orsini (1810) in 1810, but invalidated by Serafino Siepi (1822) in 1822, who singles out Ignazio Danti, Vincenzo's brother. The debate, still unsolved despite the accurate documentary researches carried out by Mariano Guardabassi (1878) earlier and by Iodoco del Badia (1898) later, restarts in 1909, when Walter Bombe, in an interview with Giulio Loccatelli and published on the "Il Giornale d'Italia" pages, floors the art history world, maintaining that the Florentine marble aren't Michelangelo's work, but they are work of one of his pupils, whereas the Perugian plaster works, which are something more than just mere casts of the Florentine marble, are work of Michelangelo. It is no coincidence that their "tecnica mirabile" (admirable technique) discloses the "mano sovrana" (sovereign hand) (Loccatelli, 1909a). Bombe's declarations fuels a heated argument: on the one hand they enjoy appreciation by the academics from Perugia (Loccatelli, 1909b), on the other hand they direct criticism of the main historians. Which are in any event so biting as to induce Bombe to pull back his assertions, reporting the hasty divulgation of the "resultati immaturi" (immature results) of his researches

[3] Enough to be subject to a real operation of "moltiplicazione della cultura" (culture multiplication) like *Michelangelo in Cina* iniziative, in which, over 2013, the Perugian plaster works' bronze copies have played a leading role in an important travelling event started from Pechino achieving Shangai. Cfr. Belardi, Bianconi, Menchetelli and Martini (2014).

Fig. 2: Digital survey of the Michelangelo plaster works of the Fine Arts Academy of Perugia, 2015, reconstructive hypotheses of the original collocation, render view

and the inconsistencies between marbles and plaster works to a clear understanding of the trainer Vincenzo Danti (Bombe & Urbini, 1909). Returning the originality chrism to the Florentine marbles and reversing the Perugian plaster works to copies rank.

As long as, in 1954, Ugo Tarchi overturns all stabilized certainties (stoked by the marginality of Charles De Tolnay (1948) and Ludwig Goldscheider (1953) quotes), publishing a reserved piece of writing (Tarchi, 1954) in which, into the shoes of the "surveyor-detective" (Belardi, 2014), reveals the differences between marbles and plaster works, by analytically comparing the Michelangelo study drawings with the photographic images and the direct surveys performed on the Florentine marbles and the Perugian plaster works[4]. The comparison reveals that the Perugian *Night*, *Dawn* and *Dusk* are substantially greater than the Florentine corresponding, while, conversely, the Perugian plaster work of the *Day* is smaller than the Florentine corresponding (Tarchi, 1954, pics. VII, XII, XVII e XXII). It is precisely this incongruity which drives Tarchi to rule out the Perugian plaster works like Florentine marbles casts on the one hand, and to conclude that the Perugian plaster works are casts of misplaced models on

[4] Tarchi particularly highlights the scientific value of the survey method, carried out "con un unico sistema per tutte e due le serie di sculture, applicando la fettuccia alle varie tese nello stesso modo" (with a single system for both of series of sculptures, by applying tape to the various stretched in the same way). Cfr. Tarchi (1954), in particular pics. II, II[A], VII, XII, XVII and XXII.

