Eye-tracking Support for Architects, Conservators, and Museologists. Anastylosis as Pretext for Research and Discussion

Marta Alina Rusnak (martajaszcz@wp.pl)
Department of History of Architecture, Art and Technique, Faculty of Architecture, Wrocław University of Science and Technology, Poland

Research article

Keywords: conservation, visual communication, decision support,eye tracking, heritage perception, anastylosis, social participation

Posted Date: March 4th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-251509/v1

Version of Record: A version of this preprint was published at Heritage Science on July 7th, 2021. See the published version at https://doi.org/10.1186/s40494-021-00548-7.

Abstract

Conservators, museologists, and architects make extremely complex decisions capable of affecting the way people perceive monuments. One might give this idea deeper consideration while pondering anastylosis, which should be done in such a way that it is possible to recognize the original and newlyadded elements. The definitions in force do not, however, explain how to make such a distinction. By using eye-tracking research, we can learn how observers look at historic objects that have been reassembled again. By combining the observation of visual behaviours with a survey of people looking at such objects, it is possible to see how the process of classifying what is new and old actually works. This knowledge allows for both a more conscious approach to heritage management process and pro-social design of exhibitions at archaeological sites, museums, and virtual reality.

1. Conservation Means Design

Designers are well aware that it is not only the form, but also the colours and their combinations that 'play key roles in visual perception, and the strategic use of these can contribute to the effectiveness of visual communications design'[1].Conservators and museologists are more than restorers of historical forms – at times, for example when reconstructing historical objects, they have to decide on the nature and scope of contemporary measures that are necessary to make it possible for such a historical object to endure and offer insight into the past. Therefore such people are also designers who have to make complex design decisions.

1.1. Starting point - definition

The following sentence became the starting point for the author's consideration of how non-professionals perceive objects undergoing conservation works:

'Anastylosis: The reassembly of existing but dismembered parts: the use of new materials should be recognizable.' [2]

The definition cited is consistent with the content of the Charter of Venice [3], and its conciseness constitutes its great advantage. However, there are doubts that a short description does not address the question of who is supposed to and how they are supposed to recognize the newly added elements. Is it meant to apply to professionals, i.e. architects, conservators, museologists, and archaeologists, who are equipped with complicated research equipment, or ordinary observers looking at such an object with the naked eye? Or maybe both perspectives should be taken into account? Moreover, the Charter of Venice also provides an excerpt which states that'replacements must integrate harmoniously with the whole'[3]. However, some experts, such as Matthew Hardy[4] (2008), suggest that the Charter of Venice might not be flawless and that it is time its assertions were looked at closely and verified.

1.2. Who designs anastylosis and where?

How can such verification be done ifthe concept of anastylosis refers to museum exhibitions, i.e. reassembled sculptures or ceramic dishes, but above all, archaeological exhibitions 'in situ', conservation of ruins and restoration of architectural objects after various types of natural disasters, armed conflicts, and attacks [2, 5]? The fact that it has ceased to refer only to real objects, because reconstruction also takes place in virtual and augmented reality,requires a careful look at the concept of authenticity in anastylosis and its recipients.The cultural, political, and economic contexts as well as the scale of objects to be reassembled is extremely diverse, hence people who design the appearance of such objects use extremely diverse methods [6].

It is possible that this issue requires a new approach: not one in which we generalize, but rather study particular aspects of this problem; not one in which we concentrate on an expert's point of view, but rather on that of a non-professional. The author suggests that anastylosis be seen as any other designing process as a result of which a message – a piece of visual information – is created. If we follow this line of thought, the task of a person creating such a message will be to make it easy to comprehend.

1.3. Anastylosis in the context of Cultural Heritage Marketing

Nowadays, fewer and fewer people are surprised by the fact that when preserving or planning an exhibition, one should use marketing tools [7, 8]. Unfortunately, the range of measures implemented for conservation is often quite narrow [9] and usually concerns only the ways of attracting visitors or the tourist facilities accompanying the monuments, selected in a way that seems appropriate and adequate to a narrow group of decision-makers, and, according to research, it does not always fulfil its primary task [10]. Proposals as to how to increase the importance of the society's point of view in the process of interpreting historical monuments have been provided by a number of scholars [11, 12, 13, 14]. According to the knowledge of the author, such research was mostly centred around satisfaction diagnosis based on an analysis of responses to surveys and experts' observations. In connection with the problems described, the author decided to invite non-professionals to participate in her scientific research, and thus present how naïve observers could participate in the process in which decisions have so far been made only in the privacy of universities, bureaus and offices, by experts whose job does not concern an issue exposed to the media [9]. The search for newmethods to increase customers' satisfaction fromencounters with architecture andmonuments is fully consistent with what is contained in the International Cultural Tourism Charter [16].

When deciding to supplement a monument that is being reassembled again, the researcher or designer must answer the question of the type of cavity filling s/he should apply in this particular case [16]. After all, there are many methods of emphasizing the original material required by doctrinal documents [17]. For example, destructs are joined and stabilized with bar housings, and fillings made of a material of a different colour and structure are prepared (Fig. 1). However, one of the most frequently used procedures that make it possible to distinguish the parts added during the reconstruction from the authentic ones is to change the brightness of the introduced elements in relation to the original, while maintaining the similarity of colour and texture.

When choosing a method, a designer should also answer the question whether the method used will cause the greatest interest in the presented object. In which case will the observers spend most of their time looking at the authentic relic fragments and distinguishing between the old and the new? The more we begin to think in detail about the most important aspect - the purpose of human contact with monuments, the more questions relating to the future perception of the projected anastylosis can be asked.An expert's evaluation of alternative design solutions, on the basis of these questions, should in theory lead, if not to the selection of one best solution, to the indication of the most favourable scope of planned activities [18].

In practice, it turns out that the decisions made by professionals are not always correct We know that a spoken or written 'text may not be a good image of someone's thoughts or knowledge' [19]? So how to get to know the opinion of non-professionalsregarding the appearance of the designed details?In relation to surveying, an alternative way to get to know and understand consumers is theirdetailed behavioural observation [20]. A measurement of physiological reactions seems to be an objective research method because the subjects do not have an active influence on those reactions, for most of them are automatic and unconscious [21]. One of the aspects of such observation may be a study of visual behaviours. The use of an eye tracker in order to guide design decisions in architecture and conservation based on social interactions appears in the aspect described above as an innovative solution [22, 23, 24, 25].

2. Research Goal

The most general purpose of presenting research on the perception of anastylosis is to encourage the scientific community dealing with the broadly understood care of monuments and heritage management to conduct public consultations more often because it is an element that serves both sides of the dialogue. The author's intention was to use a non-expert perspective in order to help facilitate the development of an optimal method of filling the gaps in a reassembled architectural detail. What was sought was the most acceptable way to expose this type of monuments to non-professionals, and in consequence the aesthetic boundaryfor the activities of professionals dealing with this type of projects.The method that made it possible to check whether the distinction between new and old elements of anastylosis is easy or difficult, engaging or tedious for viewers was not a classically edited questionnaire, but a series of registrations of visual behaviours of participants intentionally looking at such objects. Due to the innovative nature of the research –the use of an eye tracker – its aim automatically is also to present the adopted methodology.The author hopes that the analyses, although based on a specific object, would not only serve to solve one individual problem, and that the presented data and their interpretations will be connected with the results of subsequent tests of this type on other technical and aesthetic aspects in the future. Eye-tracking research should make it possible to select examples which enable an easy classification of new and old elements in anastylosis and the rejection of too vague comparisons.

3. Methods And Measures

3.1. Eye tracker and its metrics

Eye trackers are a group of devices used to record how observers look at objects presented to them. Thanks to appropriate techniques, it is possible to put graphic trajectories of eye movements along with the point-of-regard on the prepared image [26]. Eye tracking is a complex process [27] but for the purposes of this profile research, it is enough to assign eye movements to two general groups. Fixations are short pauses in which the eyeball remains in a relative stillness lasting from 66 to 416 ms [26]. It is during such point-of-regard that the brain collects a dominant part of information about the viewed surrounding. The second type of behaviours are saccades that shift attention between the one point-of-regard and another [28]. People perform an average of 2–3 saccades per second, which usuallylast from 20 to 35 ms [29].

