Possible Ways of Reconstructing Missing Sections of Mosaics

Anja Novak
Mentor: Assistant Professor, Dr. Blaž Šeme
Department of Restoration, Academy of Fine Arts and Design, University of Ljubljana, Slovenia
anja2208@gmail.com

1. Introduction

Closely associated with the ethics of the discipline, the final appearance of the mosaic is a great responsibility. Of all the conservator’s procedures, the most visible in the final appearance is retouching or filling the missing sections that are a result of the deficiency of the work. The emergence of gaps and the number of these gaps depends on the damage caused by water, light, vibrations, changes in temperature, air pollution, and human factors. The damage can also occur later, i.e. when compiling elevated fragments. It can also emerge after fragment being straightened or when tesserae come loose at the edges due to lifting. Filling the lacunae is a sensible step, also as a means of additional consolidation of the fragment.

2. Selection of reconstruction methods

Various parameters can simplify and limit our selection to make our choice easier. Artistic, historical as well as technological elements of the artwork have to be considered when making a reconstruction. The Slovenian conservator-restorer Ivan Bogovčič emphasised certain parameters that generally relate to mural paintings, but which can also apply to mosaics1:

– Importance of the monument (historical, iconographic and religious, etc.),
– Sizes and shapes of lacunae,
– Ruggedness or surface structure,
– Natural sources of light, their intensity with regard to other in-situ objects, as well as indoor museum light,
– Size and purpose of the site where the mosaic is located.

---

Two gap-filling procedures can be identified. The first one is filling the nucleus and the spaces between tesserae, or tile gaps, and the space between the frame and the mosaic, a process integrating the tesserae with the setting bed, as well as serving a decorative purpose. The second procedure is aesthetic surface treatment using pigments and surface imitation, the purpose of which is artistic and documental.

The aim of the first procedure is to unify the surface and additionally strengthen the mosaic, whereas the second procedure aims to improve its appearance and integrate the composition into an ethically acceptable whole based on sufficient historical, iconographic and documentary resources. As in most cases one part complements the other, so henceforth the methods are presented together.

3. Reconstruction methods

With the first method, archaeological reconstruction, there is a great emphasis on reversibility. Therefore, in cases where the preserved mosaic surface is very limited, all the data available can be used to arrange the pieces within the frame reasonably and temporarily fill the surrounding area with sand or a similar light material (such as expanded clay). The placement reminds one of an outdoor find. (Figure 1)

![Figure 1. Final presentation of mosaics fragments in West Lucania museum in Padula, Italy](image)

The most common method is filling with decorative plaster. It can be considered to be similar to the neutral retouching of paintings. The plaster can be toned additionally or diversely-grained brick or sand can be added to obtain the required structure (Figure 2). This is a self-sufficient reconstruction method, but it can be upgraded with one of the following three methods:

1. **Embossed imitation of the art composition’s main lines and surfaces** imitates the pattern by means of varying levels. The focus is on understanding the relief: which level will integrate a certain colour type of mosaic tesserae? Another option is to smooth one level and leave another one roughened, in order to make the motif more discernible. This is an effective reconstruction method, but it is only
suitable for bicolour mosaics, as more than two levels are difficult to distinguish from one another. (Figure 3)

2. **Embossed imitation of the mosaic tesserae surface** is an upgrade to the previous method, imitating the entire mosaic structure including the level, the tile gaps, as well as the shape and size of tesserae. It is better suited for presentation in museums where visitors are looking at objects up close, studying their composition and make. (Figure 4)

3. **Reconstruction using decorative plaster and engraving**
   This method is suitable for schematically arranged patterns with repeated motifs where the sequence is precise and clear. As the final appearance is unsatisfactory, this method is not very common. If used, it is better suited for presentation in museums where the source of light is constant and the lines as defined are better highlighted by shadows. (Figure 5)

*Figure 2. Filling the lacunae with decorative plaster on the sample (Photo: Anja Novak, May 2015)*