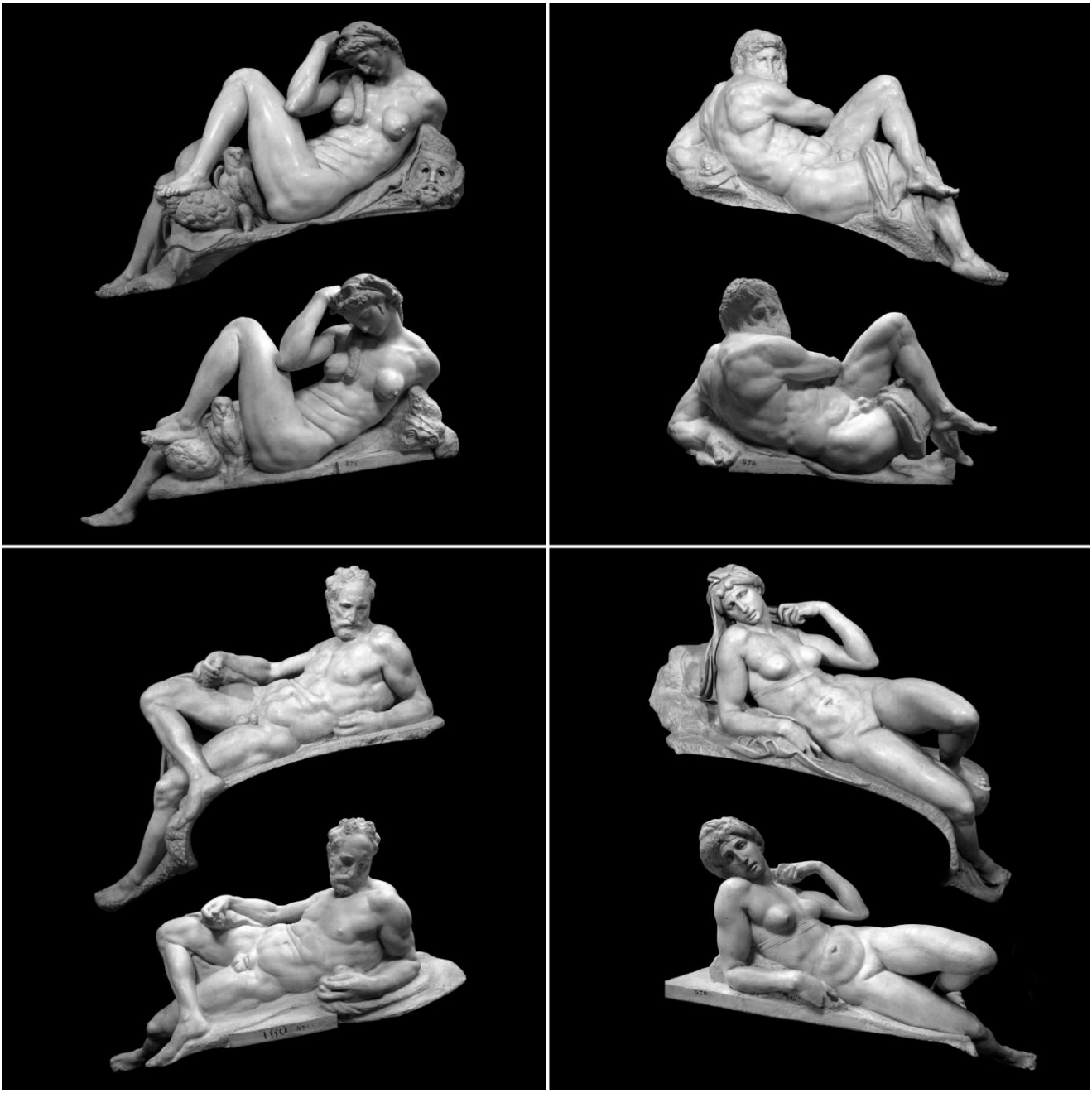

Fig. 3: Digital survey of the Michelangelo plaster works of the Fine Arts Academy of Perugia, 2015, *Night*, *Day*, *Dusk*, *Dawn*, photographic views (Florence, Perugia)