3.1.1. Eye trackers and cultural heritage

Eye-tracking studies are conducted all around the world [27], but application of these devices in research related to architectural heritage remains innovative. Eye trackers have been used while researching human-oriented strategy for protecting cityscape [24], the relationship of architecture in landscape and urban context [22, 23, 24, 25]. Researchers have also been interested in exhibition interiors and using eye trackers in museums [30, 31, 32, 33, 34].

3.2. Laboratory and apparatus

According to the current recommendations,to ensure reproducibility [35], the research was conducted in a specially prepared, quiet room with the possibility of dimming it and cutting it off from external light sources [36]. The room was devoid of visual distractors [37], unused furniture, its walls were white, and the floor was oak parquet. In the laboratory, there was a place for the subject, a chair, and a desk on which a computer screen was placed, as well as a side computer stand for the person supervising the registration process. Tobi Pro X3-120 eye tracker, which is adapted to the analysis of large images with an accuracy of 0.4°, was used to perform the tests. The stimuli were displayed on a 24″monitor (DELL Ultra Sharp U2415b). The screen was arranged vertically so that the prepared illustrations were as large as possible.The screen settings such as brightness, contrast and colour balance remained the same throughout the entire experiment.The eye tracker was mounted in the middle of the lower part of the screen housing. The device accumulated data at a frequency of 120 Hz.The observers' distance from the monitor was set in the range from 70 to 90 cm. These two lines were marked on the laboratory floor to facilitate organization. Both the screen and the seat made it possible to adjust the height.It was important because changing their mutual positions for a specific observer enabled to obtain a much better quality of individual 5-point calibration. The calibration was accepted whenthe average error was not bigger than 0,30ºand the maximum error was smaller than 0,50º [27]. If after three calibrations it was impossible to achieve desired values, the potential obstacle was tried to be identified in 2–3 minutes.If the following two attempts at successful calibration failed too, the experiment was run nonetheless, in order not to disappoint the participant, but the collected data was not used in calculations.The experiment, data verification and the report generation process were carried out in the Tobi Pro Lab program. Participants' responses as well as any problems that appeared were recorded manually.

3.3. Visual presentation of anastylosis

3.3.1. What architectural element to test?

Due to the desire to put the emphasis not so much on the analysis of a specific case, but on the presentation of a pro-social approach and idea to deepen the scope of the research that is used in the management of monuments, it was decided that the object shown in the tests should be related to the most typical understanding of anastylosis. The author stated that most professionals, having a task of selecting one illustration on the basis of which they would quickly explain to a layman what anastylosis is, would most likely choose a Greek temple, an ancient portico or a stone column rebuilt from destructs.In order to verify this opinion, an attempt, which consisted in entering the word anastylosis in several languages in the Google browser, was made. What was shown on the screen largely matched the earlier assumptions of the author. Finally, a decision was made that the column would be the subject of the reassembly. Due to the observed popularity of the solution consisting in highlighting new elements by modifying their brightnessit was agreed that the survey would employ this method.

3.3.2. Selection of the number of tested stimuli and the brightness of supplements

In order to carry out the analyses comparing different shades of cavity fillings, a model of the reassembled body of a Corinthian stone column was prepared, which was supplemented with five missing fragments of various sizes. In accordance with the guidelines included, among other things, in the study by Chelazzi, Marini, Pascucci and Turatto [37], the object was presented against a uniform black background. The adopted colour and structure of the stone was to imitate yellowish-brown limestone from which ancient buildings were often constructed. It was planned to modify only the brightness of the new elements, by adding white,thus obtaining a number of illustrations differing from one another. The sequence of stimuli intended for testing was built on the basis of two possible extreme examples (Fig. 2).One of them was the core in which the cavity fillings were made of stone identical to the original one – contrast 0% – (C0), whereas the other was a detail in which the complements were white – contrast 100% (C6) (Fig. 2).The stimulus which opened the scale prepared for testing was a column supplemented with a material slightly contrasted with the original stone of the detail (C1–10% contrast). Subsequent complements were gradually lightened by 20%.

Earlier illustrations were made for smaller differences, i.e. 10% and 15%. However, they turned out not to meet the requirements of the study. Ten people were shown the differences and then asked to arrange them in order from the least to the most visible complements. For the smallest contrast differentiation (10%) the arrangement of unmarked examples in the right order turned out to be too difficult for nine people out of ten who were asked to do it, and for four out of ten with the differentiation amounting to (15%).

The last examined element was the stimulus which was reconstructed by using almost completely whitecomplements (C5 – contrast 90%). In this way, five illustrations to be tested (**Fig. 3 and** Table 1) were obtained, the size and aspect ratio of which, 1620x2880 pixels, were adapted to the characteristics of the monitor applied in the study(**Additionalfigures-Stimulus C0-C6**).

Table 1
The method of preparing the contrast scale for individual anastyloses.

Name of example	**C0**	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
New elements	No difference	degree of contrast in the brightness of complements					complete whitening
Degree of contrast	0%	**10%**	**30%**	**50%**	**70%**	**90%**	100%

3.4. Participants

Participation in the research was voluntary. Participants received a voucher worth PLN 20 for participating in the tests. Only people who do not have professional knowledge related to the presented topic were allowed to take part. Architects, conservators, museologists, historians, and even students starting their education in any of these fields were not invited. This is important because it seems unattainable in such tests to determine the impact of the type of education received and previous professional experience on the development of sensitivity of professional observers that might modify the way they look at historical monuments [38].Moreover, the participants were only adult residents of Wroclaw agglomeration (Poland), who did not turn 65. Volunteers declaring their willingness to participate in the test filled in a questionnaire available on the Internet, the content of which also indicated which of the volunteers had visual impairments(for example monochromatism) or other diseases that prevented them from participating in the tests. The participants gave their written consent to the anonymous use of the collected data for scientific purposes.

182 people participated in the recordings. Not all data turned out to be implemented in a way that could enable their use later. As a result of the first verification, 161 recordings of the participants were qualified to the stage of interpreting the accumulated data, which in the light of other eye-tracking studies of this type can be considered a large group [39]. Correct recordings were made by 99 women and 62 men **(Appendix 1- Contrast Age and Sex Appendix).**Some of the eliminated recordings belonged to people who did not receive sufficiently precise calibration results, changed their body positions in a way that disrupted the work of the eye tracker, or for some reasons stopped looking at the screen while the tested stimulus was displayed.

3.5.Preparation of the presentation to be shown to the participants

The research also included nine photos of various types of complements to the antique detail. The illustrations were to be displayed randomly, enabling the subjects to become familiar with the topic before examining the researched illustration. Stimuli C1, C2, C3, C4 or C5 were shown as one of the last four illustrations. It was important to present only one variant of the illustration to a specific observer, so that the processes of using short-term memory [40] and comparing similar images [41] would not influence the test results.It was significant that the whole group was subjected to the same procedure and the observers intentionally [42] approached the next elements, whereas usually people who look at reassembled museum exhibits or Acropolis buildings are not familiar with the concept of anastylosis and they do not know what its rules are. By making the researchmore similar to the situation described, this problem was not explained to the participants of the tests either. However, the research had to be designed in such a way that it could be concluded that the participants had the same cognitive intention. If the observers did not follow the command and looked at the pictures freely, their motivation would be unknown, which is presented in the classic eye-tracking experiment by Alfred Yarbus [43]. In order to compare the reception of the prepared examples, it was necessary to come up with a task forcing observers to recognize and differentiate the old elements and what the new ones.

The task was formulated as simply as possible, namely ‘On the details shown within 10 seconds, find and count the newly added elements’**(Additional figures- Boards with commands)**. The volunteers were supposed to execute such a commandten times for the examples. On the boards between the illustrations which presented anastylosis, a request was displayed, i.e.‘Say out loud how many new elements there were’. After the answer was obtained and recorded, the supervisor of the experiment initiated a display of another image.

The above-described combination of this taskalong with the eye-tracking recording was supposed to enable the interpretation of the data. The eye tracker precisely recorded each participant’s eye tracking route as well as the places where they focused their visual attention [44]. If the numbers quoted by the observers had not been noted, it would not be possible to state what the effect of looking at any area was. After all, it is possible to look at a completed fragment and not to recognize it as a new one for various reasons.

All images which constituted the presentation were displayed for 10 seconds. The time was selected by doing a reconnaissance before the tests. Illustrations C1, C2, C3, C4 and C5 were presented to 25 different people (each of the 5 pictures was seen by 5 people) who were then asked to say how many new elements they had seen. The two fastest answers, not necessarily correct, were given after 6 seconds, the slowest responder gave the answer after 19 seconds. The median for the reported results was 10 seconds (**Additional file - time experiment**).

