FROM AUTHENTIC TO REALISTIC, FROM TRUE TO PLAUSIBLE

THE DIGITAL ARCHITECTURAL SURVEY BETWEEN THE REAL AND THE VIRTUAL

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ESSAY 78/04

ARCHITECTURE'S DIGITAL REPRESENTATION
DIGITAL SURVEY
DIGITAL 3D MODEL
OPTIMIZATION OF ARCHITECTURE'S MODELLING

In the digital survey, the traditional opposition between uniqueness, authenticity, originality of reality and the multifaceted structure of multiplicative reproduction typical of the representation of architecture –through synthetic digital 3D models or realistic ones from SFM, interpretative syntheses of data visualization, physical models from rapid prototyping– it loses definition and becomes more and more vanishing.
Although these are technical operations, in fact, in the various processing steps between acquisition and output the data gradually assumes states of greater or lesser proximity to the real data and a variable verisimilitude.
The paper investigates in theoretical terms how the conceptual domain of the informative artifact declines the cloud populated by the terms 'original' 'copy', 'clone', 'reproduction', 'model' and uses the selected case study with technical exemplification, interrogating it innovatively by means of 'plausible' optimization by algorithms currently in the betaversion phase of development by the authors.

INTRODUCTION

Any reflection on the relationship between the authentic and the false cannot ignore the already widely discussed relationship between originals and copies, assuming the respective etymological meanings[1] as the conceptual origin, and with a clear limitation of the field to Western European culture[2]. The subject of this paper is the digital architectural survey, where we focus on technological artefacts, although we reference some studies concerning artistic artefacts, which have been investigated much more in this sense, and subsequently will apply the necessary epistemological and disciplinary shifts. The paper proposes a reflection on the disciplinary field of architectural survey to deal with the theme of the relationship between source, process, and output characteristics. We theoretically frame the etymological and conceptual cloud populated by the terms 'original', 'copy', 'clone', 'reproduction', and 'false'. As a subsequent technical example, we innovatively investigate the selected case study through 'plausibility' optimization algorithms, which are currently in the beta version phase of development.

FRAMEWORK AND DISCUSSION

Many studies have explored the problem of the copy in the art history and criticism, highlighting how the myth of the originality of work is overall a relatively recent concept, in extreme synthesis linked to Romanticism, and it must also deal with a positive meaning of the term coming from antiquity and linked to the function of transmitting cultural value between the eras as well as increasing the value of the original itself. In fact, we have an undoubted debt to copies and copying, which is constituted by the transmission of works and knowledge. For example, just think of the copies of Roman statuary taken from the surviving Greek works, or the immense patrimony that came to us from scribes and medi-

Fig. 1 JR, *Real and realistic*, 2021. Picture of the monumental photographic collage installation *The wound*, ph. Puma, P., Palazzo Strozzi in Firenze, 2021.

eval copyists that have copied and transcribed ancient manuscripts and codices for centuries before the invention of printing[3]. Other examples are the continuous recreation carried out by Renaissance collectors in search of classical canons and, more recently, the fundamental didactic function that saw the exercise of copying as an indisputable basis of artists' training, even beyond the nineteenth century (Belardi et al., 2014; Belardi, 2017; Latour et al., 2011).

Therefore, if accompanied by a detailed critical analysis, the apparent monolithicity of the negative meaning that accompanies the copy in our culture can be questioned under various profiles (Preciado, 1989).

Among various social, economic, and commercial factors conferring a copy of an artwork an augmentative status on the original, the knowledge is the reasons peculiar to the broad disciplinary spectrum of process modalities (copying) and product (copy). However, leaving aside the analogy with the aforementioned studies, at least a couple of problems must be focused on in some detrimental aspects because they directly concern the specific discipline of the architectural survey. Technical artefacts are producted using partly automatic processes aimed at seriality, where the copy is even an aspiration, and programmatically designed with a function. In what terms can the dialectic between original and copy be dissolved when we are not talking about artistic artefacts but about technical artefacts born as serial products? In addition, has all the augmentation potential of digital clones coming from the architectural survey been identified and deployed as already has occurred in the case of art copies?

