

University of Groningen

## Delaunay triangulations of hyperbolic surfaces

Ebbens, Yde Matthijs

DOI:  
[10.33612/diss.181607575](https://doi.org/10.33612/diss.181607575)

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2021

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*  
Ebbens, Y. M. (2021). *Delaunay triangulations of hyperbolic surfaces*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen. <https://doi.org/10.33612/diss.181607575>

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Propositions accompanying the PhD thesis  
**Delaunay triangulations of hyperbolic surfaces**

Yde Matthijs Ebbens

1. 千里の道も一歩から (A journey of a thousand miles begins with a single step).
2. A connected, regular curve in  $\mathbb{R}^n$  has constant affine curvatures if and only if the area of any full-dimensional simplex whose vertices are points on the curve does not depend on the actual positions of the vertices but only on the affine arc length of the curve segments between the vertices. (Bachelor's thesis)
3. The systole of the generalized Bolza surface of genus  $g$  is equal to twice the distance between the midpoints of adjacent sides of a regular hyperbolic  $4g$ -gon of area  $4\pi(g-1)$ . (Chapter 2)
4. Identifying opposite sides of a centrally symmetric hyperbolic  $4g$ -gon of area  $4\pi(g-1)$  yields a hyperelliptic surface of genus  $g$ . If the vertices of this centrally symmetric hyperbolic  $4g$ -gon are sufficiently close to the vertices of a regular  $4g$ -gon of area  $4\pi(g-1)$ , then the systole of the corresponding hyperelliptic surface is equal to the distance between the midpoints of some pair of opposite sides or it is equal to twice the distance between the midpoints of some pair of adjacent sides of the centrally symmetric hyperbolic  $4g$ -gon. (Chapter 2)
5. Given any closed hyperbolic surface, there exists a set of generators of its corresponding Fuchsian group such that the word length of any element of the Fuchsian group corresponding to one of its systoles is arbitrarily large with respect to this set of generators. (Chapter 2)
6. Bowyer's algorithm for Delaunay triangulations of finite point sets in the Euclidean plane can be generalized to compute Delaunay triangulations of sufficiently large and well-distributed point sets on the generalized Bolza surfaces. (Chapter 3)
7. Every closed hyperbolic surface of genus  $g$  has a distance Delaunay triangulation with at most  $151g$  vertices. (Chapter 4)
8. There exist open subsets  $U_g$  of the Teichmüller space  $\mathcal{T}_g$  of closed hyperbolic surfaces of genus  $g = 2, 3, \dots$  and a positive constant  $A > 0$  such that any distance Delaunay triangulation of a surface in  $U_g$  has at least  $Ag$  vertices. (Chapter 4)

9. There exists an infinite family of closed hyperbolic surfaces (but not necessarily one for every genus) and a positive constant  $B > 0$  such that any surface of genus  $g$  in this family has a distance Delaunay triangulation with at most  $B\sqrt{g}$  vertices. This is asymptotically optimal. (Chapter 4)
10. It's a dangerous business going out of your door. You step onto the road, and if you don't keep your feet, there's no knowing where you might be swept off to. (J.R.R. Tolkien, *The Fellowship of the Ring*)