3.6. Assignment of AOI

In order to generate appropriate reports on the method of getting acquainted with the appearance of the five prepared stimuli, it was necessary to define the Areas of Interest [39, 45] to which individual visual behaviours of the participants were to be assigned, i.e. fixations and saccades. The method of determining Areas of Interest for the examined images is presented in the following illustration (Fig. 4). The AOI NEW fields were designed to include the boundaries between the old and new parts and the outline was enlarged by a 30-pixel wide envelope. Each illustration had fields designated in the same way, for which reports of features that were valid during the analysis were generated. The zone which was a combination of fields 1AOI NEW to 5 AOI NEW was called ALL NEW AOI.

4. Research Hypotheses

It was assumed that the application of a low contrast will result in few participants correctly recognizing the historic and newly added elements. Observers will not notice a part of newly added complementswith too low a degree of contrast or they will look at them but will not be able to classify them as the new ones.In order to recognize new parts, observers of vague combinations will make most shifts between old and new elements. The application of higher contrast will accelerate and make it easier to find new elements and this will increase the number of people correctly performing the task. Thanks to the additional time, they will be able to carry out an ‘extended investigation of images’[38]– shortening the time necessary to complete the task will allow observers to look more peacefully at an object, including its authentic elements.

5. Calculations

5.1. Analysis of participants' responses

The first and the simplest part of the analysis was the compilation of the data concerning the answers given by volunteers who tried to count all new fields. The results of the analysis are presented in Table 2.

Table 2.
Answers given by the participants in relation to the tested stimuli C1-C5. (author)

Example / stimulus		**C1**	**C2**	**C3**	**C4**	**C5**
Respondents		**33**	**33**	**31**	**31**	**33**
Answers	correct	**6**	**16**	**20**	**21**	**22**
		18%	48,5%	64,5%	67,7%	66,7%
	wrong	**27**	**17**	**11**	**10**	**11**
		81,2%	51,5%	35,4%	32,3%	33,3%
All mistakes by 1		**22**	**15**	**8**	**7**	**9**
more / fewer by 1		0 / -22	0 / – 15	0/-8	+ 1 / -6	+ 2 /-7
All mistakes by 2		**3**	**0**	**2**	**2**	**2**
more / fewer by 2		0 / -3	0 / 0	0/ -2	0 / -2	0/ -2
All mistakes by 3		**0**	**2**	**1**	**1**	
more / fewer by 3		0 / 0	0 / -2	0 / -1	0 / -1	
All mistakes by 4		**1**				
more / fewer by 4		0 / 1				
All mistakes by 5		**1**				
more / fewer by 5		0 / 1				

In accordance with the assumptions adopted, the number of good answers increased for the examples which presented successively more contrastivecomplements. The greatest improvement in the accuracy of answers, by as much as 29.7%, occurred between examples C1 and C2. Another difference between examples C2 and C3 was significantly smaller, amounting to 16%. The number of incorrect responsesrecorded for the observers of examples C3, C4, and C5, remained at a similar level, i.e. around 32–35%. Moreover, the quality of answers was constantly improving. In example C1 there were participants who failed to notice more than 3 new areas. There were no such big mistakes in examples C2, C3, and C4. For example C5, no one made a mistake of more than 2 new fields. It is surprising and difficult to interpret that in examples C4 and C5, there were people who gave results that exceeded the number of added brighter elements presented in the examples, although the contrast visible in these examples, according to the author, should not be misleading. On the basis of the responses of the subjects, examples C3, C4, and C5 can be considered similarly favourable. In order to carry out a further interpretation, the obtained results should be connected with the results of the eye-tracking registration.

5.2. Analysis of participants' visual behaviours

5.2.1.Observing and noticing complements

The first element that can be directly related to the oral responses is how many participants looked at all the added items. Table 3 presents the number of people who performed fixations in all fields of visual attention corresponding to the new fragments. As expected, their number is gradually increasing. By comparing these results with the answers which were given by the respondents (Table 2), it can be seen that some of the people who looked at all the elements that were to be counted did not properly classify the element. It occurred in eleven cases for example C1, in two cases for example C2 and in as many as five cases for stimulus C5. The number of people who noticed some element but were not able to recognize it as new is very high only for example C1, and the level of confusion for the remaining examples is much lower. It seems that an example favouring the correct solution of the task was stimulus C4 because the number of correct answers fully coincided with the results of the eye-tracker registration. It is puzzling why the confusion increased for exampleC5. It should be admitted that it is completely surprising and difficult to interpret that three people who countedthe brighter fields for variant C3 did not perform fixationin one of the fieldsbut gave the correct answer.

Table 3
Comparison of the number of observers who performed fixations in all five NEW AOIs with the correctness of the answers given.(author)

	C1	C2	C3	C4	C5
Eye-tracking results					
Observers who performed fixations in all AOI NEW	17	**18**	**17**	**21**	**27**
Correct answers (from Table 2)	**6**	**16**	**20**	**21**	**22**
Classification errors	**11**	**2**	**3 (!)**	**0**	**5**

The doubts arising from the presented comparison prompted the author to undertake a precise comparative analysis as a result of which 10 test participants, who gave results exceeding the number of visually visited fields, were found. The comparison presents AOI NEW fields that they saw **(Appendix 2- Visit and verbal)**and the recorded content of responses they gave. The Table 4 indicated participants could be the people who counted these zones seeing them in a peripheral way [46], however, it is unlikely because AOI fields were intentionally enlarged in relation to the actual limits of the complements to eliminate the influence of this phenomenon on the results of the experiment. The discrepancy could also result from an unconscious mistake or a hidden desire to ‘do it better’. The eye-tracking data made it possible to eliminate survey errors of this type.

Table 4
Participants with noticed inconsistencies between their answers and the number of AOI fields in which fixation was performed. The responses which were considered correct at an earlier stage of the analysis were marked with a bold envelope.(author)

		VISIT COUNT					NUMBER OF AOI WITHOUT VISIT	VERBAL RESPONSES	NOT SEEN BUT NUMBERED
	PARTICIPANT	**1 AOI NEW**	**2 AOI NEW**	**3 AOI NEW**	**4 AOI NEW**	**5 AOI NEW**			
C3	**C3 9**	3	-	-	-	1	**3**	**4**	**2**
	C3 16	3	2	3	-	-	**2**	**5**	**2**
	C3 29	-	2	2	1	1	**1**	**5**	**1**
C4	**C4 2**	1	2	1	1	1	**0**	**6**	**1**
	C4 23	1	-	1	-	1	**2**	**4**	**1**
C5	**C5 8**	3	-	3	-	2	**2**	**4**	**1**
	C5 10	3	2	1	1	1	**0**	**6**	**1**
	C5 20	4	-	3	2	2	**1**	**5**	**1**
	C5 30	3	1	1	2	1	**0**	**6**	**1**
	C5 32	1	2	2	-	-	**2**	**4**	**1**

It is intriguing why such mistakes did not occur when the participants looked at the first two examples (C1 and C2) and as many as 5 people gave too high a result in the example, which is the most obvious. Were the observers of example C5 really theleast focused on the task? These observations force us to modify the previously provided data. The data for examples C3 and C5 were changed (Table 5**and** Table 6).

Table 5
Fragment of Table 2 modified as a result of learning about visual behaviours of the participants and comparing them with the answers given, assuming that counting and finding in a different order may cause mistakes(author)

Example / stimulus	**C1**	**C2**	**C3**	**C4**	**C5**
Respondents	**33**	**33**	**31**	**31**	**33**
Well performed task	**6**	**16**	**20**	**21**	**22**
			18		**21**
	18%	48,5%	64,5%	67,7%	66,7%
			54,8%		63,6%

Table 6
Table 3 modified as a result of learning about the visual behaviours of the participants and comparing them with the answers given, assuming that counting and finding in a different order may cause mistakes(author)

	C1	C2	C3	C4	C5
Eye-tracking results					
Observers who performed fixations in all AOI NEW	17	**18**	**17**	**21**	**27**
Correct answers (from Table 2)	**6**	**16**	**18**	**21**	**21**
Classification errors	**11**	**2**	**1 (!)**	**0**	**6**

The revised data only deepened the differences between example C4 and the two adjacent stimuli C3 and C5. There must be some reason why the fourth stimulus supported the correct performance of the task in the best way. We decided to examine the remaining parameters of the process of eye tracking over the presented images more specifically in order to better diagnose the reason for the observed relations.