Originals and copies in digital architectural surveys

A first deepening of this topic would immediately bring up the question of the Renaissance differentiation between *ars* and *téchne*, which are referenced in other studies and we will not deal with here. As is almost inevitable, starting from Benjamin's paraphrase (Benjamin, 2011), in the era of the very easy technical reproducibility of digital artefacts, the authentic/fake contrast[4] makes a further leap in meaning. It happens not only because technical artefacts make no difference in using the original or the copy, much more than for serialisable artworks, but also because our digital multilingualism does not limit itself to reproducing, but rather places the artefact in a context that is different each time from the original one by actually modifying its statute to each 'phase passage' and, using the versatility of the reproductions, further meaning and added value are given to each passage (which could perhaps create a different 'aura' each time)

(Lichty, 2009). Like the digital society and infoculture, moreover, for some time also many scientific fields such as digital architectural survey have been characterized by a growing media convergence, which allows fluidity in the process of close integration between the real and the virtual based on the gnosiological and operational chain of data acquisition, processing, restitution, and communication. It also allows easy coproduction of ideas and sharing of contents (Cao, 2018; Daly et al., 2019).

Above all, in this framework characterized by co-authorship and cooperative working methods, becomes more and more blurred lose their definition and vanishes the traditional contrast between authenticity and originality of reality and the multiform structure of its multiplicative reproduction now consolidated and typical of the representation of architecture, and carried out through digital 3D models synthesis or photorealistic from SFM, interpretative synthesis of data visualization, physical models from rapid prototyping, and so on (Puma, 2019) (Figure 1).

Finally, with respect to the first question, it is also necessary to divide the field with respect to the decisive element of the size of the object detected. On the scale of architecture and of the city, a 'copy' is never really a copy, at least in the sense of a faithful replica made by a different author, but more properly, we must speak of reproduction[5]. It is only when the survey documents objects of limited size that we can use the terms 'copy' and 'clone'[6], even using the terminological and conceptual categories of artwork.

Augmentative potential of the digital clone

With regard to the second point, it is necessary to start from the consideration that, as in the past, the copy has always constituted the possibility of establishing a bridge between epochs. Even today, multiplicative reproduction under certain conditions already provides a powerful bridge function between the past and the future that is not free from critical aspects.

Although, in fact, in the technical domain, reproducibility is an added value as the versatility of digital data allows the narrative context to be continuously varied and renewed, in the age of easy falsification, the problem of *auctoritas* arises with even greater rigor.

By repositioning the elements involved, a redefinition of the *auctoritas* could be framed in this context by the declination of the reliability requirements of the digital architectural survey in taxonomic terms: the original/copy pair actually has different modalities of declination in the survey process (measurable through precision), in the product of the survey (measurable in accuracy), and in the use of the clone (governed by the disciplinary statutes).

And if this qualification is maintained with vertical continuity, it could represent the reconstitution of an alias of *auctoritas* originally deriving from uniqueness and originality that is now also valid for the digital context.

In this sense, the digital artefact becomes an informative artefact that assumes a role of knowledge multiplier even superior to the artwork copy, provided that the cultural motive unfolds in the knowledge society while reconciling the dynamic adaptation to the contexts of use to rigorous scientific qualification.

Our transcription and data processing abilities are speeding up, expanding, and automating. One example is the creation of many types of fakes through AI starting from real and authentic primitives.

The more this happens, the more our commitment must increase to scientifically qualifying the processes, products, and finalization (Sacchi, 2018; Salerno, 2018). This intent takes different forms, ranging from those of a statutory order to those of a more strictly technical type, such as the sample case set out below. The case concerns the application of algorithms to the 2D graphical processing of a part of an architectural plan survey (Sgherri, 2016) of the castle of Riolo Terme (Ravenna, Italy) for optimizing the 'plausibility' to the initial and origin data.