*Figure 3. Embossed imitation of the art composition's main lines and surfaces on floor mosaic from Emona, National museum Slovenia (Photo: Anja Novak, April 2015)*
Tonal imitation of the art composition's main lines and surfaces makes the filled lacuna more visible than is the case with the reconstruction method using engraving, and therefore better suited to outdoor floor mosaics. It can also be used in compositions of greater complexity if there is sufficient data on their design. If compositions are geometrical, the lines composed of darker shade tesserae are usually emphasised as their colours are most distinct, so that the course of the pattern is clearly visible. The strip that we trace is of the same width as the strip of tesserae, yet of a lighter shade. (Figure 6)
Tonal and color imitation of mosaic tesserae surface can be used for compositions of greater as well as lower complexity. In cases of greater complexity where the lacunae as well as tesserae are small, the standard retouching method should be used, and the fields filled by lines and dots. In the event of larger lacunae and tesserae, the surface should be imitated by using stamps of the same shape as mosaic tesserae. In this way the very nature of the artwork is better preserved. (Figure 7)

This reconstruction method can be upgraded by the embossed imitation of the mosaic tesserae surface with tonal imitation, in which the plaster is colour retouched as well as modelled.
The final two methods are **total reconstruction using new or old tesserae**. In both cases, good documentation is of vital importance as each replaced tessera needs to be documented. Reconstruction with new tesserae is the most invasive method, therefore the decision for this, if taken, requires even more justification. Total reconstruction using old tesserae, however, is among the most basic and ancient methods, not only due to the fact that many border tesserae tend to come off in mosaic partition and lifting. It is this method that was used by the ancient Romans to renovate and repair their damaged mosaics. Today it is used when only a few tesserae are missing, and these usually already become fastened while the mosaic surface is being cleaned. (Figure 8)

![Figure 8. Total reconstruction using old tesserae on the sample (Photo: Anja Novak, May 2015)](image)

### 4. Practical implementation

For practical implementation a twisted rope was chosen as template from a fragment presented in the lapidarium of the National Museum of Slovenia. The intention was not to make a reproduction; the motif merely facilitated a working process. Furthermore, the original version has been preserved in its entirety, whereas six experimental samples feature two intentionally made lacunae at exactly the same position.

Stone tesserae was used, cut with *martellina* (a mosaic hammer) into cubes with a diameter of 1 cm. The brick tesserae were made additionally using three types of clay to achieve differing colour tones after firing.

The mosaic was constructed using the direct method by pressing stone tesserae into fresh mortar. As the base, spruce plywood was chosen, onto which a thin insulation layer made by mixing Kerabond (a cementitious powder with excellent binding properties on all surfaces) and Isolastic (a flexible acrylic adhesive) was applied. Mortar was mixed according to the classical Roman technique from marble...
powder, pozzolana, ground brick and traditional lime putty. The ratio of binder to filling was 1:1. A smaller batches of mortar was mixed when needed, as it is important for the mortar to be fresh for easier handling and to have better binding properties. Cubes were laid into the mortar in a sequence, which was the only way the composition could be followed. The mosaic was sealed using the same mortar, to which oxide black pigment was added. Float was used to fix it into the interstices properly, and then the surplus mortar from the surface was removed.

Each sample was thus composed of five layers: the insulation layer, the classical Roman mortar and sealer, and two layers of decorative mortar. (Figure 9)

![Figure 9. Making the mosaic sample (Photo: Anja Novak, May 2015)](image)

The final and crucial phase was filling the lacunae on experimental samples in various ways. As long as a mosaic hammer could be used, the first lacuna with 'original' tesserae was filled. The level of lacuna was made lower than the ‘original’. The method proved to be the least appropriate as it is difficult to grout when the lacuna is lower and of an irregular shape. Also, the final result is not very clearly visible.

If reconstructing with decorative plaster, the right shade of mortar has to be carefully used. At the end it can’t be too light or too dark. First, the first layer of mortar composed of one part lime putty and two parts calcite sand was applied. It was applied up to half the sample height. For the second and last layer, lime, silica sand, oxide black pigment, and ground brick were used. In all the samples, this mortar was also used to integrate the mosaic and its frame.

In the Reconstruction using engraving and in the tonal imitation of main lines I the line of black tesserae was highlighted, as they stand out the most, heading the composition. For the engraving method, a scalpel was used to carve lines vertically and into fresh plaster. In the tonal imitation of main lines, the line was drown into fresh plaster, using the fresco technique.