5.2.2. Characteristics of the method of searching for new fields

5.2.2.1. Involvement in the task – duration of fixation.

The most general parameter which can determine the level of participants' involvement in the process of getting acquainted with the presented stimulus is the average duration of fixation. Long-lasting fixations indicate that the object is somehow more engaging [47]. In this case, it especially applies to fixations which were performed within the fields which were searched for and were supposed to be counted (ALL AOI NEW), as well as those against which they were distinguished (AOI OLD) **(Appendix 3-Fixation duration)**. The values obtained as a result of the registration are presented in Table 7.

Table 7
Fixation duration for AOI NEW I AOI OLD(author)

Example / stimulus	**C1**	**C2**	**C3**	**C4**	**C5**
Fixation duration on AOI NEW (1–5) [s]	**0,197**	**0,204**	**0,210**	**0,206**	**0,195**
Fixation duration on AOI OLD [s]	**0,189**	**0,193**	**0,192**	**0,194**	**0,181**

The example the participants looked at with the greatest commitment is stimulus C3. The shortest fixations were recorded for the two extreme examples, i.e. C1 and C5. For some reason, looking at both the old and the new parts was the least engaging for example C5.

5.2.2.2. Task completion time

Another aspect that tells us something about the way in which the participants found complements in the presented anastyloses is the data related to the time of performing the task. The time to first fixation

(Appendix 4 - Time to firs fixation)on the target area reflects the moment when the process of searching for new objects could be realised [39]. A shorter time to perform the first fixation on the examined object/field means that it gained properties which make it easier to attract attention. The analysis of the time of performing the first fixation appears as a particularly important aspect of recognizing the disposition of visual attention.

5.2.2.3. Time to finding the first field.

Box plot 1 presents the comparison of the time to first fixation in one of AOI NEW fields. The results of five participants, i.e. C1 22, C1 15, C2 18, C4 9, C5 9 were marked as points in Box plot1 because they clearly stood out from other recorded values. In the scale of the entire research, 5 people constitute only 3.1% of the research group size.

It is surprising that the analysis of the box plots shows that finding the first reassembled fragment was not, contrary to the author's original expectations, the fastest for C5. It turns out that C4 obtained the best results and that its observers, considered as a group, achieved the best results.

5.2.2.4. Time tofinding the last field.

Time that passed before finding the last field is a parameter much more difficult to analyse than finding the first one. Each participant performed the fixationin one of the fields and only one of them claimed not to recognize any. However, many participants of the research did not find all five cavity fillings **(**Table 6**).** For this reason, the analysis covers all participants, but it refers to the issue of 'visualfinding' the last AOI NEW field they looked at. The obtained search results took the values presented in the form shown in **box plot 2** (which also shows how many people failed to look at allthe fields).

The recorded values show the point after which participants did not recognize any new elements. Again, the results did not show that recognizing new elements was the easiest for those observing the most expressive example. C4 turned out to be the most advantageous once again as the participants who looked at it who found all the fields the fastest.

5.2.2.5. Search efficiency, gazes,and number of fixations 'on target'.

The number of gazes in a given field may also indicate a method of finding new fields. A gaze means drawing visual attention to the AOI under study, i.e. performing fixation within it or staying in another zone of the fixation sequence continuously. A large number of returns to viewing the same element, combined with a large number of fixations, may indicate some kind of difficulty in reading information [48, 39].

Not only did the participants looking at C4 find the first and the last of the five fields earlier (**Box plot 1, Box plot 2**), fewer of them also carried out the recounting process. This shows that they doubted less that they had done the task well. People looking at C5 returned to the same fields much more often, which is shown in the data in Table 7 regarding the average number of gazes counted for all AOI NEW fields. The number of fixations on-target divided by the total number of fixations [49] also shows a reduced search efficiency (**Appendix 5- Fixation count)**. Such a comparative analysis can be undoubtedly subjected to those examples which obtained similar results in the survey. Analysing the data collected for C4 and C5, it can be seen that this parameter turned out to be the least advantageous for the more expressive element **(**Table 8**).**

Table 7
Average number of gazes(author)

	C1	C2	C3	C4	C5
Average Visits in ALL NEW AOI	9,67	10,45	9,52	9,61	10,73

Table 8
Number of fixations (author)

		C1	C2	C3	C4	C5
A	On target fixations ALL AOI NEW [fix]	15,33	16,79	14,87	15,22	15,51
B	THE WHOLE IMAGE [fix]	27,38	31,55	27,10	28,06	30,15

5.2.2.6. Time spent looking at the background and beyond the screen.

Another element which proves the involvement of participants in the task is the time they spent looking beyond the presented object, i.e. at the background or completely beyond the screen. The easier the task becomes for the participants, the more it can be boring for the participants who start looking from side to side instead of looking at the presented object. In order to discuss this aspect, a comparison presented in Table 9 was prepared.The values in the second line of this table refer to the average time viewers spent viewing all AOI NEW fields. The third line deals with the duration of getting acquainted with the form of the authentic parts of each of the five presented reconstructions. The lastone is about the time spent looking beyond the object, at a black background or even beyond the screen.

Table 9
Total gaze duration(author)

	C1	C2	C3	C4	C5
AOI ALL NEW [s]	3,041	3,141	1,894	1,672	1,871
AOI OLD PATRS [s]	2,624	4,229	3,723	3,691	3,426
OUTSIDE anastylosis [s]	4,335	2,630	4,383	4,637	4,703

Variant C2 turned out to be the most demanding in terms of cognition. The participants exposed to it hardly looked around during the task, devoting most of the time to moving their eyes around the presented element. The data in Table 9 show that stimulus C5 turned out to be the least engaging because its observers spent almost half of the time looking beyond the presented architectural element (Table 9), and as it was proved that they were not the fastest to perform the task.

5.2.3. Heat maps / hot spot plot

Apart from the numerical values presented in Table 9, a difference in the method of viewing individual examples can be presented by comparing heat maps [50]. This kind of analysis may constitute a graphical summary of previous observations. Figure 5 shows thermal maps of extreme generated automatically by the Tobi Pro Lab program for the transparency set by the author (50%), the kernel size (kernel) of 100 pixels and the selected colour model (colourmodel (green, yellow, orange, red). These maps show the places which the participants of the research looked at, valorising the least frequently and most frequently viewed places. The longer more people looked at a given place, the warmer the colour of this place became (ranging from a dark green shade, through yellow and orange to red). Figure 5 presents the heatmaps of examples C2, C4, and C5.The object in C2 is observed in the least orderly manner, and the orange colour gets few dots and many green grains/dots are scattered. The heatmap for C5 shows many more such places, which means thatthe observers looked at the clear boundaries,which resulted from the large variations in brightness, often and for a relatively long time. (salient irregularities) [51]. Such animage indicates the efficiency of the search for new fields [49]. However, the fact that two orange spots and one reddish spot clearly go beyond the outline of the presented anastylosisof C5 is of little advantage, and thus the attention map is somehow ‘torn’. In this respect, example C4 looks more favourable.

6. Results

The research showed that eyetracking is a method thanks to which it is possible to define conditions that are make it easier for laymen to recognize what is a new and what is an original element of anastylosis. Stimulus C4 turned out to be the potentially best cognitive variant. Surprisingly, the stimulus with the strongest contrast turned out to be less advantageous in terms of cognition. It turned out that too obvious an example made looking at the presented anastylosis more chaotic.

7. Discussion

7.1. Methodology

After carrying out all the analyses, the author must admit that it was an oversight not to include visualization C6, which presented the core of the column with completely white cavity fillings. This example was eliminated because when displayed on a large monitor it looked completely artificial and bright elements seemed to be simply glaring. However, with the eye-tracking data for this example the interpretation of results would become even more reliable. In the current epidemiological situation, conducting supplementary tests is impossible due to the restrictions introduced.

The remaining aspects of the preparation of the research can be considered correct. This applies, for example, to the time that the observers had to perform the task. On the basis of the data in**Box plot 2**, it is easy to estimate that approximately 75% of the participants did not find any new fields after 6 seconds. According to the author’s interpretation, this suggests that the time span allocated to the experiment was certainly not too short.