MATERIALS AND METHODS

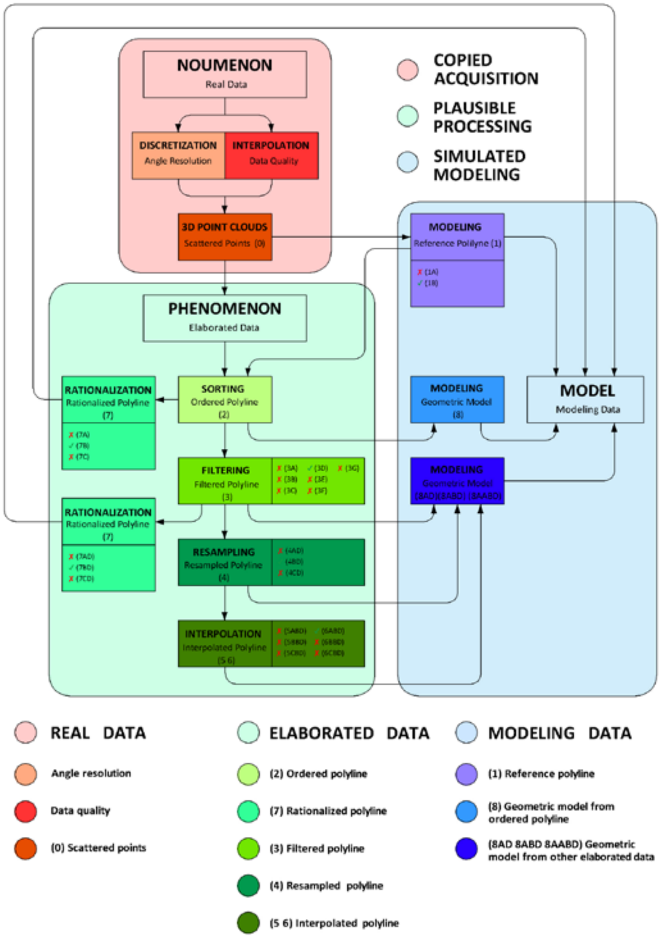
In an emblematic sense, below we decline the triad of 'copied', 'plausible', and 'simulated' in application practice of the digital survey LS, which show a correspondence with the three distinguishable moments of 'acquisition', 'processing', and 'modelling' of data.

The term 'simulated'[7] is intended both in its technical-specialist meaning in operational research in statistical mathematics, as the analysis of a process or system through the construction of a mathematical model that can be solved by means of an electronic computer, and its common use as the modelling of a phenomenon.

Below, we show examples of the distinction between the terms of 'copy', 'reproduction', and 'model' in relation to the corresponding three phases indicated above (Figure 2). The above description reveals an interesting methodological synthesis of the process in Kantian philosophy, meaning that the real datum represents the thing in itself, the Kantian noumenon that is by definition unattainable and asymptotic for scientific knowledge (which will never be able to give a complete and exact representation). In the action of acquiring the data copied from reality in a virtual copy, it would become a phenomenon that realistically represents reality.

Through the application of categories (such as methods of processing data by human intellect) and with the identification of the attributes deemed necessary from time to time, it is represented in a reliably plausible manner. Finally, through its modelling, the data becomes communicable as a simulated model related to the 'real'. The triad of the 'noumenon', 'phenomenon', and 'model' will find within its terms some processes of acquisition, processing, and modelling, such as to generate products –starting from an initial product with initial data and progressing to a final product containing new data.

Fig. 2 Anzani, G., *Methodological synthesis of the process*, 2021.



RESULTS

Noumenon

In the acquisition phase of real data, assuming the use of an LS equipment virtually free of acquisition errors, we obtain a virtual copy of the original. We will never be able to achieve a certified copy by making a comparison between the corresponding data, even when limiting the comparison to only the category of a geometric positioning of points in 3D Cartesian coordinates. The uneludible discretization and interpolation processes inherent in the technology of data-acquisition equipment leads to only an asymptotic tendency for the copied virtual data to faithfully and completely represent reality.

Even if we want to limit ourselves to considering only the category of the 3D positions of points of reality as the true one by depriving it of all the other categories, we will obtain at most a partial copy of reality:

Specifically, the acquisition through LS, the processes indicated above translate as follows.