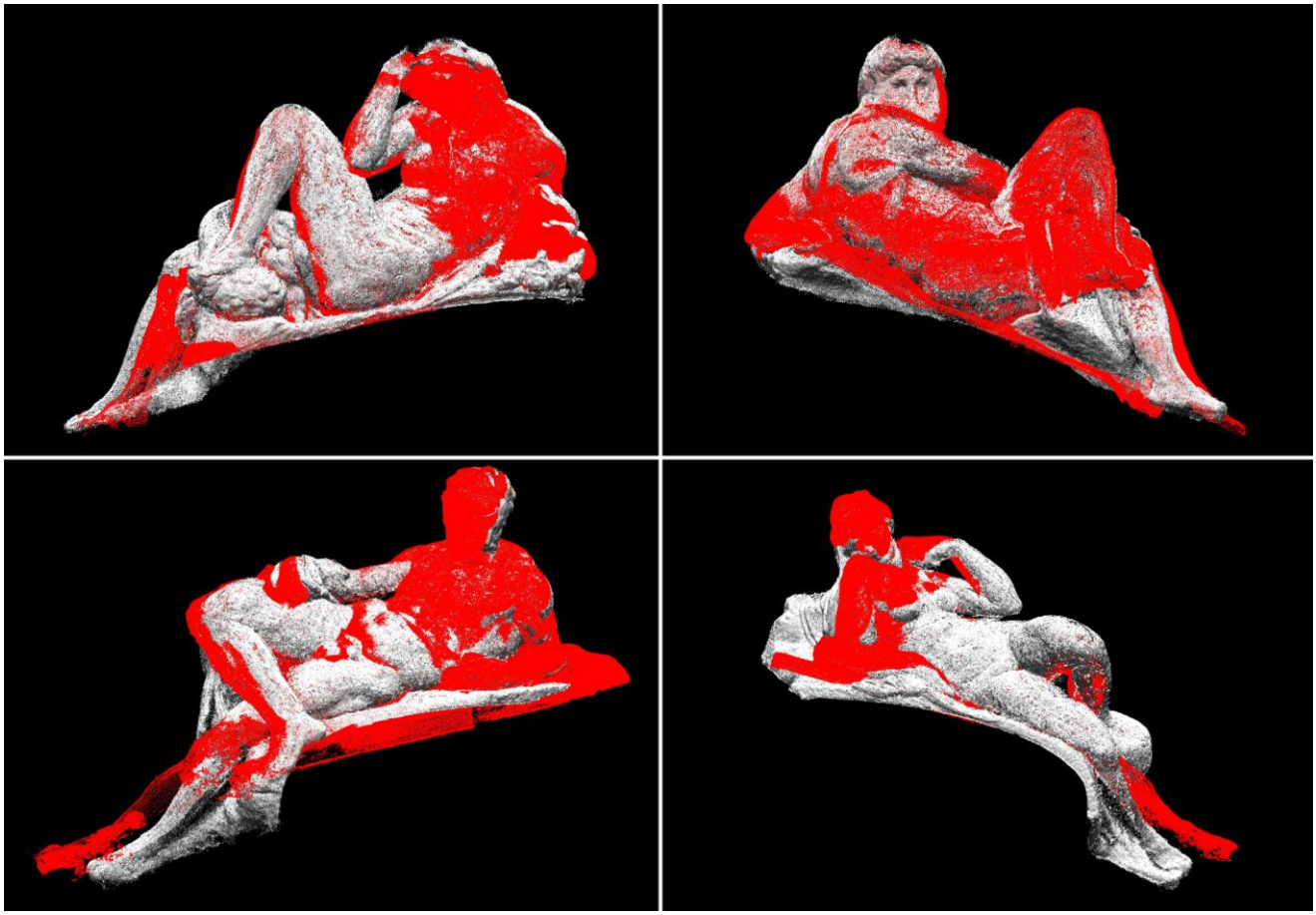

Fig. 4: Digital survey of the Michelangelo plaster works of the Fine Arts Academy of Perugia, 2015, *Night*, *Day*, *Dusk*, *Dawn*, point cloud (white: Florence, red: Perugia)

the other hand[5]: maybe shaped by Michelangelo himself starting from his study models previous to the Medicis' marbles[6], as confirmed by the different positioning of the Perugian plaster works compared with the Florentine marbles (the former are placed on an incline plane, while the latter are laid over a volute) that can be reasonably attributed to the variability of Michelangelo's inspiration (Tarchi, 1954, in particular pics. II e II[A]).

A brave thesis, which returns dividing researchers. In fact, while Giusta Nicco Fasola (1955) supports Tarchi's conclusions, John David Summers (1979) and Dimitrios Zikos (2008) contest that, restarting the allocation hypothesis

[5] The main differences relate to the poses (in particular the pose of the *Dawn*'s leg, elongated in Perugia and folded in Florence, and the different twisting of *Dusk*'s back and *Day*'s bust, head and limb) and some details (in the Perugian *Dawn* the bendages wrapping Florentine head are missing, in the Perugian *Dusk* the figure shakes a "panno" (fabric) with its left hand and in the Perugian *Night* the owl and the mask used to decorate the figure appear differently placed and least well defined than the Florentine corresponding). Cfr. Tarchi (1954), in particular pics. III, IV, V, VI, IX, X, XI, XIII, XIV, XV, XVI, XVIII, XIX, XX, XXIII, XIV, XXV e XXVI.