The relatively short research time and limiting it to a single object results in the fact that we learn about the first reactions of the observers, from which they derive basic knowledge about the object. However, it is impossible to conclude how it affects the aesthetic experience that lasts longer and refers tolarger scale anastyloses. Experiments on the perception of anastylosis could be carried out with the application of a mobile eye tracker, making models of various anastyloses.

The places where we display artefacts that have undergone anastylosis are drastically different from the atmosphere of a lab deprived of other stimuli (e.g. background music or conversations of other people). This applies to both traditional museums and archeological sites that are transformed so that they resemble museums in some aspects. Eye-tracking techniques make it possible to register eye movement in such real-life circumstances, but to conduct research related to such a precise issue outside a lab would make it virtually impossible to come up with a methodology that ensures comparable results.

7.2. Is such an advanced research method necessary?

7.2.1. The survey is enough ...

If the tests presented were to be completed at the stage of the participants' survey, it would turn out that any contrast of at least 50% is appropriate. In the author's opinion, even such a simple study, in the absence of advanced equipment and funds for research, would prove to be a valuable hint for people responsible for selecting the method of filling in the missing elements in anastylosis. Further research showed, however, that drawing scientific knowledge only from surveys and similar tools is a far-reaching simplification and may lead to erroneous conclusions. Despite many studies, we still have a relatively poor understanding of how people actually experience authenticity at heritage sites [52].

7.2.2. Public opinion interest

Conversations with the participants constituted a side element of the research. The impact the unusual test had on the volunteers was noticeable. After the tests, over 70% of the participants wondered what the purpose of the research was, how the eye tracker worked and what such tests were to be used for in the long run. The volunteers discovered aspects that they had never thought about before, which in itselfwas an impulse for short or longer consideration. Almost 45% of the participants asked to be sentthe conclusions of the research.This is consistent with the trends reported in the research on Heritage and Social Value: Public Perspectives on European Archaeology [53] and the declared readiness of almost 50% of laypeople to actively engage in the protection of the region's native heritage. The application of an eye tracker and other devices which in an unusual way engage laypeople to get to know monuments should be treated as a social advertisement of professionals and topics they deal with. Izabela Parowicz [9] insightfully writes about the need to make such direct contacts.

7.3. Clarity of the message

By looking in detail at the method which allowsviewers to perceive an object designed by a specialist, it is possible to gain valuable knowledge. For example, it is intriguing that even when using very high contrast, as in example C5, it is impossible to be sure that observers will notice new elements. As many as 18.2% of the participants who looked at picture C5 did not look at one of the complements. Another 21.2% of the participants, although they swept the bright element with their eyes, they did not recognize it. This is an important signal for professionals.The participants were focused only on this aspect of reality, which was separated for the needs of the research, but anywaythe task turned out to be too difficult for one third of participants. This shows how important it is to get to know the public perspectiveof the heritage thatarchaeologists, architects and museologists take care of. Thanks to such researchit is possible to realize thatwhat an expert considers obvious, clear, and unambiguous, does not necessarilyhave to be so for a large part of the society.Perhaps some messages we would like to convey will never be fully understood by some recipients. This does not mean, however, that we should give up on the efforts to facilitate and deepen the society's relation with monuments. In order to do this, we must observe and listen to ordinary people interacting with the heritage which we manage as experts and, if possible, remove the diagnosed barriers. According to the research, even a small change may cause either an improvement or a significant deterioration of the process of a monument’s perception.

8. Future Research Perspectives

The article presents only one design aspect– luminance modulation – whichcan distinguish between authentic and newly added elements in the objects from the past that have been reassembled. This is one of the many steps which are necessary to be taken to obtain a complete picture of the perception of designs submerged in a historical context. Further variables are the number and area of complements as well as the use of a different texture of the fragments added. It should not be forgotten that the way a monument is perceived is also influenced by other factors, such as lighting or itssurroundings (background). It also seems that further research on the perception of conservation cavity fillingsshould also apply to monuments which are made from various materials and at various architectural scales [54]. Finally, the visual criteria for assessing anastylosis may change with place, culture, and time [55, 56], so it would be interesting to conduct comparative studies inviting people from different countries and representing different cultures to take part in tests.

9. Summary

Although some architects and conservators declare more or less openly that “the idea of public consultation has become fetishized and is simply fashionable” [57], the author believes that such a community-oriented approach is not so much a fad as an organically progressing evolution, thanks to which the opinions of the society can be studied and taken into consideration on many coexisting levels so that the applicable law and procedures become more and more adequate and effective [58, 25], or in other words, as optimal as possible in a given situation [59].

Declarations

Acknowledgments

Collaboration group:

graphical cooperation: Wojciech Fikus (independent, Wrocław, Poland)

hardware consulting: Ewa Ramus (Neuro Device, Warszawa, Poland)

data collecting: Mateusz Rabiega (Wroclaw University of Science and Technology, Poland), Małgorzata Cieślik(independent, Wrocław, Poland)

References

[1] O'Connor Z, Colour, contrast and Gestalt theories of perception: The impact in visual communications design. Color Research and Application. 2015; https://doi.org/10.1002/col.21858.

[2] Bold J. Introduction: Reconstruction. The Build Heritage Following War and Natural Disaster In: Bold J, Larkham P, Pickard R, editors. Authentic Reconstruction. Authenticcity, Architecture and The Buidd Heritage, London/Oxford/NewYork/New Dehli/Sydney: Bloombury Academic; 2018. p.2-25.

[3] ICOMOC. The Venice Charter for the Conservation and Restoration of Monuments and Sites, Venice: ICOMOS; 1964.

[4] Hardy M. The Venice Charter Revisited: Modernism, Conservation and Tradition in the 21st Century. Newcastle upon Tyne: Cambridge Scholars Publishing; 2008.

[5] Moshenska, G. Curated Ruins and the Endurance of Conflict Heritage. Conservation and Management of Archaeological Sites, 2015; doi:10.1179/1350503315Z.00000000095.

[6] Sroczyńska J. Prezentacja interpretacyjna zabytków architektury w ochronie dziedzictwa kulturowego, Kraków: Wydawnictwo Politechniki Krakowskiej; 2018.

[7] Rowan Y, Baram U. Marketing Heritage: Archaeology and the consumption of the past, Walnut Creek: AltaMira Press; 2004.

[8] Colvati A, Usai A. Partnership Building Strategy in place Branding as a Tool to Improve Cultural Heritage District's Design. The Experience of UNESCO's Mining Heritage District in Sardinia, Italy. Journal of Cultural Heritage Menagmant and Sustaneble Development. 2015; doi.org/10.1108/JCHMSD-02-2014-0007.

[9] Parowicz I. Cultural Heritage Marketing. A Relationship Marketing Approach to Conservation Services. Cham: Palgrave Macmillan; 2019.

[10] Spaeth, T. Do Logos Really Matter. Across the Board. 1999; 31/3:51-53.

[11] Beck HH, Social and Aesthetic Values: New assasment methodologies for involving the community, Place , 1995;1:15-18.

[12] Callebaut D, Killebrew AE, Silberman NA. Interpreting The Past. Presenting Archeological Sites to the Public, Brussels: Flemish Heritage Institute; 2004.

[13] Shalaginova I. Ethical Pronciples of heritage presentation for world heritage sites, 2008.

[14] Kłosek-Kozłowska D. Ochrona wartości kulturowych miast a urbanistyka. Warszawa: Oficyna Wydawnicza Politechniki Warszawskiej; 2017.

[15] ICOMOS. International Cultural Tourism Charter: Managing Tourism at Places of Heritage Significanc. Mexico: ICOMOS;1999.

[16] Petzet M. Princeples of preservation. An Introduction to the International Charters for Conservation and Restoration 40 Years after the Venice Carter. In: International Charters for Conservation and Restoration. Monuments & Sites I. München: ICOMOS; 2004. p.7-29.

[17] Jokilehehto J. A History of Architectural Conservation. London: Butterworth Heimnann; 1999.

[18] Vroom VH, Yetton PW. Lidership and decision-making. Pittsburg: University of Pittsburg Press; 1973.

[19] Grzegorczyk A. Mała propedeutyka filozofii naukowej. Warszawa: PAX; 1989.

[20] Pierański B. Pomiar Fizjologiczny w badaniu wewnątrz-sklepowych zachowań. Poznań: Uniwersytet Ekonomiczny; 2019.

