Approximating Edge-Touching Regular Polygon Patterns Using Crocheted Bead Lace

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Abstract

I have a fondness for crocheting lace as well as for making geometric patterns with regular polygons. This document describes how I interpret this type of pattern as beaded lace using a (probably) non-standard method of bead crochet.

Introduction

I learned to crochet when I was young, and a desire to make geometric lace to match fabric eventually led me to figure out ways to crochet with thread and sequins. I have also long been obsessed with making geometric patterns, especially those consisting solely of a single type of regular polygon. From SuperPaint on a Mac Plus to Graphic on an iPad, vector-based drawing programs have proved to be invaluable in this endeavour. A few years ago, I realized that many of these patterns could be directly translated into crochet pieces involving round beads.

Unlike bead weaving and many forms of bead embroidery, my method allows the hole of the bead to be visible instead of the side. And unlike more traditional bead crochet, beads are placed on the hook as needed rather than being pre-strung. I work mainly with 10/0 and 11/0 seed beads, metallic thread, and a crochet hook that is approximately 0.5 mm, but the method should also work with larger beads and hooks.
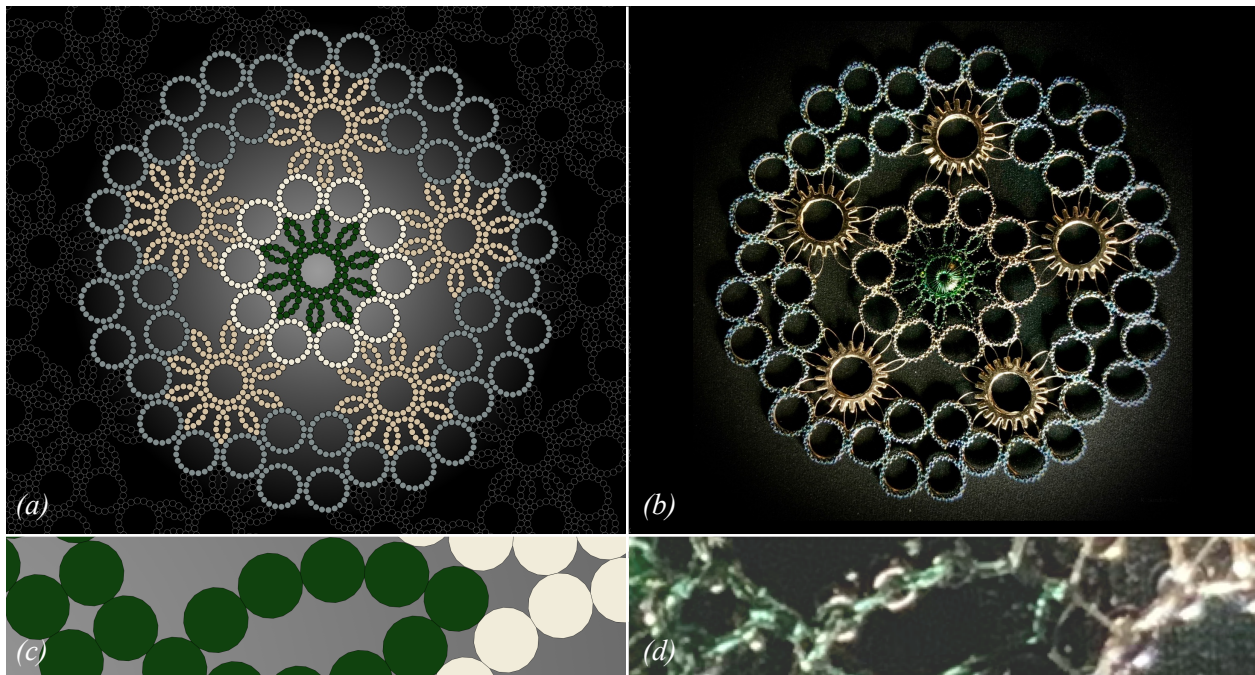

Figure 1: *Regular polygon pattern approximation using bead crochet:*
(a) pattern of edge-touching 20-gons, (b) corresponding bead crochet piece [1],
(c) 10x magnification showing a few 20-gons, (d) 10x magnification showing the corresponding beads.