[6] In this sense Tarchi rejects all the previous hypothesis, in which he argues that the noticed differences between marbles and plaster works don't owe to wrong restorations of the latter, because that restorations would lead into evident discontinuity in the figures pose. In addition to this he denies that Vincenzo Danti could be the author of the missing originals as marbles copies of his mentor Michelangelo, because just "osservare il vigore plastico con cui sono state eseguite le statue perugine, vigore che la formatura in gesso non è riuscita a svisare, perché tale ipotesi crolli. I gessi di Perugia parlano chiaro a chi sappia guardarli e denunciano nettamente l'unghia del leone" (see the plastic strength with which the Perugian statues have been made, strength that the gypsum moulding has failed to distort, so that the hypothesis falls down. The perugian plaster works speak for themselves to those who are able to look at them and they clearly expose the lion nail). In addion, in that case, Danti would have reproduced in the copies the exact shape of the originals. Cfr. Tarchi (1954), in particular pics. XXV, XXVI e XXVII.

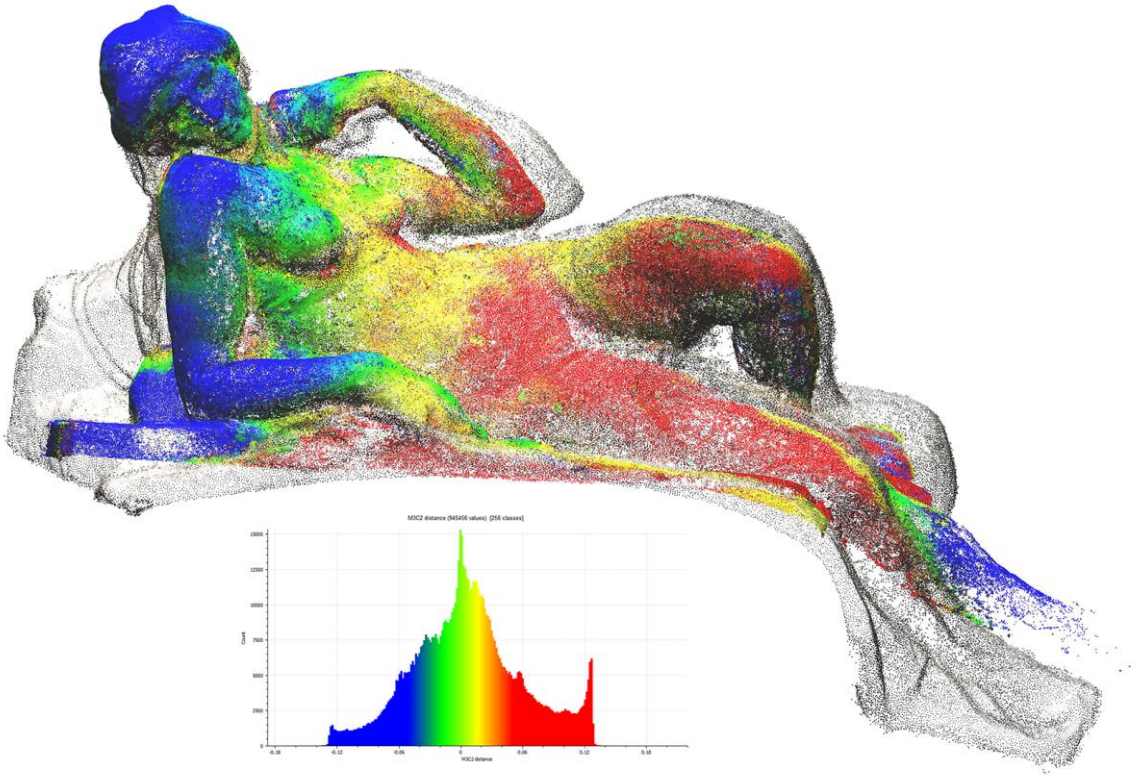

Fig. 5: Digital survey of the Michelangelo plaster works of the Fine Arts Academy of Perugia, 2015, *Dawn*, metrical gap relating to consecutive points (black: Florence, colored: Perugia)

to Danti's compass, in particular to Timoteo Refati, Ignazio's partner (*Aurora e Crepuscolo*, 2008). However not even the new documentary contributions find out by Lidia Mazzerioli solve the enigma, because, though confirming the hypothesis that Vincenzo Danti is the Perugian casts' author, they don't throw light on happening (Mancini, 2011; Boco, 2014), in which it seems characteristic at least that the casts obtained from a number of original models may be partly of greatest dimension and partly of smaller dimension than the originals corresponding.