- Given the rotation on the azimuth and zenith axes of an LS station during data acquisition between successive acquisitions of single points, the discretization translates into the angular resolution of the data angle resolution (A.R.) measured in pixels/360°, or rather in the definition of a spherical grid for the acquisition of points. The choice of the appropriate A.R. will therefore be essential to obtain a good compromise between the quality of the digital architectural survey and the size of the file generated.
- Given the inevitable systematic error of the instrumentation, ingenerating during the acquisition of each single point a range of noise (R.N.) measured in mm, the interpolation translates into accuracy of the data that is data quality (D.Q.), or rather, the determination on a statistical basis of an average value between a variable number between 2 and 16 of several repeated acquisitions.
- Doubling or halving D.Q. decreases or increases the R.N. of the pixel by 40%. R.N. is proportional to the distance of a single point from the LS acquisition station and varies between 0.4 mm and 4 mm when considering acquisition distances between 10 m and 100 m. The execution times of the survey measured in minutes will proportionally depend on the settings chosen for A.R. and D.Q. This gives rise to a Data Rate (D.R.) measured in pixels / seconds that is characteristic for each set scan, as well as a maximum quantity of points that can be acquired in a given scan (Table 1).

Phenomenon

In the elaboration phase of the acquired data, a more advanced and complex series of further opportune processes of data transformation will take place (Asperl et al., 2007). In order to evaluate the greater or lesser adherence of the various transformations carried out on the acquired data, the mean squared difference (M.S.D.) will be adopted as an indicator[8] (Ventsel, 1983). Some examples of applicable transformation processes applicable to the acquired data to obtain conversion products are described below.These processes can be applied in cascade or independently of each other starting from different products[9].

NOUMENON				
Angle Resolution	Data Quality			
	Less 2	Normal 4	High 8	Premium 16
Preview - 1.250		0:26 min		
Low - 2.500	0:26 min	0:52 min	1:44 min	
Middle - 5.000	0:52 min	1:44 min	3:22 min	6:44 min
High - 10.000	1:44 min	3:22 min	6:44 min	13:28 min
Super high - 20.000	3:22 min	6:44 min	13:28 min	26:56 min
Ultra high - 40.000		13:28 min	26:56 min	53:20 min

Tab. 1 Anzani, G., *Noumenon*, 2021.

- *Process: sorting; initial intermediate and final product: scattered points (0), reference polyline (1), ordered polyline (2); goal: to process the data*. A set of scattered points is transformed into ordered polylines passing through suitable sub-sets of points according to paths defined by reference polylines. These polylines are defined manually and designed to allow for the identification of underlying geometries and generate an appropriate ordering of the points. This will allow us to better process the data in the subsequent phases and to increase its communicability. The definition of a suitable reference polyline, albeit brief, is a prerequisite for the success of the subsequent phases (see in Table 2 for the difference of M.S.D. between 1A and 1B).

- *Process: filtering; initial and final product: ordered polyline (2), filtered polyline (3); goal: to clean the data*. Ordered polylines containing erroneous data both in terms of erroneously or unintentionally scanned artefacts and R.N. are transformed into filtered polylines obtained by filtering the vertices to clean the data. This eliminates any vertices where the transverse distance with respect to the indicated reference polyline is beyond a certain tolerance limit. Cases are reported in Table 2 with distances between a maximum of 50 cm (3A) and a minimum of 5 mm (3G), which filter between 0% (3A) and 80% (3G) with values of M.S.D. between 0.000 (3A) and 40.227 (3G). Given the acquisition parameters and the manual determination of the reference polyline used, it is convenient to use a filtering distance on the order of 5 cm, which will limit the filtering percentage to a value lower than 10%. This allows us to maintain the filtering adhesion (SQM) within acceptable values (3D) (Figure 3).
- *Process: resampling; initial and final product: filtered polyline (3), resampled polyline (4); goal: to decimate the data*. Filtered polylines containing an enormous amount of vertices are transformed into resampled polylines by resampling the vertices to decimate the data based on the longitudinal distance between two successive vertices along the same polyline. The cases reported in Table 2 were obtained with resampling distances between a maximum of 10 cm and a minimum of 5 mm and filter between 79% (4AD) and 14% (4CD) with M.D.S. values between 32,086 (4AD) and 27,814 (4CD). Given the acquisition parameters and the choices made for filtering, it is convenient to use a resampling distance on the order of 5 cm, which will result in a significant percentage of filtering higher than 50%. This allows us to keep the M.S.D. of resampling adherence within acceptable values (4BD).