Pattern Conversion

Suppose that we are given a connected pattern involving only one type and size of regular polygon, where all connections are made by having edges coincide. If the polygons are replaced by their inscribed circles, the result is a pattern of circles that touch at the same locations as did the centers of the edges on the original polygons (see Figure 2).

In many types of beading, the beads are oriented so that their sides are visible rather than the hole, greatly restricting the angles at which adjacent beads can be easily attached. Here the beads need to represent polygons that can attach at various angles, so I place them so that a line through the hole of the bead would be perpendicular to the plane of the pattern. The beads act as spacers to make sure that each stitch can reasonably represent the distance between the centers of adjacent polygons, and the stitches serve to force adjacent beads to touch.
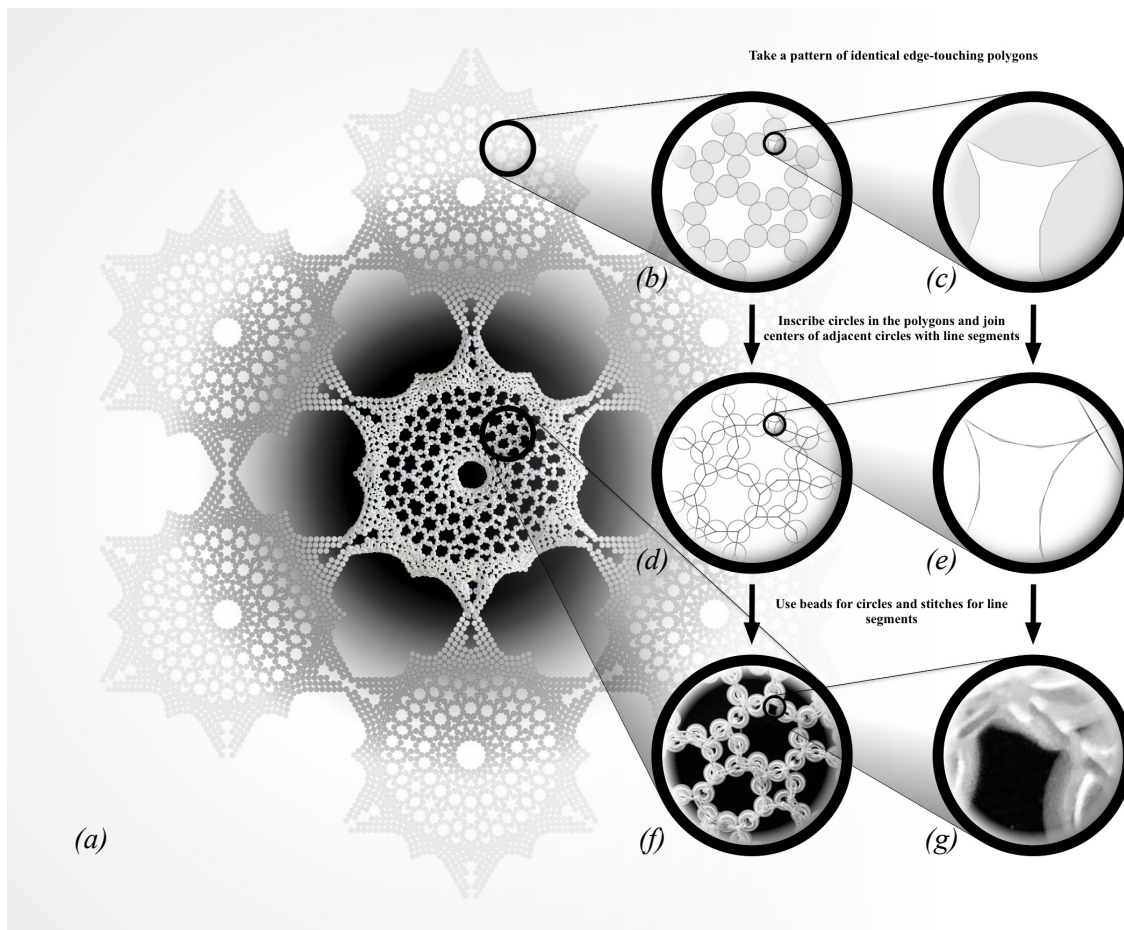

