

The background features a dark blue gradient with faint, light-colored technical diagrams. On the left side, there is a large circular scale with numerical markings from 140 to 260 in increments of 10. Several circular diagrams with arrows and dashed lines are scattered across the background, suggesting a technical or scientific theme.

Assignment #2: Poisson Surface Reconstruction

USTC, 2024 Spring

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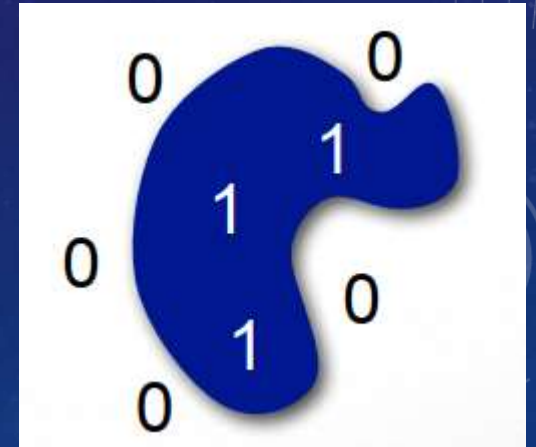
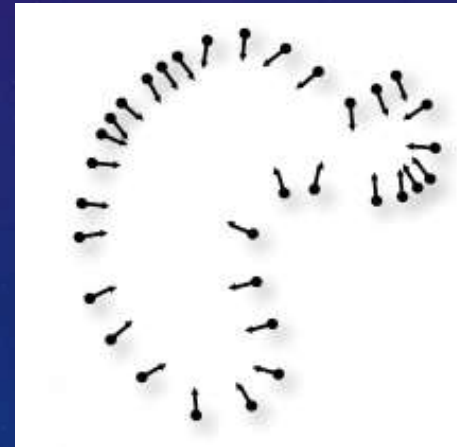
<https://qingfang1208.github.io/>

Indicator Function

- Reconstruct the surface by solving for the indicator function of the shape

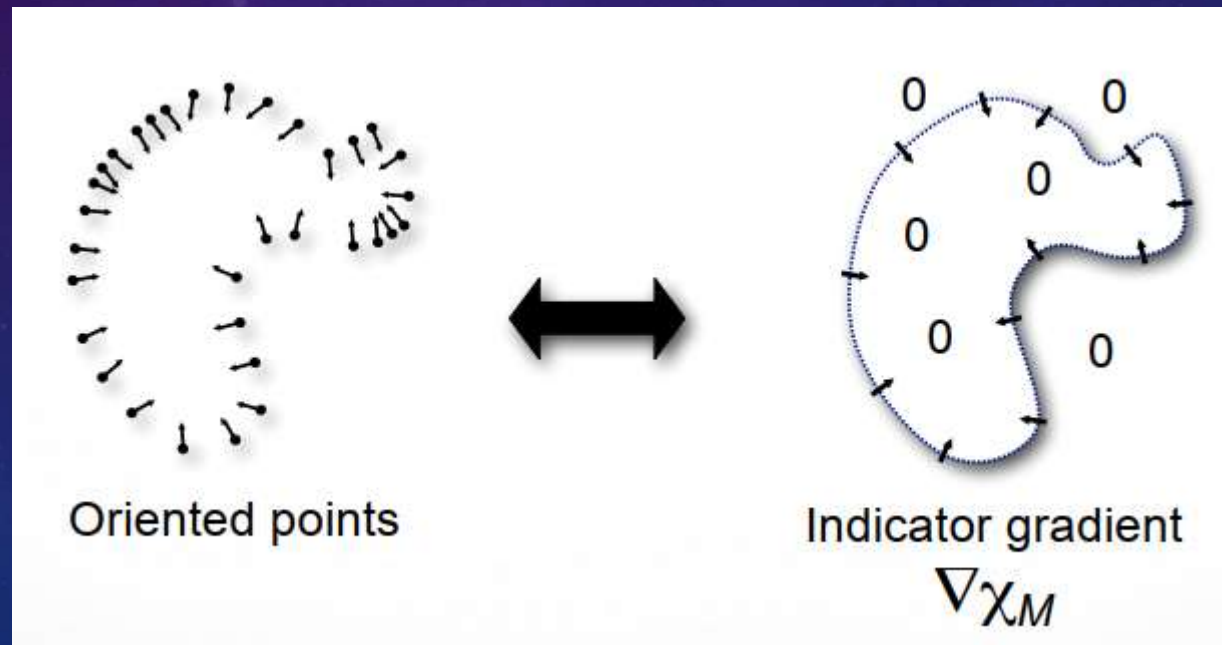
$$\chi_M(p) = \begin{cases} 1, & \text{if } p \in M \\ 0, & \text{if } p \notin M \end{cases}$$

- How to construct the indicator function?