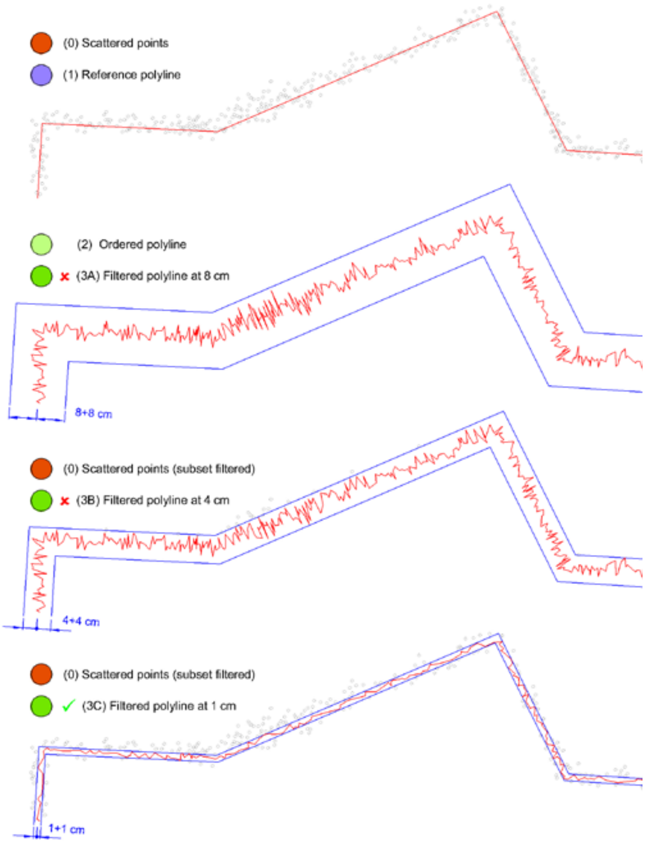


Fig. 3 Anzani, G., *View of some of the products related to filtering process obtained by varying the setting parameters*, 2021.

- *Process: interpolation; initial and final product: resampled polyline (4), interpolated polyline (5, 6); goal: to smooth the data.* Resampled polylines that are too corrugated and jagged are transformed into interpolated polylines by interpolating the vertices to smooth the data. This is done using specific algorithms based on Lagrange and Bézier interpolation, as well as calculation of the moving averages of various types and orders. The cases reported in Table 2 adopt both linear and geometric interpolations of order between 3 and 7. These cases carry out negligible reductions of the starting data and give rise to interpolation adherence values of M.S.D. between 31.905 (6ABD) and

34.150 (5CBD), and all decrement values from the initial resampling adhesion have an M.S.D. of 29.386 (4BD). It is essential to note that unlike all the other conversions listed here, resampling is a process that produces falsified polylines whose vertices derive from calculations carried out on the vertices of their neighbourhood and not a selection of acquired vertices. The calculations show that geometric interpolation is preferable to linear and low values for the order of the moving average. In both cases, geometric interpolation limits the smoothing produced in the vertices of the underlying geometries.

- *Process: rationalization; initial and final product: various possibilities (2, 3), rationalized polyline (7); objectives: to lighten the data and improve its quality.* Ordered polylines or filtered polylines containing data that are not rationally selected are transformed into rationalized polylines by rationalizing the vertices derived from only data acquisition to increase both the lightness of the data and the quality of the data. This is done using more advanced algorithms than the previous ones. For example, the Douglas-Peucker algorithm allows us to rationally resample a polyline with a very faithful perceptual representation of the original (Douglas et al., 1973; Hershberger et al., 1992; Wu et al., 2003). In the more linear sections, the quantity of points will be reduced, while in the more variable sections, the number of points will be kept higher.

Thus, it will be possible to obtain an incredible percentage of filtering between 81% (7C) and 99% (7AD) when adopting resampling distances between a maximum of 10 cm and a minimum of 5 mm. M.S.D. values between 11.549 (7c) and 47,786 (7ad) are obtained.

Considering the acquisition parameters, the choices already carried out in the previous filtering phase, and the aim of maintaining the adherence of resampling M.S.D. within acceptable values, it is convenient to use a rationalization distance on the order of 5 cm (7b) (7bd).

