

A Large Alhambra Tiling

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1 Introduction

The reconstruction of Islamic patterns using modern computer graphics requires an original description to work from. It appears that many Victorian publications contain significant errors and are therefore an unreliable source of primary data for such patterns.

A simple example of an incorrect graphic, compare David Wade's photograph with the illustration in Jones [2], Plate XLII(6). The original has a clear 'kink' in the interlacing, while the version produced by Jones does not. It has also been noted that Jones' book on the Alhambra has incorrect colours [1, Page 244]. Hence modern digital photos are to be preferred, although with the Alhambra there are often wooden chairs in the way excluding part of the pattern!

Here we are concerned with a large Alhambra Dado (from Mirador de Lindaraja) for which there is an excellent high resolution photograph from Nick Crossling. This photo is shown in Figure 1, but with the Islamic script and edging removed.

Note that all the figures here have a high resolution and hence can be examined in detail by zooming in appropriately.

2 Implementing the patterns

Many of the original patterns produced in [3] were poorly presented and many have been redone. For the Alhambra, the patterns are being reviewed by Tony Lee and being revised as necessary. Figure 3 gives the old version of the same pattern. This was produced by only using the central motif and a small surround with a symmetry of $p4m$. The reason for making such a poor approximation was to simplify the work involved in undertaking the full pattern. The problems involved in producing the full version are noted in Appendix A.

The program used to construct these patterns uses the rotational symmetry to reduce the work needed. Hence the old version which was $p4m$ was easier than the new version which is cm . Unfortunately, the original pattern is not strictly cm . To see this, note that the area around the white circle in Figure 4 does not appear near the centre of the dado, as required for cm symmetry. Hence I have ignored this area in producing Figure 2.

A careful examination of the photo will also reveal irregularities in the colouring which again have been ignored.

3 Acknowledgements

This note would not have been possible with the photos of David Wade and Nick Crossling, and also the expertise of Tony Lee in exactly how Islamic star patterns should be presented.

References

- [1] Antonio Fernández-Puertas. *The Alhambra: Volume I — from the ninth century to Yusuf I (1354)*. SAQI Books. 1999. ISBN086356466.
- [2] Owen Jones. *The Grammar of Ornament*. 1856. (Dover reprint: ISBN048625463)
- [3] B. A. Wichmann, *The World of Patterns*, CD and booklet. World Scientific. 2001. ISBN 981-02-4619-6
<http://www.worldscibooks.com/mathematics/4698.html>