[21] Stewart DW, Furse DH. Applying psychophysiological measures to marketing

and advertising research problems. Journal of Current Issues and Research in Advertising, 5:1, p.1-38; DOI: 10.1080/01633392.1982.10505319.

[22] Junker D, Nollen Ch. Mobile eyetracking in landscape architecture. Analising behaviours and interactions in natural environments by the use of innovative visualizations. Proceeding of The International Conference "Between Data and Science" Architectur, Neuroscience and the Digital Worlds. London: UEL London. 2017; dx.doi.org/10.5772/interchopen.74992.

[23] B. Kabaja, M. Krupa, Możliwości wykorzystania metody eyetrakingu do badań nad historyczną przestrzenią w kontekście jej postrzegania przez użytkowników (na przykładzie Rabki Zdrój) – cześć 1 – uwagi wstępne. Journal of Heritage Conservation. 2017; doi.org/10.17425/WK52EYETRACK.

[24] Zhang LM, Zhang RX, Panoramic visual perception and identification of architectural cityscape elements in a virtual-reality environment, Future Generation Computer Systems. 2021; https://doi.org/10.1016/j.future.2020.12.022

[25] Rusnak M. Eye tracker as a pro-social tool of managing urbanistic and architectural heritage. Protection of Cultural Heritage. 2020; doi:10.35784/odk.1273

[26] Poole A, Ball LJ. Eye Tracking in Human-Computer Interaction an Usabilyty Research: Current Status and Future Prospects In: Ghaoui C editor. Encyclopedia of Human-Computer Interaction Pennsylvania: Idea Group; 2005.

[27] Carter BT, Luke SG. Best practise in eye tracking research. Journal of Psychophysiology. 2020; https://doi.org/10.1016/j.ijpsycho.2020.05.010.

[28] Nystöm KM, Anderson R, Dewhurst R., Jarodzka H, van de Weije J. Eye tracking. A comprehensive guide to metods and measures. Oxford: Oxford University Press; 2011.

[29] Henderson JM. Human gaze control during real-world scene perception. Trends in Cognitive Sciences. 2003; https://doi.org/10.1016/j.tics.2003.09.006.

[30] Kędziora Ł, Jak wykorzystać okulografię w muzeum: przyczynek do dyskusji, Sztuka i Kultura; 2016; http://dx.doi.org/10.12775/SZiK.2016.010.

[31] Walker F, Bucker B, Anderson NC, Schreij D, Theeuwes J. Looking at paintings in the Vincent Van Gogh Museum: Eye movement patterns of children and adults. PLoS ONE. 2017; https://doi.org/10.1371/journal.pone.0178912.

[32] Mokatren M, Kuflik T, Shimshoni I. Exploring the potential of a mobile eye tracker as an intuitive indoor pointing device: A case study in cultural heritage, Future Generation Computer Systems. 2018; https://doi.org/10.1016/j.future.2017.07.007.

[33] Rusnak M, Ramus E. With an eye tracker at the Warsaw Rising Museum: valorization of adaptation of historical interiors. Journal of Heritage Conservation**.** 2019; doi:10.17425/WK58WARSAW

[34] Krogh-Jespersen S, Quinn KA, Krenzer WLD, Nguyen C, Greenslit J, Price CA Exploring the awe-some: Mobile eye-tracking insights into awe in a science museum. PLoS ONE. 2020; https://doi.org/10.1371/journal.pone.0239204.

[35] Fiedler S, Schulte-Mecklenbeck M, Renkewitz F, Orquin JL. Increasing Reproducibility of Eye-Tracking Studies. A Handbook of Process Tracing Methods; 2019. p.65.

[36] Goldberg J, Wichansky AM. Eye tracking in Usabilyty Evaluation: A Practicioner's Guide" In: Hyönä J, Radach R, Deubel H. editors. The Mind's Eye: Cognietive and Applied of Eye Movement Reserch, Oxford: Elsevier Science; 2002. p.493-516.

[37] Chelazzi L, Marini F, Pascucci D, Turatto M. Getting rid of Visual distractors: the why, when, how, and where. Current Opinion in Psyhology. 2019; doi: 10.1016/j.copsyc.2019.02.004.

[38] Harland B, Gillett J, Mann CM, Kass J, Godwin HJ, Liversedge SP, Donnelly N. Models of Adress in Pictorial Art: An Eye movement Study of Manet's Bar at the Foliee-Bergėre. Leonardo, 2014; https://doi.org/10.1162/LEON_a_00676.

[39] Jacob RJK, Karn K. Eye tracking in human-computerinteraction and usabiity reserch: ready to deliver the promises In: Hyönä J, Radach R, Deubel H. editors. The Mind's eye: Cognitive and applied aspects of eye movement research. Oxford: Elsevier Science. 2003. p.573-605.

[40] Nęcka E, Orzechowski J, Szymura B, Wichary S. Psychologia poznawcza. Nowe Wydanie. Warszawa: PWN; 2020.

[41] Duncan J, Humphreys G. Visual search and stimulus similarity. *Psychological Review*. 1989; 3:433-458.

[42] Dreyfus HL. *Husserl, Intentionality and Cognitive Science.* Cambridge: MIT Press;1982.

[43] Yarbus A. Eye Movements and Vision. New York: Plenum Press; 1967.

[44] Duncan J. Visual search and visual attention" In: Posner I, Marin O. editors. *Attention and Performance XI,* New Jersey: Routeledge;1985.p.85-105.

[45] Duchowski, A.T. Eye tracking methodology. Theory and practice, London: Springer-Verlag; 2007.

[46] Francuz P. Imagia. Towards a neurocognitive image theory. Lublin: KUL; 2013.

[47] Just, M.A., Carpenter, P.AEye Fixation and cognitive process. *Cognitive Psychology*.1976; 8/4: 441-481.

[48] Goldberg JH, Stimson MJ, Lewenstein M, Scott N, Wichansky AM. Eye tracking in web search tasks: design implications In: ETRA: Proceedings of the Eye Tracking Research & Applications Symposium. New York: ACM; 2002. p.51-58.

[49] Goldberg JH, Kotval XP. Computer interface evaluation using eye movements: Methods and constructs. *International Journal of Industrial Ergonomics.* 1999; https://doi.org/10.1016/S0169-8141(98)00068-7.

[50] Olmsted-Hawala E, Holland T, Quach V. (2014) Usabilyty Testing In: Bergstrom JR, Schall AJ editors. Eye tracking in user experience design. Amsterdam/Boston: Morgan Kaufmann; 2014. P.49-80.

[51] Gombrich EH. Zmysł porządku. O psychologii sztuki dekoracyjnej. Kraków: Universitas; 2009**.** (publication in English: Gombrich EH. The Sense of Order. A Study in the Psychology of Decorative Art. Oxford: Phaidon; 1979.)

[52] Jones S. Experiencing Authenticity at Heritage Sites: Some Implications for Heritage Management and Conservation. Conservation and Management of Archaeological Sites. 2009; https://doi.org/10.1179/175355210X12670102063661

[53] Kajda K, Marx A, Wright H, Richards J, Marciniak A, Rossenberg KS, Pawleta M, van den Dries MH, Boom K, Guermandi MP, Crido-Boado F, Barrerio D, Synnestvelt A, Kottskakis K, Theodoroudi E, Luth F, Issa M, Frase I. Archeology, Herirtage, and Social Value: Public Perspectives on European Archeology. European Journal of Archeology. 2018. doi:10.1017/eaa.2017.19.

[54] Arrarte-Grau M. The Scales of Colour Perception in Architecture, In: Procedings of the international Colour Asociation (AIC) Conference. Lisboa: AIC; 2018. p.71-76.

[55] Loventhal D. Menaging The Flux of Authenticity In: Procedings of The Nara Conference on Authenticity. Nara, Japan, November 1994, Nara: UNESCO, ICCROM, ICOMOS; 1995.p.369-370.

[56] C. de Cambra (ed.) **Preserving transcultural heritage: Your way or my way?** Questions on authenticity, identity and patrimonial proceedings in the safeguarding of architectural heritage created in the meeting of cultures In: Rodrigues dos Santos J.editor. Actes du colloque tenu à Lisbonne, 5-8 juillet 2017. Portugal: Caleidoscópio: 2017. p. 63-72.

[57] Rutkowski R. (2013) Zawód Architekt – Roman Rutkowski. Architektura Murator 2012; 11:112.