In order to throw light on this intricate historical-artistic enigma, the Department of Civil and Environmental Engineering of the University of Perugia has turned on a reserved research[7] that, recalling the comparison started by Ugo Tarchi between the Perugian plaster works and the Florentine marbles, it is proposed to perfect it using advanced survey techniques. In this sense, the survey of the Perugian plaster works has been carried out by integrating the continuous metric data derived from the digital survey with the discontinuous metric data derived from the direct survey[8]. The technique used has been the digital photomodelling which makes it possible to obtain a textured cloud of points of the captured object starting from a discrete, but synergistic, series of reserved photographic images (*image-based modelling*). The approach adopted is the *structure for motion* which taking advantage of the photogrammetric basic principles automates the process for conjugate image points recognition on the shoot set used, and starting from these it rewrites independently the gripping points position and the geometries of the photographed scene. The capturing data has been made through collection of a digital photographs set taken circling around the gypsum to survey. To acquire

[7] This research survey is scientifically coordinated by the professor Paolo Belardi of the Department of Civil and Environmental Engineering of the University of Perugia.

[8] The digital survey of the Michelangelo plaster works of the Fine Arts Academy of Perugia has been conducted by the Department of Civil and Environmental Engineering of the University of Perugia (science director: Paolo Belardi; survey team: Paolo Belardi, Luca Martini, Michele Martorelli). Cfr. Martorelli (2013-2014), Moulon and Bezzi (2012), Cignoni, Callieri, Corsini, Dellepiane, Ganovelli and Ranzuglia (2008), De Luca (2011). Cfr. also Belardi, Bianconi and Romano (2005).

images a digital reflex camera (DSLR) Canon EOS 5D Mark II has been used, characterized by a 21,1 megapixel sensor CMOS, CCD 36 x 24 mm, with a 2784x1856 pixel images resolution. The shoot have been made in diffused natural light conditions with a shutter click every 15 degree, so that each sampled point could be present in three images at least. The software that have been used are Python Photogrammetry Toolbox[9] for the cloud of points' construction starting from the shoot, CloudCompare because of cleaning the cloud itself and MeshLab because of creating and to texturing the mesh surface. 145 photographic images have been handled for the *Dusk*, 135 for the *Dawn*, 129 for the *Day* and 128 for the *Night*, in 15, 30 and 50 cluster shots. The digital clones, in addition to vouch for two-dimensional and three-dimensional restitution of the architectural drawing, has confirmed the precision of the metric values published by Tarchi and it has allowed to speculate about the original plaster works location in the church of Sant'Angelo della Pace[10]. For this purpose, assuming as credible the hypothesis that their relative disposition in respect to the altar coincides with that of the Florentine marbles in range of the tombs pertaining to the Medicis', a body of graphic and infographic drawings has been composed, returning the plaster works position according to the doric arcade which chant the lateral walls of the Alessi's ecclesiastical building. Moreover, because of the presence of three lateral recesses interrupted by two pilaster strips, more suitable alternatives have been verified, even assuming the presence of two central lateral altars. That has enabled the prefiguration of a number of possible dispositions, virtually realizing the documentary knowing thanks to high-tech technologies applied to the scientific research and to the prefiguration of virtual reality.

The next stage consisted of undertaking a research survey, reserved and intended to obtain the digital clones of the marbles of the Medicis' tombs architectural complex in Florence[11] in order to digitally compare them with the Perugian plaster works, so to fulfill the wishes with which the Florentine architect gloomily ends his script regarding the Michelangelo's querelle: "se fosse possibile trasportare i calchi perugini accanto alle statue della Cappella Medicea!" (if it was possible to transport the Perugian casts close to the statues of the Medici Chapel!) (Tarchi, 1954). The technique used has been the digital photomodelling following the same operative approach undertaken for Perugian plaster works[12]. 100 photographic images have been handled for the *Dusk*, 92 for the *Dawn*, 75 for the *Day* and 99 for the *Night*, in 15, 20, 25 and 30 cluster shots. In this sense the overlapping of the clouds of point obtained by photomodelling and the comparisons, respectively, between textured meshes and canonical two-dimensional architectural drawings of the architectural surveys have been performed. For the overlapping of the clouds of points the CloudCompare software's "Fine registration" command has been used. This one by the Iterative Closest Point (ICP) algorithm has allowed the optimization of the clouds of points' overlapping. In this sense retaining the cloud of a Florentine

[9] In this survey campaign the "Feature Extractor" values has been set to "siftvlfeat" and "Photos Width" to "2400".