PHENOMENON							
ID			Description of the process and value of the setting parameter		number of vertices in the product obtained and M.S.D.		
					number	percentage	M.S.D.
0	✓		Scattered Points from LS		**7210**	----	----
2B	✓		Sorting with refer. polyline (1B)		**7210**	----	----
3A	✗		Filtering whit reference polyline (1B)	0,5	7210	0,00%	0
3B	✗			0,25	7190	0,28%	5,99
3C	✗			0,1	7087	1,71%	20,311
3D	✓			**0,05**	**6769**	**6,12%**	**26,701**
3E	✗			0,025	5325	26,14%	32,92
3F	✗			0,01	2747	61,90%	38,639
3G	✗			0,005	1440	80,03%	40,227
4AD	✗		Resampling from filtered polyline (3D)	0,1	1548	78,53%	32,086
4BD	✓			**0,05**	**3094**	**57,09%**	**29,386**
4CD	✗			0,025	6187	14,19%	27,814
5ABD	✗		Linear or Geometric Interpolation from resampled polyline (4BD)	3	3092	57,12%	32,329
5BBD	✗			5	3090	57,14%	33,333
5CBD	✗			7	3088	57,17%	34,15
6ABD	✓			**3**	**3092**	**57,12%**	**31,905**
6BBD	✗			5	3090	57,14%	32,638
6CBD	✗			7	3088	57,17%	33,107
7A	✗		Rationalization (Douglas Pecker) from ordered polyline (2B)	0,1	108	98,50%	33,202
7B	✓			**0,05**	**466**	**93,54%**	**22,071**
7C	✗			0,025	1379	80,87%	11,549
7AD	✗		Rationalization (Douglas Pecker) from filtered polyline (3D)	0,1	38	99,47%	47,786
7BD	✓			**0,05**	**313**	**95,66%**	**36,711**
7CD	✗			0,025	1223	83,04%	29,276

Tab. 2 Anzani, G., *Phenomenon*, 2021.

Model

In the modelling phase of the acquired and possibly processed data, possible simulation processes will take place. In this case, subjective choices and operations will be introduced and carried out directly by the operator or by means of specific algorithms (Anzani, 2011).

The aim is idealizing what is represented by categorizing the data into a mathematical, statistical model to replace the previous data. Examples include the conversion of a polyline into a line (if with a distinctly linear trend) or into arcs of a circle or ellipse (if with a curved trend). This is done using appropriate mathematical calculations that are mainly based on approximation of the data by means of applying M.S.D. to the known vertices of the polyline under examination. Its adherence is optimized to the ideal geometric model chosen for modelling (Gini et al., 1976).

In this way, we obtain a modelled polyline (8), which is an idealized representation of the original data. Given the procedures used, it will also be a plausible and reproducible polyline as its vertices derive from automatic and repeatable calculations (Krawczyk, 2009; Togores, 2018).

In conclusion, a total reasoning about the triad of the noumenon, phenomenon, and model can be interesting, and the reference polyline (1) described only summarily in the initial phase can be compared with the modelled polyline (8) of the final phase. Both are plausible polylines that do not use actually detected points except for special cases. The first is a single polyline drawn by manual actions that cannot be reproducible, and the second is a reproducible polyline that is drawn by algorithms that allow us to obtain the same result with the same parameters provided. Both cases are modelled polylines that derive from the identification of underlying geometries as corresponding to mental models. However, in the first case, the identification takes place synchronically upon the manual design, and in the second

Tab. 3 Anzani, G., *Model*, 2021.

MODEL							
ID			Description of the process and value of the setting parameter		number of vertices in the product obtained and M.S.D.		
					number	percentage	M.S.D.
1A	✗	●	Reference polyline from (0)	A	25	99,65%	119,371
1B	✓			**B**	**45**	**99,38%**	**40,504**
8	✓	●	Modelled polyline from (2B)	**A**	**31**	**99,57%**	**37,985**
8AD	✗	●	Modelled polyline from (3D)				
8ABD	✗		Modelled polyline from (4BD)				
8AABD	✗		Modelled polyline from (6ABD)				

case, it takes place diachronically upon application of the appropriate modelling algorithms. Both are light polylines of 45 and 31 vertices, respectively, which represent 7210 acquired points, and both are polylines adhering to acquired data M.S.D. values of equal to 40,504 and 37,985, respectively (table 3). Given the narrow kinship between the two, it is possible to hypothesize an iterative process that allows the modelled polyline (8) to be re-entered (8) for subsequent refinements, as reference polyline (1). It obtains refinement in cascade polylines in the various phases until a new modelled polyline of greater refinement is achieved (Figure 4).