Gradient Relationship

- There is a relationship between the normal field and gradient of indicator function



Integration as a Poisson Problem

- Represent the points by a vector field \vec{V}
- Find the function χ whose gradient best approximates \vec{V}

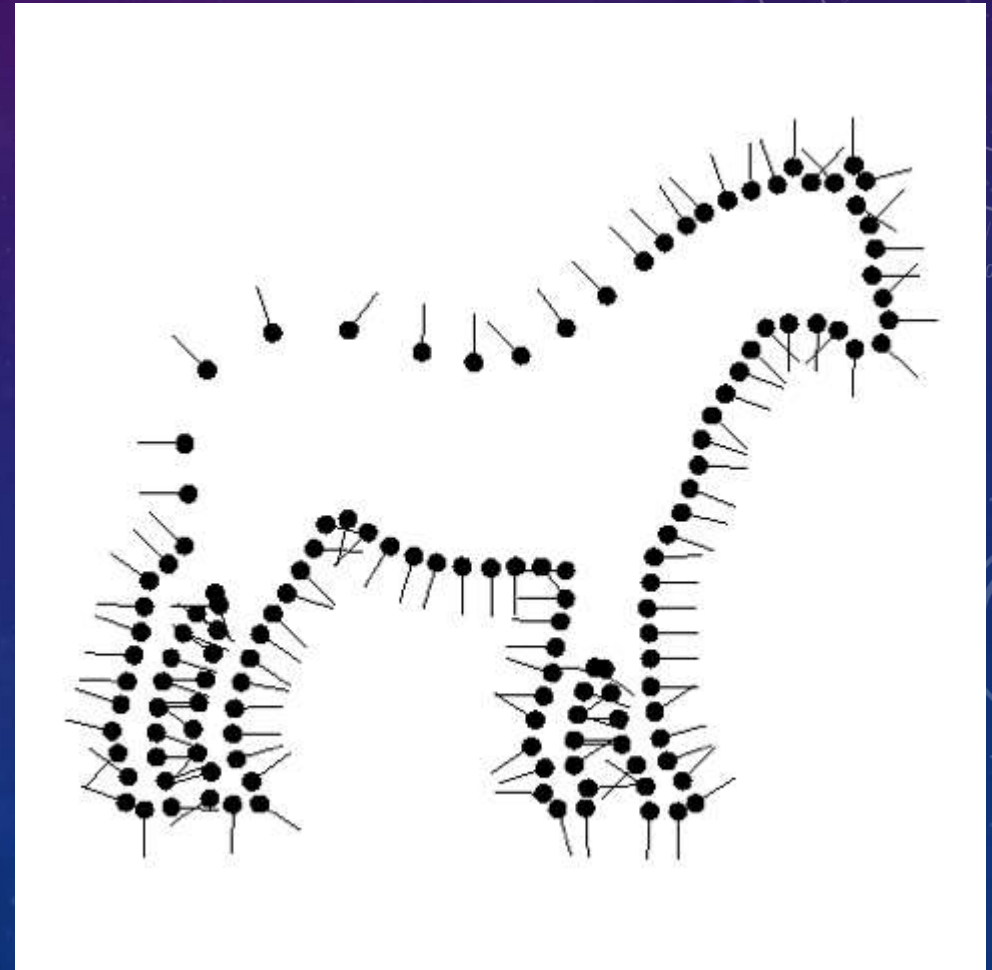
$$\min_{\chi} \|\nabla\chi - \vec{V}\|^2$$

- Applying the divergence operator, we can transform this into a Poisson problem

$$\nabla \cdot (\nabla\chi) = \nabla \cdot \vec{V} \implies \Delta\chi = \nabla \cdot \vec{V}$$

