Growing Circles: A Region Growing Algorithm for Unstructured Grids and Non-aligned Boundaries

Saeed Dabbaghchian (saeedd@kth.se)

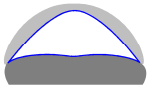
Department of Speech, Music, and Hearing, KTH Royal Institute of Technology, Stockholm, Sweden

1. Problem Statement

Geometry of an enclosed region

What about using Geometrical Boolean (i.e. union)?

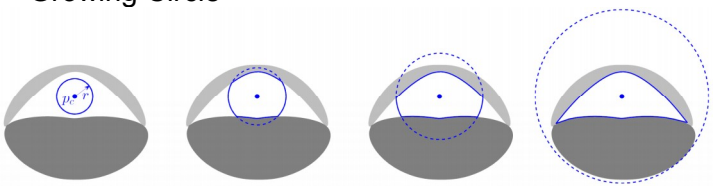
- **if boundaries are aligned** ✓



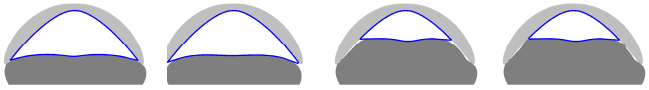
- **non-aligned boundaries** ✗

2. Proposed Solution

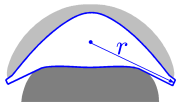
Growing Circle



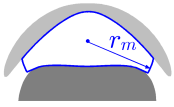
applying to the previous examples: ✓



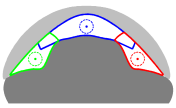
What about these examples?



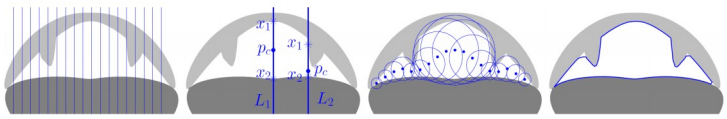
maximum radius



more circles



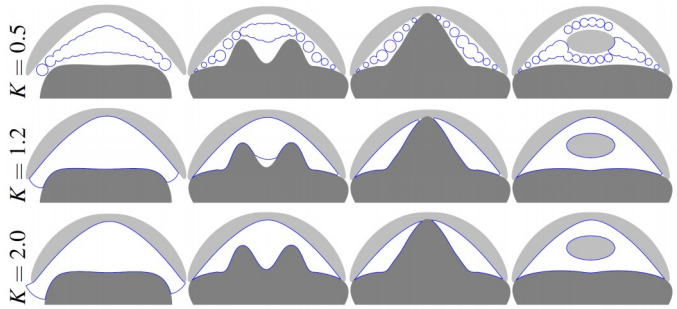
Calculation of centers and maximum radius



$$d = \min_{i \in (1,2)} \|x_i - p_c\|, \qquad d_l = \frac{\|L_1 - L_2\|}{2}, \qquad r_m = K \times \left(d^2 + d_l^2\right)^{0.5}$$

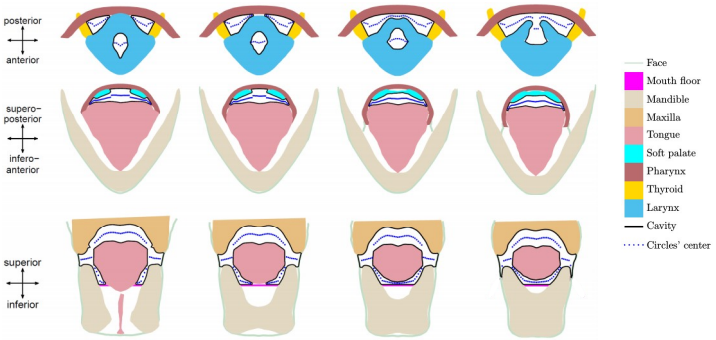
3. What is K?

Small K: several disconnected polygons
Large K: continuous polygon but problem with wide gaps

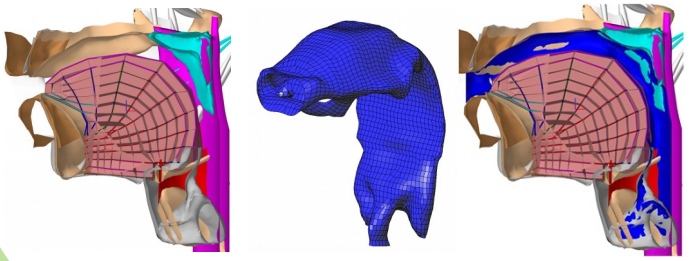


4. Upper Airway Modeling

2D cross-sections



From 2D cross-sections to 3D geometry



References

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Saeed Dabbaghchian
Email: saeedd@kth.se
Web: http://www.speech.kth.se/~saeedd/