Figure 2: *Translating a pattern of edge-touching polygons for use with beads:*
(a) pattern of edge-touching 18-gons with central motif replaced by bead crochet [2],
(b) magnified sample of pattern,
(c) further magnification of three 18-gons,
(d) the sample with circles inscribed in the polygons and centers of adjacent circles joined,
(e) further magnification of the same three 18-gons with their inscribed circles,
(f) magnified part of beaded piece corresponding to the sample,
(g) further magnification of the three beads corresponding to the three 18-gons.
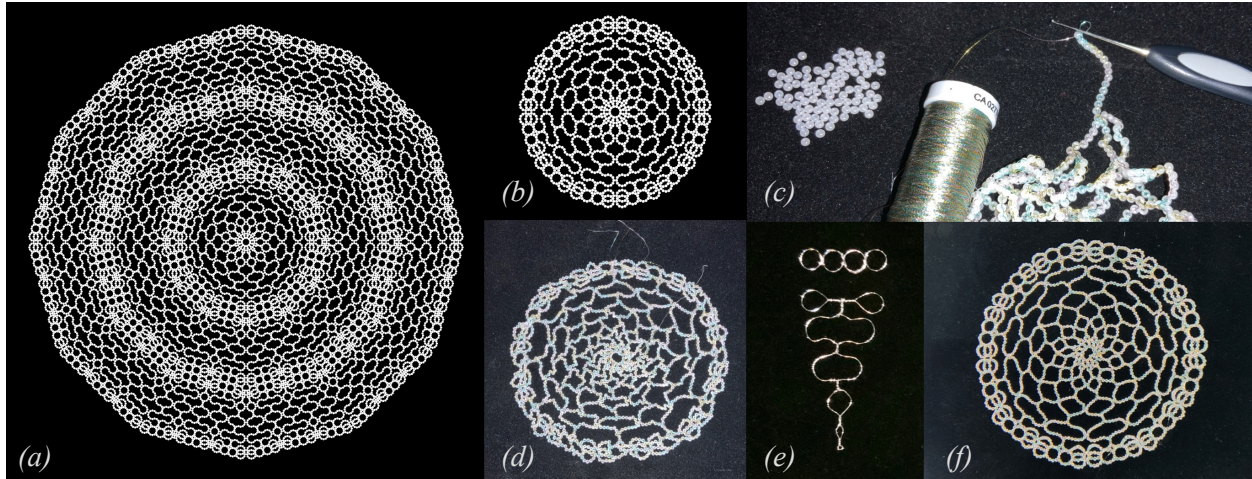
Figure 3: *Work in progress: (a) pattern of 24-gons using groupings that I call "polygon squiggles" [4], (b) portion of pattern to bead, (c) partially finished piece showing beads, thread and hook, (d) finished piece before sewing in stiffeners, (e) bent and twisted wire stiffeners, (f) piece after sewing to wire.*

Fastening the Beads

There are likely many ways to attach the beads to one another, but I have found that using a crochet hook to form a chain stitch through the beads to be a reasonable option (Figure 3c). It is sometimes necessary to go through the same bead multiple times to connect to all adjacent beads, so it is important that the hook is narrow enough, and the thread fine as well as unlikely to fray.