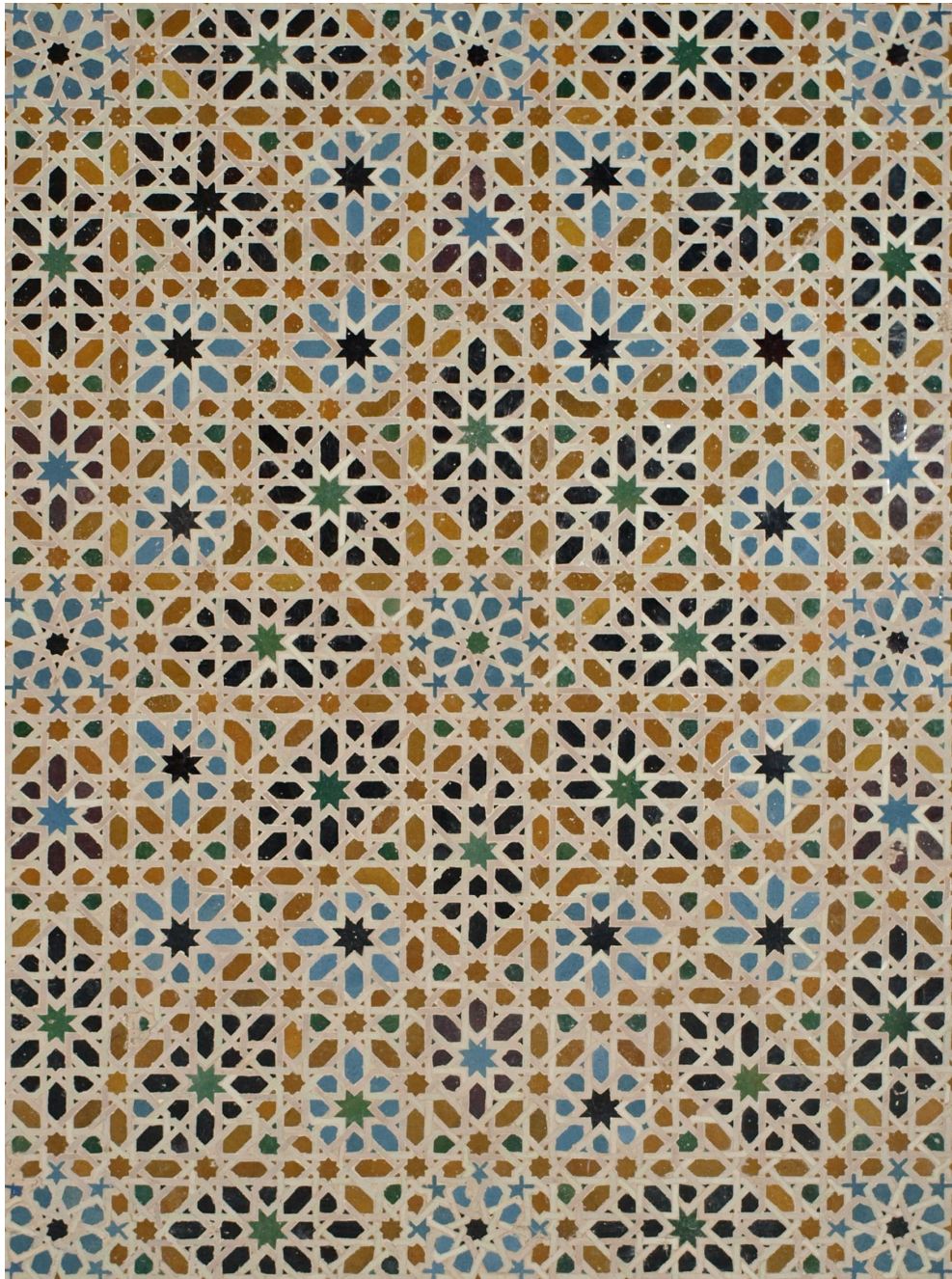


Figure 1: Photograph from Nick Crossling ©Nick Crossling

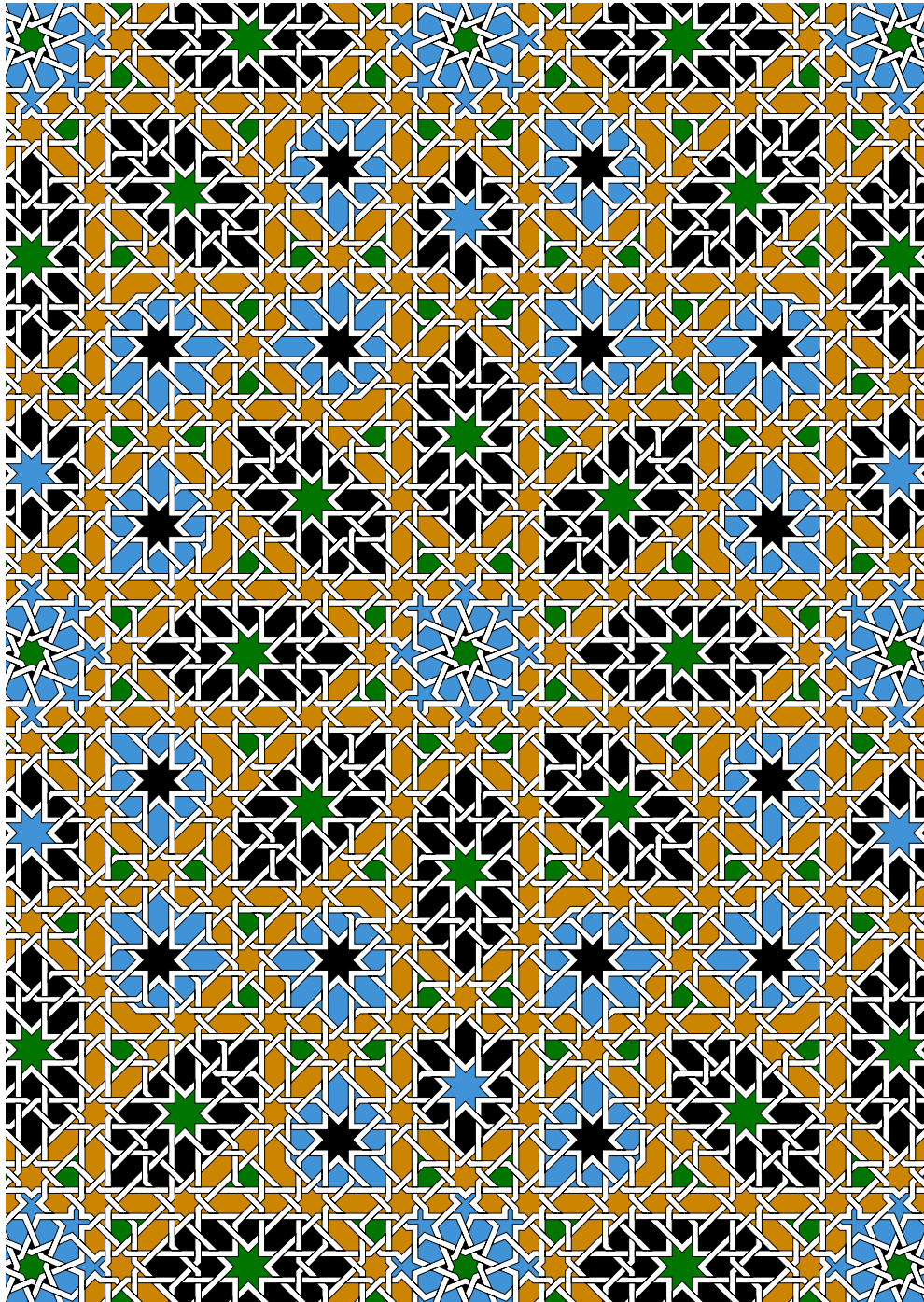


Figure 2: Completed pattern

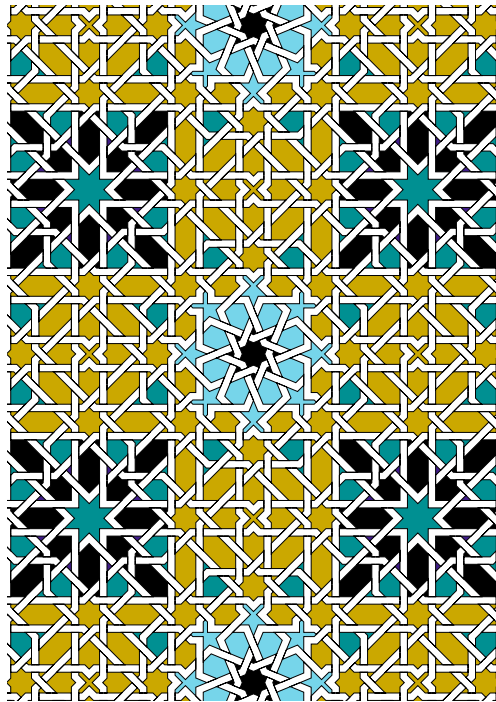


Figure 3: Old version

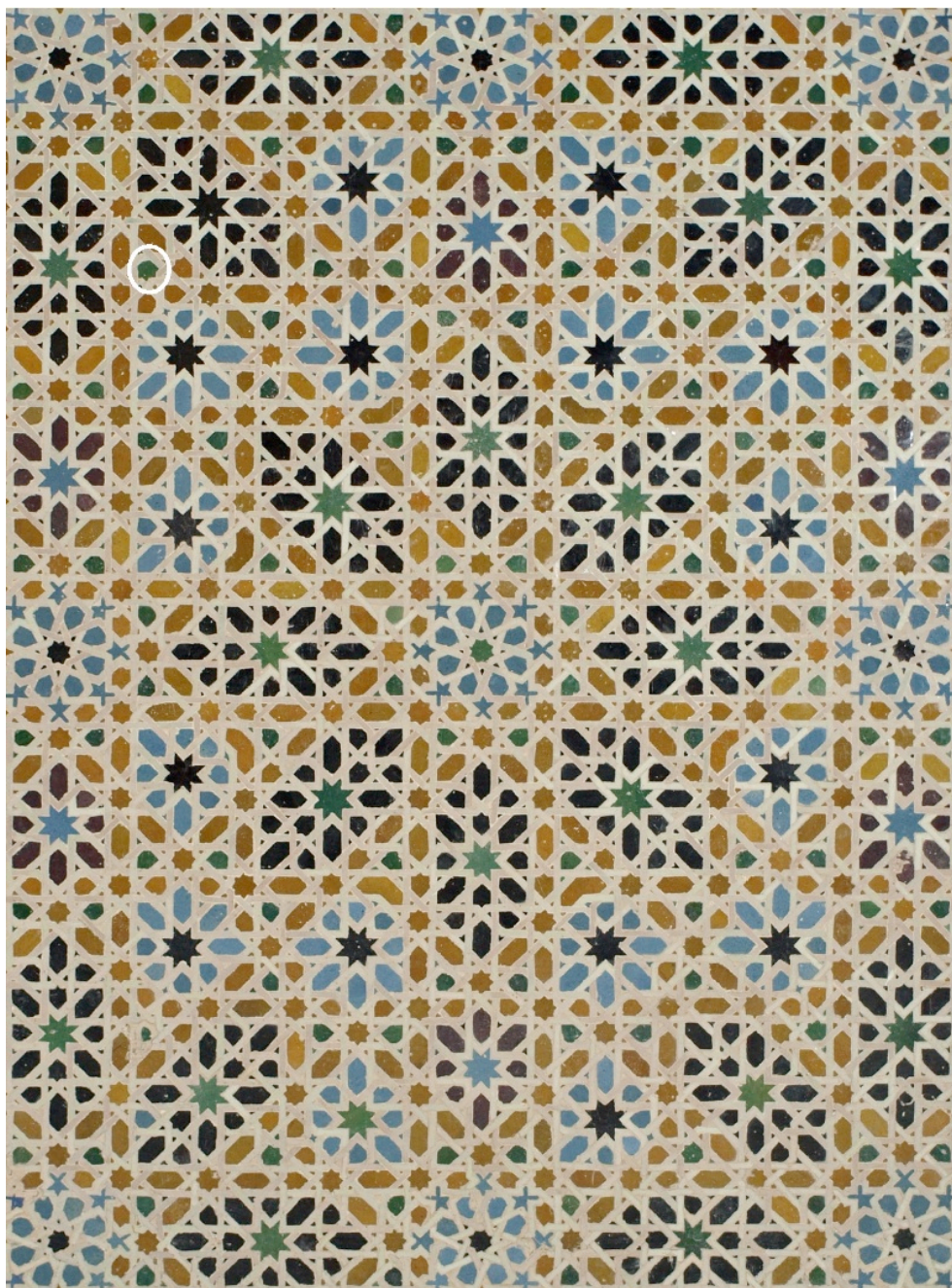


Figure 4: Not *cmm* ©Nick Crossling

A Implementation problems

This particular pattern does not present any geometric issues, since all the edges and lengths are determined by the octagonal layout. This implies that the problem with the full pattern is simply the size:

Pattern	Files size (bytes)	Number of polygons	Number of edges
Old	8065	54	375
New	105,000	610	3444

Hence the work involved for the new version is roughly ten times that for the old. In fact the new pattern took me about 40 hours to produce.

I therefore decided to improve my software to minimise the work involved. The data consists to the geometry of the polygons (not a problem in this case) and the pairing of the edges shown which edge is joined to which. This pairing can be partly automated if the edge-pairing is sufficient to display the complete pattern.

I first modified my Ada drawing program to compute the pairs not given in the data file. Unfortunately, this modification missed some pairings. Hence I then computed the pairs from the actual pattern itself (drawn with an option to show the edge numbers). This would have worked perfectly had I not omitted two polygons. The effect of this omission was for the drawing program to draw the polygons round to hole and then collapse on itself!

I therefore conclude that producing such patterns is tricky and not to be undertaken lightly.

v15