[58] Fung A. Empowered Participation. Reinventing Urban Democracy. Princeton: University Press; 2004.

[59] Egloff BJ. Archeological Conservation and Menagment. Oxford: Archeopress; 2019.

Figures

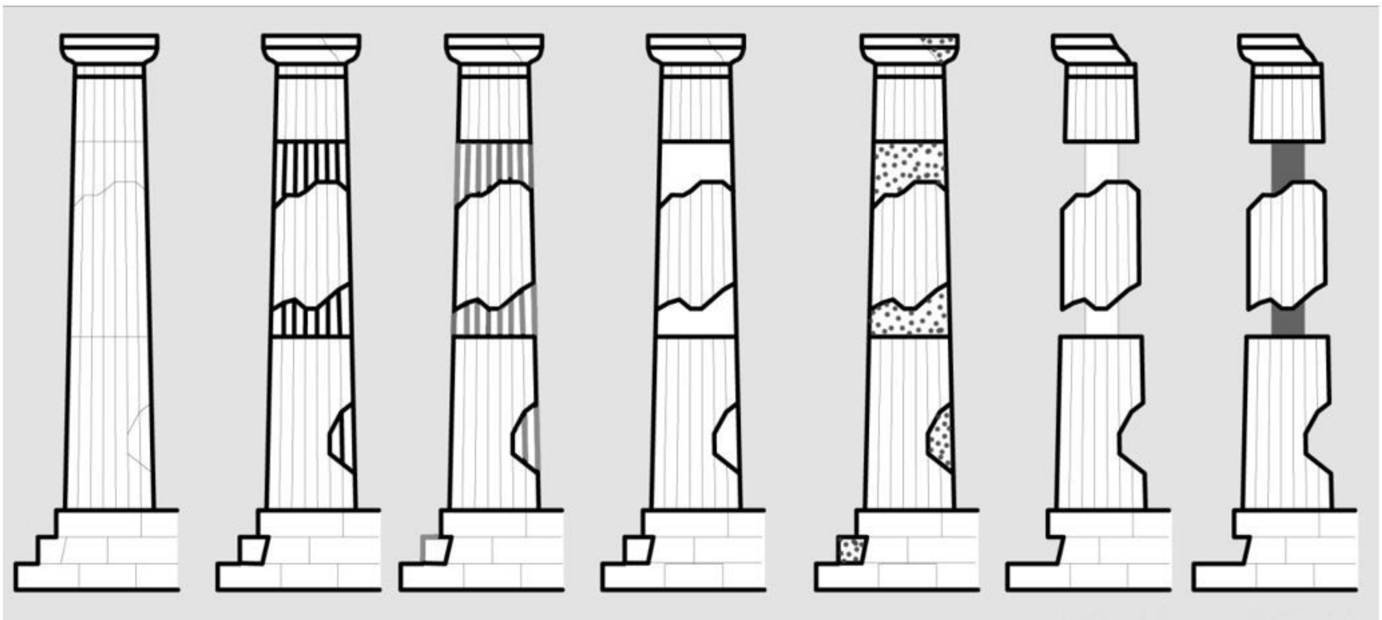

Figure 1

The diagram presents the idea of different methods of anastylosis

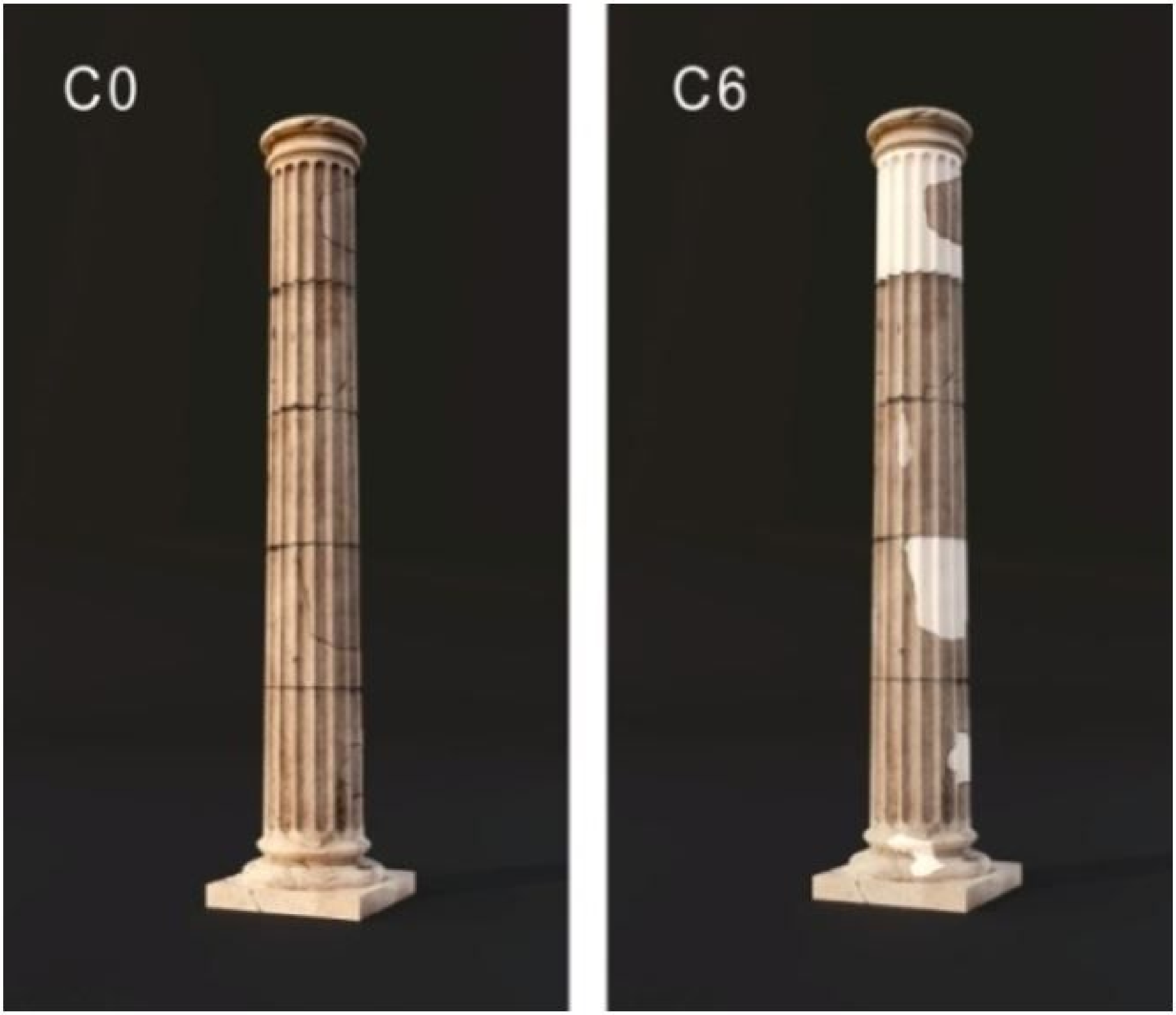

Figure 2

Extreme examples of the use of contrast anastylosis C0 and C6