In the second to last sample the lacuna surface with plaster colour retouching was imitated using the stamp method. Potatoes werw cut into blocks of various sizes
and shapes, then dipped into limewater mixed pigments, or the paint was applied on the potato stamp with a brush, and then the potato piece was stamped into fresh plaster.

The final sample was left unchanged to make the course of practical work more clear.

5. Conclusion

While working, the dividing point was found: the colour, i.e. the reconstruction variations where pigment had to be used. In case of the twisted rope, all other monochromatic reconstructions seemed more appropriate. The preserved part is large and artistically unchallenging, its minor lacunae helping to complete the composition organically. Therefore a minor intervention was sufficient to make the composition complete. If the composition had been more complex, featuring more undulating forms and tesserae of smaller dimensions, a different reconstruction method have probably had to be choosen.

The reconstruction method therefore largely depends on the mosaic in question, its material composition, production techniques, preservation, and storage methods, as well as invisible factors: time limits and the funds available. Within these restrictions, the choice is also subjective, depending on the experts consulted, with their conflicting opinions originating in the ethical and aesthetic principles each of them wishes to emphasise.

Figure 10. Final mosaics samples with filled lacunae (Photo: Anja Novak, May 2015)
6. Bibliography

BOGOVČIČ, Ivan, Dva načina konserviranja in restavriranja antičnega mozaika, in Varstvo spomenikov 16, Ljubljana 1972.


BOGOVČIČ, Ivan, O restavratorskih posegih na mozaikih v Sloveniji, in Mozaiki severnega Jadrana: arheološke raziskave in valorizacija (ed. STOKIN, Marko; KRAMAR, Sabina), Ljubljana 2010

BOGOVČIČ, Ivan, Restavriranje mozaika (študijsko gradivo), Ljubljana 2000.

BUKOVAC, Matic, Rekonstrukcija dela rimskega mozaika za muzejsko prezentacijo, diplomsko delo, Ljubljana 2008.


FIORI, Cesare; MUSCOLINO, Cetty, Restauri ai mosaici nella basilica di S.Vitale a Ravenna: L’arco presbiteriale, Faenza 1990.

GARČEVIĆ, Milun, Mozaik: povjest i izvedba, Zagreb 2009.


PFLAUM, Miran, Emonske mozaiki – Kaj smo se ali se nismo naučili v zadnjih stoletih?, in Mozaiki severnega Jadrana: arheološke raziskave in valorizacija (ed. STOKIN, Marko; KRAMAR, Sabina), Ljubljana 2010

PFLAUM, Miran: Restavriranje emonskih mozaikov, shranjenih v Narodnem muzeju Slovenije, in ARGO, Časopis slovenskih muzejev, 43/1,1 (ed. Alenka MIŠKEC), Ljubljana 2000

Progetto di recupero e conservazione della Villa Romana del Casale di Piazza Armerina (ed. Guido MELI), Palermo 2007

TITOMANLIO, Manlio, Mozaiki in magneti: Magnetni podstavki za prezentacijo mozaičnih fragmentov, in Mozaiki severnega Jadrana: arheološke raziskave in valorizacija (ed. STOKIN, Marko; KRAMAR, Sabina), Ljubljana 2010

ZIZOLA, Chiara, The conservation and restaoration of the mosaic floor of the Byzantine church (Western) in Mamshit (Negev desert), in Mosaics: conserve to display? (ed. Patrick BLANC), Arles 2003

6.1. Internet source


MARTIN, Aurelie, Problématique posée par les réintégrations des lacunes dans
Possible Ways of Reconstructing Missing Sections of Mosaics


MORO, Fabiana; PUJIA, Angelica, *The newly applied mortars in mosaic restoration*, available on: http://ceroart.revues.org/1759#tocto1n5, May 2014


6.2. Photo source

Figure 1: Manlio TITOMANLIO: Magnetna adhezija za pritjevanje mozaičnih fragmentov, in *Mozaiki severnega Jadrana*, Vestnik XXIV (ed. Jelka Ribnikar), Ljubljana 2010

Figure 4: FIO, Cesare; MUSCOLINO, Cetty, *Restauri ai mosaici nella basilica di S.Vitale a Ravenna: L’arco presbiteriale*, Faenza 1990

Figure 2,3,5-10: Personal archive of Anja Novak