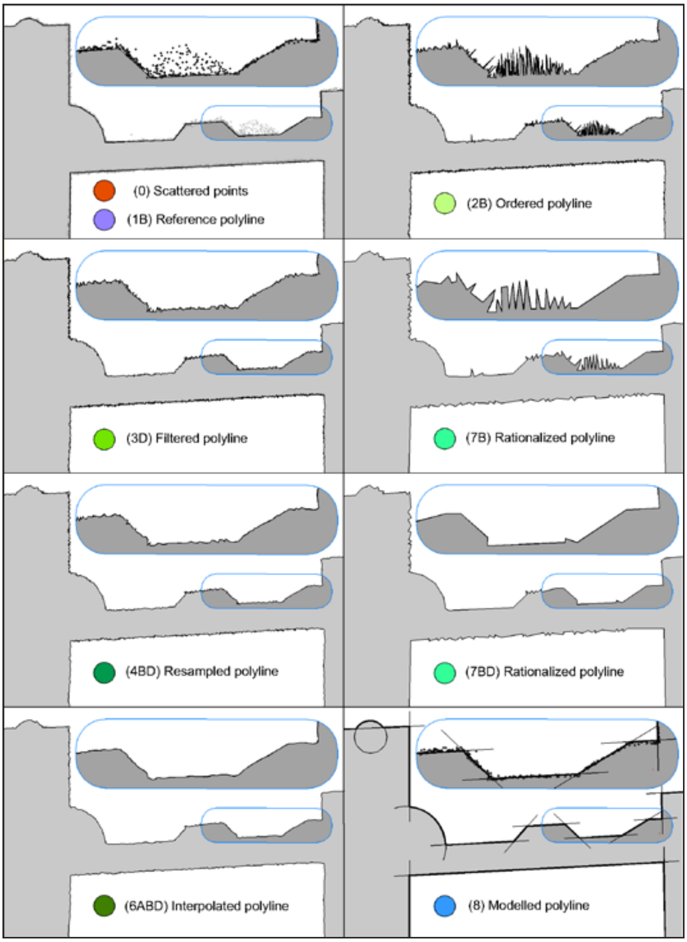


Fig. 4 Anzani, G., *View of some of the products related to the chosen application case and resulting from the application of specific processes (related data in Table 2)*, 2021.

CONCLUSIONS

As argued above, in the subsequent processing steps of a digital two-dimensional or three-dimensional architectural survey model, the optimization operations can be done by manually reinterpreting the primitives or, conversely, in a completely automated way ultimately obtaining results of similar reliability. The AI finds its vocational use above all in the automation of iterative operations but does not actually give sufficient guarantees in terms of critical control of the dataset. However, it is not excluded that in the future, machine learning may at least first develop discretization support, such as in the case of OCR or voice dictation software.

For what has been said above, the hermeneutical implications are doubled according to the type of text in question, which remain the same in both the case of digital and physical artefacts (3D visual models or maquettes).

In the case of the real data constituted by the architectural text, in the presence of a reproduction, the value of direct experience and the aura of the *hic et nunc* conferred by the relationship with the scale and quality of the context are lost and this quality does not need protection from copyright even in the world of the internet and it does not fear copying.

However, the digital artefact allows to create contexts that are unattainable in space and time and add information layers (as now consolidated in AR and VR applications) more and more customizable (Maldonado, 1992; Campanelli, 2016; Vercellone, 2017; Puma, 2019a). On the other hand, in the case of object-scale artefacts, as in the case of an archaeological finds or industrial design products, the clone maintains the correct scale relationship with the observer and can be enjoyed in a multichannel manner (with increasing plausibility from the smartphone screen to the VR and the maquette). If musealised without damaging the context, which can be recalled and reconstructed by corroboration in the digital environment, it supports and flanks the museographical narrative, being already intrinsically deprived of the original context.