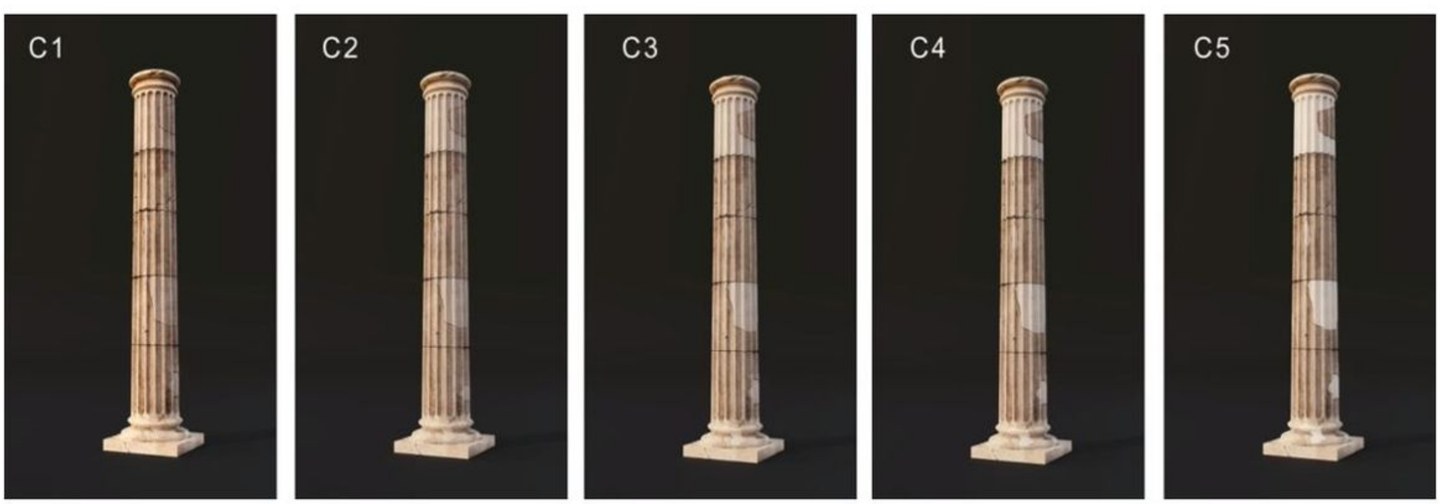

Figure 3

Comparison of illustrations used during eye-tracking registrations C1-C5

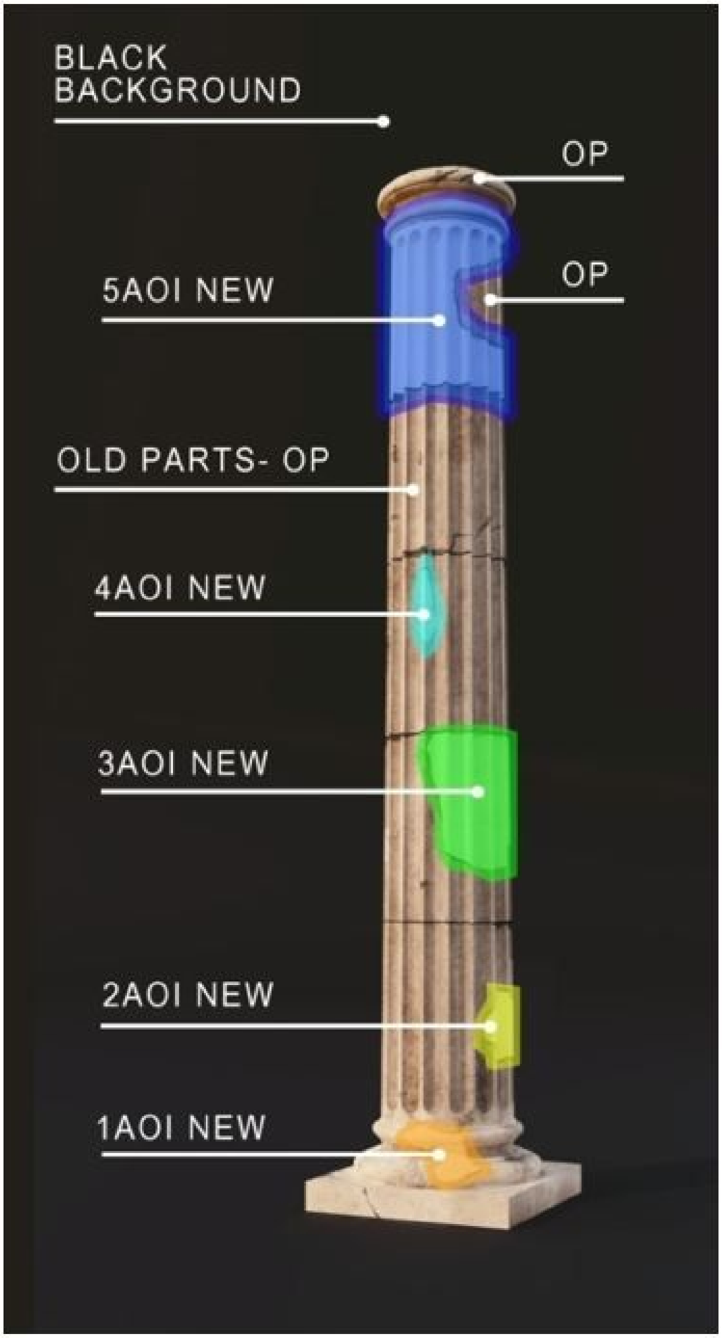

Figure 4

The method of determining AOI fields (TobiProLab / author)

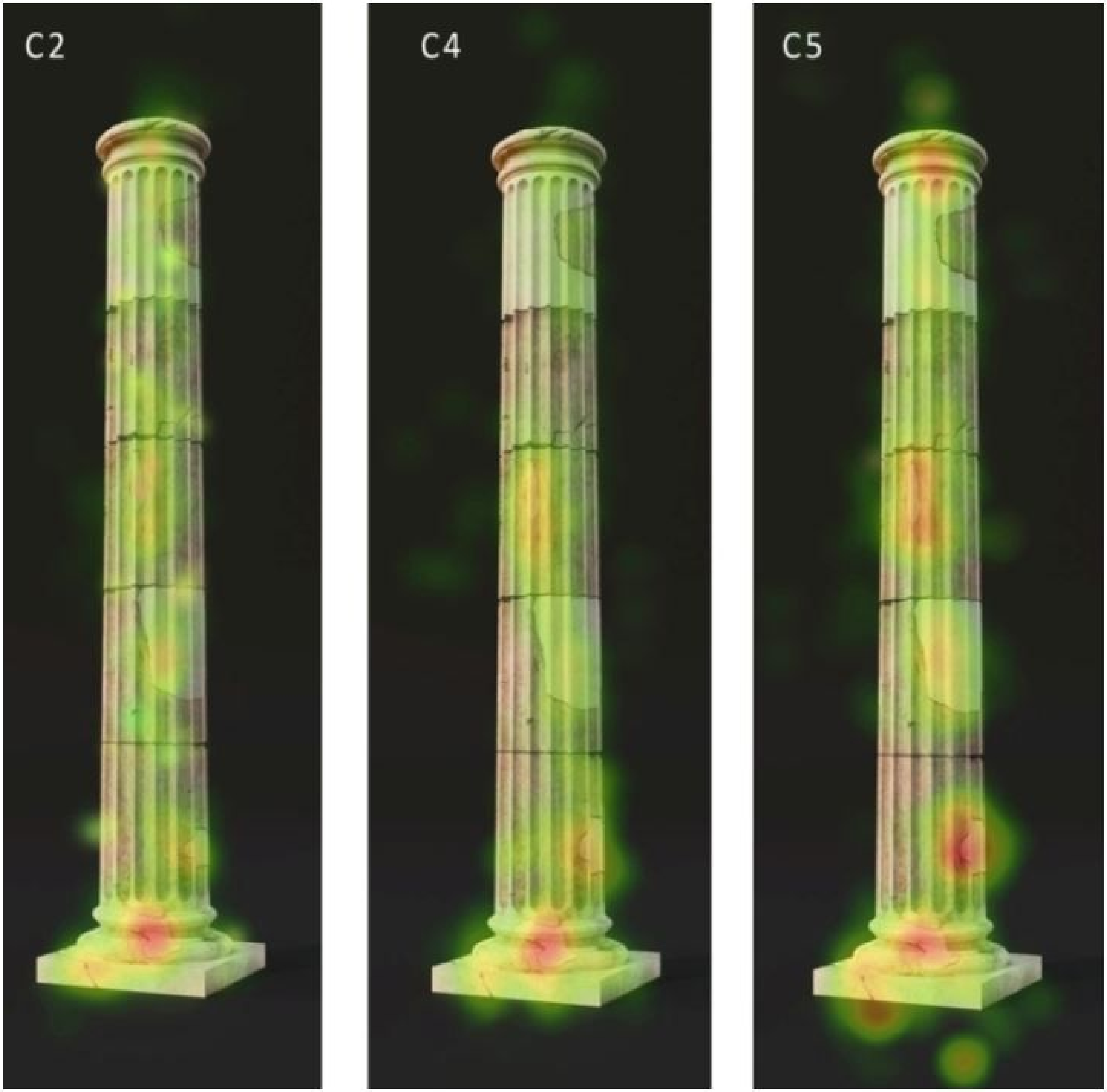

Figure 5

Comparison ofheat maps for examples C2, C4, and C5 (TobiProLab / author)

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Box1.jpg
- Box2.jpg

- GraphicalabstractHerStud1.jpg