The beads are free to move to some degree, so the resulting beaded piece may not exactly match the original pattern. It is sometimes necessary to sew a stiffener to the back to force a specific angle or curve onto a group of beads, as can be seen in Figures 3d, 3e and 3f. This was done for the piece in Figure 1b, but not for the one shown in Figure 2a.

Some Variations

Upon occasion, I have found it visually interesting to substitute larger beads, sequins, or custom-bent wire shapes for portions of the patterns (see Figure 1b for examples).

Some of my recent patterns, such as ones that relate to Cairo Tilings on a framework of polygon rings ([3] and Figure 4a), would be interesting to try to bead. Many of my patterns feel more like tilings than lace because the negative spaces left over by the polygons can form fascinating shapes on their own —like alligators or perhaps croco-tiles (Figure 4b and 4c). I hope to eventually try making small multi-holed beads that could act as fillers for these sorts of spaces.
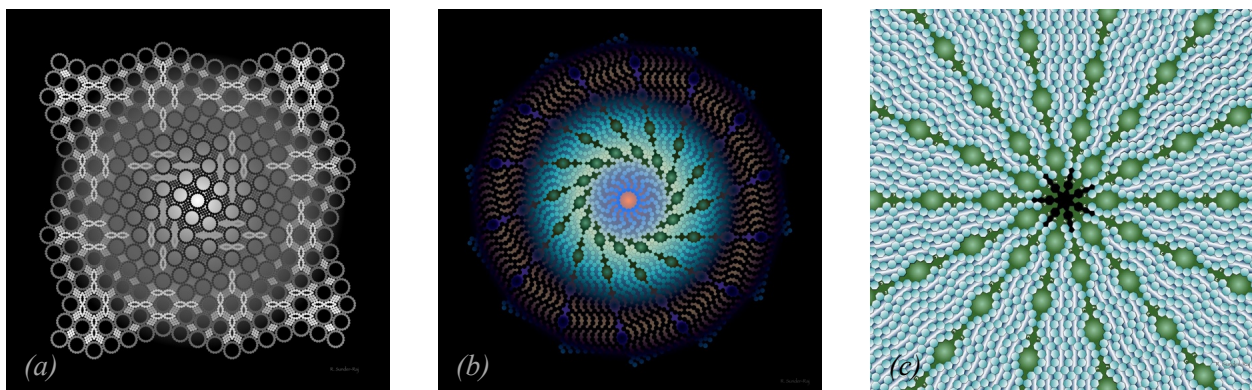