[10] Cfr. Crispolti (1597) and Cecchini (1954). The architectural survey of the church of Sant'Angelo della Pace in Perugia has been conducted in the framework of the educational and research activity of the ex Drawing and Architecture Interdisciplinary Section at the Department of Civil and Environmental Engineering of the University of Perugia coordinated by the professor Paolo Belardi, and in particular in the framework of the PhD course in "Civil Engineering" (XXIV cycle), activated in the academic year 2008-09 at the University of Perugia (coordinator: professor Claudio Tamagnini, tutor: professor Paolo Belardi; PhD students: Marco Armeni, Luca Martini). About the church of Sant'Angelo della Pace cfr. Belardi (2012b) and Martini (2010-2011).

[11] Thanks to the doctor Monica Bietti, Director of the Museum of Medici Chapels of the Polo Museale Fiorentino, for the willingness proved during the research survey. The digital survey of the Michelangelo's murbles of the Museum of Medici Chapels of the Polo Museale Fiorentino has been conducted by the Department of Civil and Environmental Engineering of the University of Perugia (science director: Paolo Belardi; survey team: Paolo Belardi, Luca Martini, Michele Martorelli). Thanks to Mr. Silvio Dotto of the Museum of Medici Chapels for the precious help during the shoot.

[12] The shoot have been made by the use of a digital reflex camera (DSLR) Canon EOS 5D Mark II, characterized by a 21,1 megapixel sensor, CCD 36 x 24 mm, with a 2784x1856 pixel images resolution. The photographic images has been made in diffused natural light conditions with a shutter click every 15 degree, so that each sampled point could be present in three images at least. The software that have been used are Python Photogrammetry Toolbox (in this survey campaign the "Feature Extractor" values has been set to "siftvlfeat" and "Photos Width" to "2650") for the cloud of points' construction starting from the photographic images, CloudCompare because of cleaning the cloud itself and MeshLab because of creating and to texturing the mesh surface.

marble as reference, the cloud of the respective Perugian plaster work has been rigidly roto-translated through a recurring process in order to obtain their geometrical collimation. Once that the clouds have been overlapped, by the use of the CloudCompare M3C2 plugin it has been possible to evaluate the medium metrical gap relating to consecutive points. In particular through the commands "Filter points by value" and "Show histogram" it has been possible to draw this gap by the use of color and to represent a Cartesian diagram that indicates the distance between points in the x-axis and the number of the corresponding points in the y-axis[13]. This scientific analysis has allowed to verify Tarchi's metrical and morphological considerations, so to generate a new contribution to the research thanks to the searching chances offered by the new technologies of the augmented reality. What has come to light reflects the observations of the Tuscan historian, therefore it is desirable that this research hypothesis could be the starting opportunity to further investigations with a view to obtain documentary clues that will make it possible its complete definition. Otherwise is now verified that the survey, which is in itself a cognitive act, might sustain and guide the archeological-scientific research at the same time. Above all in the specific case, in which the proposed contribution check on the connection between the Perugian plaster works and the Florentine marbles through the historical research, the detective survey and the new technologies: paraphrasing the Michelangelo's famous motto "*col cerviello et non con le mani*" (brain instead hands) that is declaring the "surveyor-detective" as decisive figure in range of any historical-artistic research.

[13] It is useful to point out that the values in the x-axis represent the distance between consecutive points of the two clouds, and not the effective metrical gap between matching points (for example the same part of a given limb or decorative element) of plaster works and marbles.

Fig. 6: Digital survey of the Michelangelo plaster works of the Fine Arts Academy of Perugia, 2015, *Night*, *Day*, *Dusk*, *Dawn*, elevations (Florence, Perugia)

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