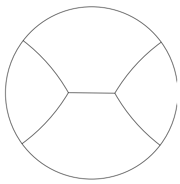
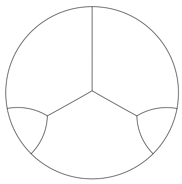
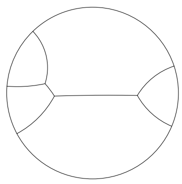
CANDIDATE SOLUTIONS TO BIDISPERSE PARTITIONS OF THE DISC

We present conjectured candidates for the least perimeter partition of a disc into $N \leq 10$ regions which take one of two possible areas. We assume that the optimal partition is connected, and therefore enumerate all three-connected simple cubic graphs for each N. Candidate structures are obtained by assigning different areas to the regions: for even N there are $N/2$ regions of one area and $N/2$ regions of the other, and for odd N we consider both cases, i.e. where the extra region takes either the larger or the smaller area. The perimeter of each candidate is found numerically for a few representative area ratios, and then the data is interpolated to give the conjectured least perimeter candidate for all possible area ratios. At larger N we find that these candidates are best for a more limited range of the area ratio.

For further details see the article:
Least-perimeter partition of the disc into N regions of two different areas
Francis Headley, Simon Cox
`https://arxiv.org/abs/1901.00319`

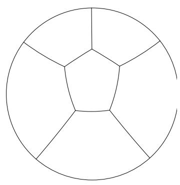
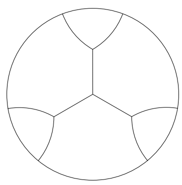
This document gives the topology of the conjectured least perimeter candidates for each N, with a particular geometry shown for a representative area ratio A_r for which it is optimal, and the range of area ratio for which we conjecture that it is optimal.

$N = 4$ $N = 5_{32}$ $N = 5_{23}$

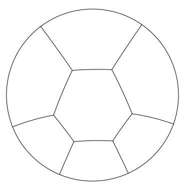
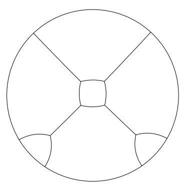
All area ratios

$N = 6$

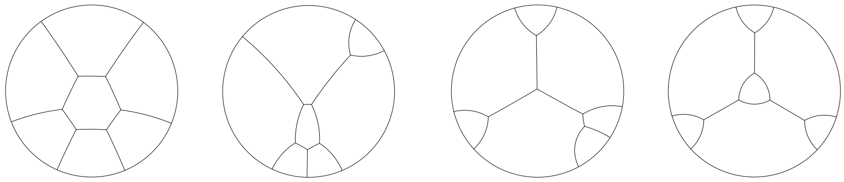
$A_r \leq 2.60$ $A_r \geq 2.60$

$N = 7_{43}$

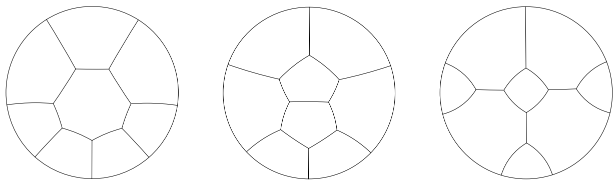
$A_r \leq 2.80$ $A_r \geq 2.80$

$N = 7_{34}$



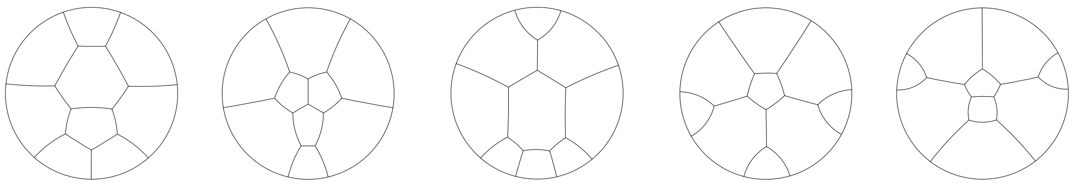
$A_r \leq 2.50$ $2.50 \leq A_r \leq 4.01$ $4.01 \leq A_r \leq 8.34$ $A_r \geq 8.34$

$N = 8$



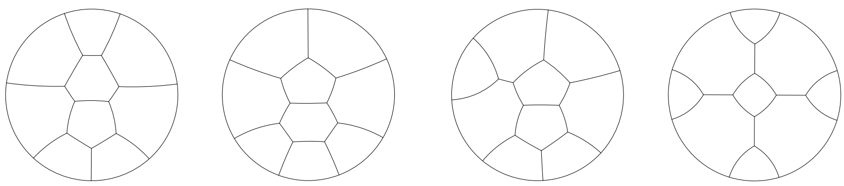
$A_r \leq 2.60$ $2.60 \leq A_r \leq 3.90$ $A_r \geq 3.90$

$N = 9_{54}$



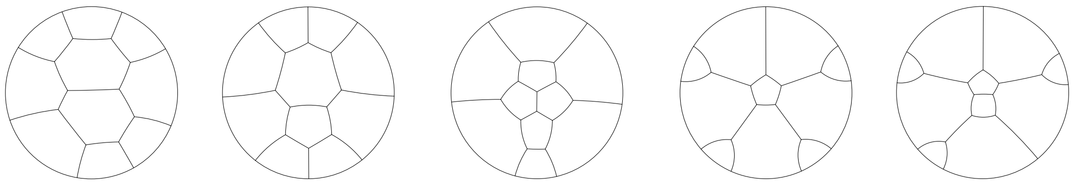
$A_r \leq 2.77$ $2.77 \leq A_r \leq 3.16$ $3.16 \leq A_r \leq 4.33$ $4.33 \leq A_r \leq 5.70$ $A_r \geq 5.70$

$N = 9_{45}$



$A_r \leq 1.77$ $1.77 \leq A_r \leq 2.68$ $2.68 \leq A_r \leq 3.75$ $A_r \geq 3.75$

$N = 10$



$A_r \leq 1.40$ $1.40 \leq A_r \leq 3.90$ $3.90 \leq A_r \leq 4.50$ $4.50 \leq A_r \leq 5.20$ $A_r \geq 5.20$