Figure 4: *Potential future bead crochet projects.*

I have sometimes sewn a layer of regularly oriented beads over the crocheted ones to hide the holes. But I have also had some success at beading multiple layers at a time. My patterns can often be coloured in more than one way, emphasizing different aspects of the design. Figure 5a shows a pattern of dodecagons coloured to emphasize its rings of polygons while Figure 5b shows the same pattern coloured to show petal-like structures. I worked the central part of this pattern using three layers of beads so that each side could show one of these colourings. Figures 5c and 5d show the two sides of this piece.
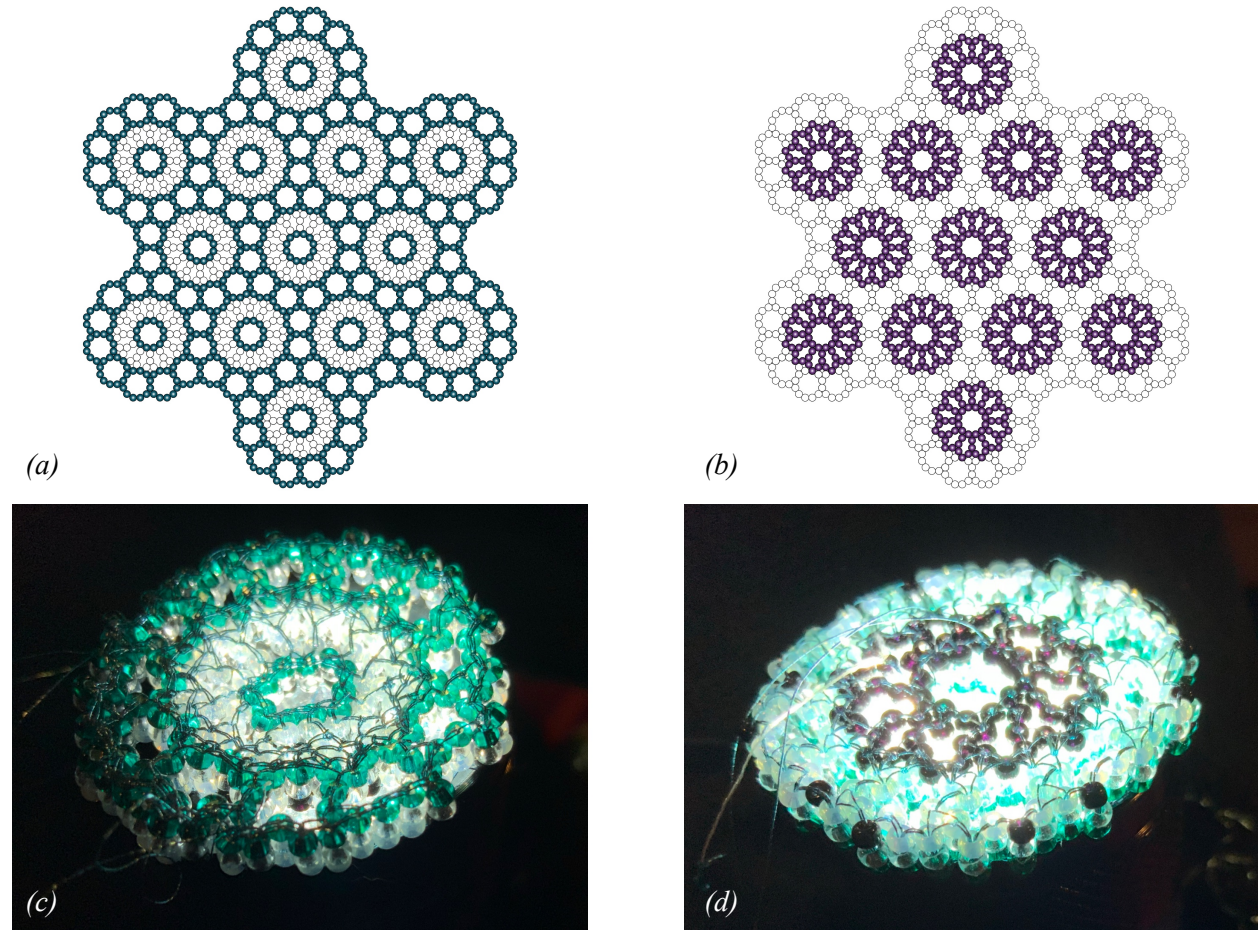

(a)

(b)

(c)

(d)

Figure 5: *Multi-layer bead crochet: (a) polygon pattern showing rings, (b) polygon pattern showing petals, (c) one side of beaded sample, (d) other side of beaded sample.*

Acknowledgements

References

[1] R. Sunder-Raj. "Regular polygon pattern approximation using bead crochet." Bridges 2020 Art Exhibition Catalog, http://gallery.bridgesmathart.org/exhibitions/2020-bridges-conference/rashmis

[2] R. Sunder-Raj. "Bead Crochet Piece." Joint Mathematics Meetings 2021 Art Exhibition Catalog, http://gallery.bridgesmathart.org/exhibitions/2021-joint-mathematics-meetings/rashmis

[3] R. Sunder-Raj. "Suggestions of Cairo Tilings from Patterns of Regular Polygons." 2021. https://twitter.com/i/moments/1381708490406760453

[4] R. Sunder-Raj. "Polygon, Wedge and Arc Squiggles." 2018. https://twitter.com/i/moments/1050938075222855680