In the transformations from the authentic to the realistic, from the real to the probable, the recreation of the context is therefore central to the creation of digital contents and will increasingly be so in the future.

Thus, this constitutes the added value to aim for as an 'auralization' of the informative artefact. This especially in the case of historicized architectural heritage, characterizes what architecture has always been: art for public use, with no distance between work and people.

ACKNOWLEDGMENTS

The editorial and scientific responsibility of the paragraphs is recognized to: Paola Puma for *Introduction*, *Framework and discussion*, *Conclusions*; Giovanni Anzani for *Matherials and methods* and *Results*.

NOTES

1 Original [adj. Der. of lat. originalis, from origo -inis 'origin'], relative to the cause or place of origin, and then also original, or, more often, derived from a specific process of origin and unchanged in the following, as to say a unique product of ingenuity or a machine, unaffected by anything extraneous. copy: Drawing, painting, sculpture that more or less faithfully reproduces a work of art. The difference between copy and replication (repetition by the same author of his own work), even making variations, widespread use even in the contemporary age; the copy it must also be distinguished from the fake, due to its non-fraudulent intentionality. (Treccani, n.d., Originale, Copia) (translation by authors).
2 To cite just one example, in Chinese culture, copying means with a completely different value that is not at all negative.
3 It inserts in the theme, that had already been open in ancient times (suffice it to mention the opposition between 'archetype' (original) and 'antigraph' (copy), which recurs in Luciano), the question of the limit between copy and interpretation as, "for the purposes of textual criticism the work of the professional amanuensis, very faithful to the copy he transcribes, is generally more certain than that of the occasional and learned copyist, who often interprets the text" (Treccani, n.d., Amanuense) (translation by authors).
4 Forgery: counterfeiting of a document, work of art, or other, mostly for the purpose of fraud ((Treccani, n.d., Falsificazione) (translation by authors).
5 Reproduction: copies with different characteristics and in variable number of copies as desired (Treccani, n.d., Riproduzione) (translation by authors).

6 Clone: apparatus of various kinds, or other product, which identically reproduces another, as a perfect copy or with the same characteristics (Treccani, n.d., Clone) (translation by authors).
7 The term 'simulated' refers to the Italian meaning "simulato nella sua accezione tecnico-specialistica e d'uso comune nella ricerca operativa in ambito matematico statistico, di analisi di un processo o di un sistema attraverso la costruzione di un modello matematico risolubile per mezzo di un calcolatore elettronico – modellizzazione di un fenomeno" (De Mauro, 2000, p. 2460).
8 The Mean Squared Difference (M.S.D.) or Standard Deviation is a mathematical method for the determination of statistical dispersion; that is, an estimate of the variability of a set of data or some variable. It can be adopted to express the dispersion of data around a reference model to which the data must tend, such as the arithmetic mean or the adherence to a specific curve. It has the same unit of measurement as the values taken into consideration. In statistics, the precision of the data or the adherence of the data to a specific model can therefore be expressed as the M.S.D. A lower M.S.D. will indicate a greater adherence of the data to the model, and vice versa.
9 In each row, Table 2 indicates the identification codes (ID) for each conversion product (1st column). The transformation processes (2nd column) and their configuration parameters (3rd column) are described. The number of vertices present [and removed] and the relative percentage are considered as evaluation elements (4th, 5th, [6th] column). In order to evaluate the adherence of the product obtained from the process to the starting data, the M.S.D. is considered (6th column).

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Article available at

DOI: 10.6092/issn.2724-2463/12708

How to cite

as article

Puma, P., & Anzani, G. (2021). From authentic to realistic, from true to plausible: the digital architectural survey between the real and the virtual. *img journal*, *4*, 262-283.

as contribution in book

Puma, P., & Anzani, G. (2021). From authentic to realistic, from true to plausible: the digital architectural survey between the real and the virtual. In M. Ghizzoni, Musiani, E. (Eds.), *img journal 04/2021 Copy/False/Fake* (pp. 262-283). Alghero, IT: Publica. ISBN 9788899586195

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