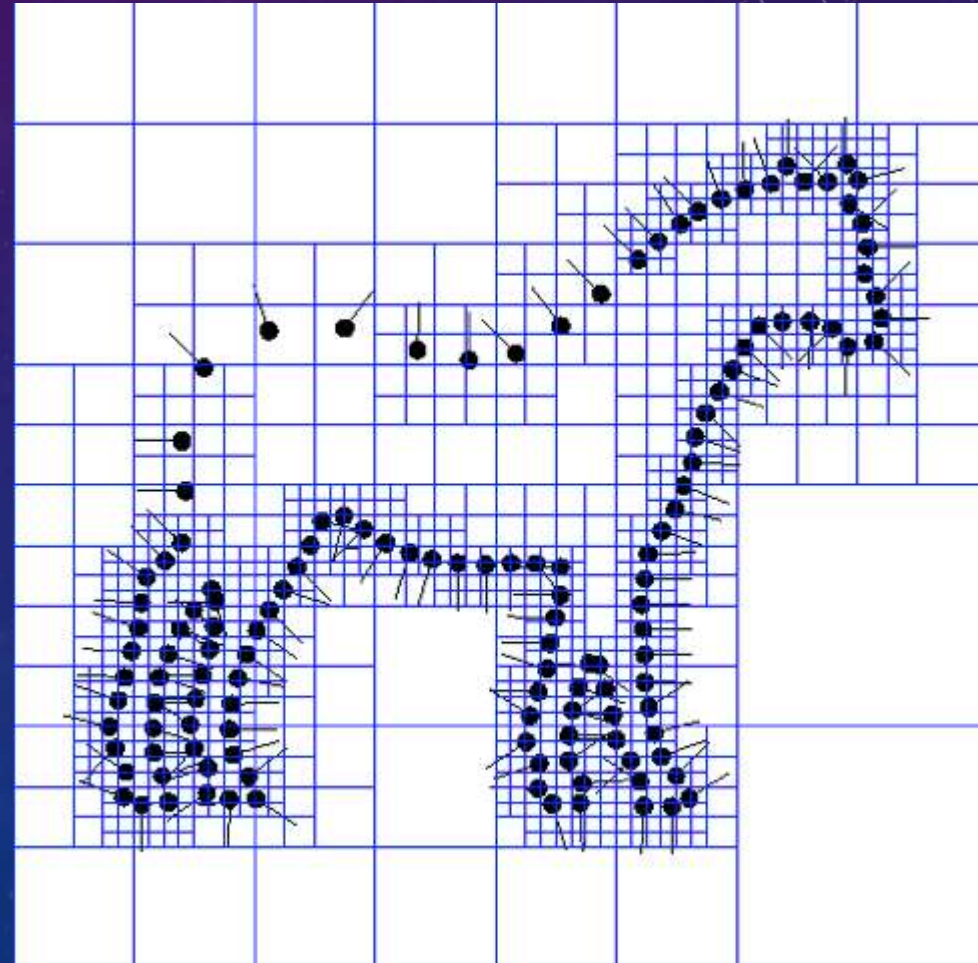
Implementation: Adaptive Octree

- Given the Points:
 - Set Octree
 - Compute vector field
 - Compute indicator function
 - Extract iso-surface



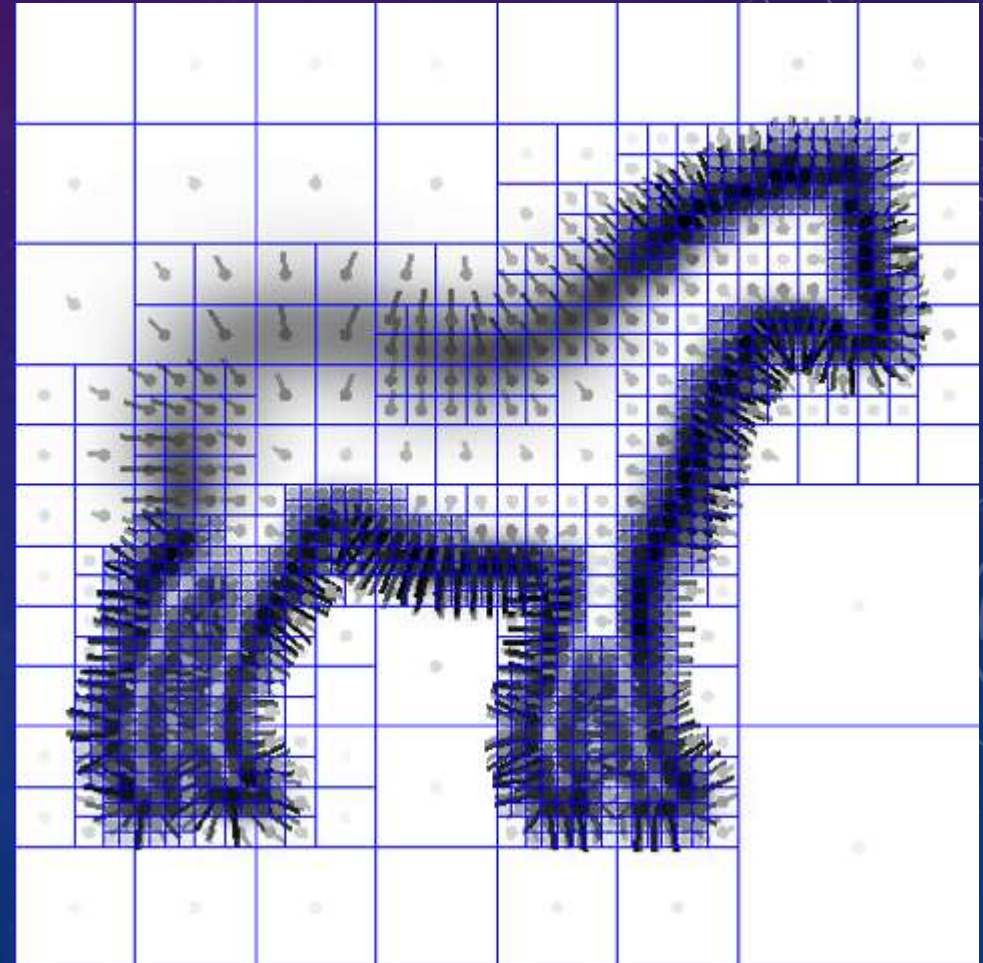
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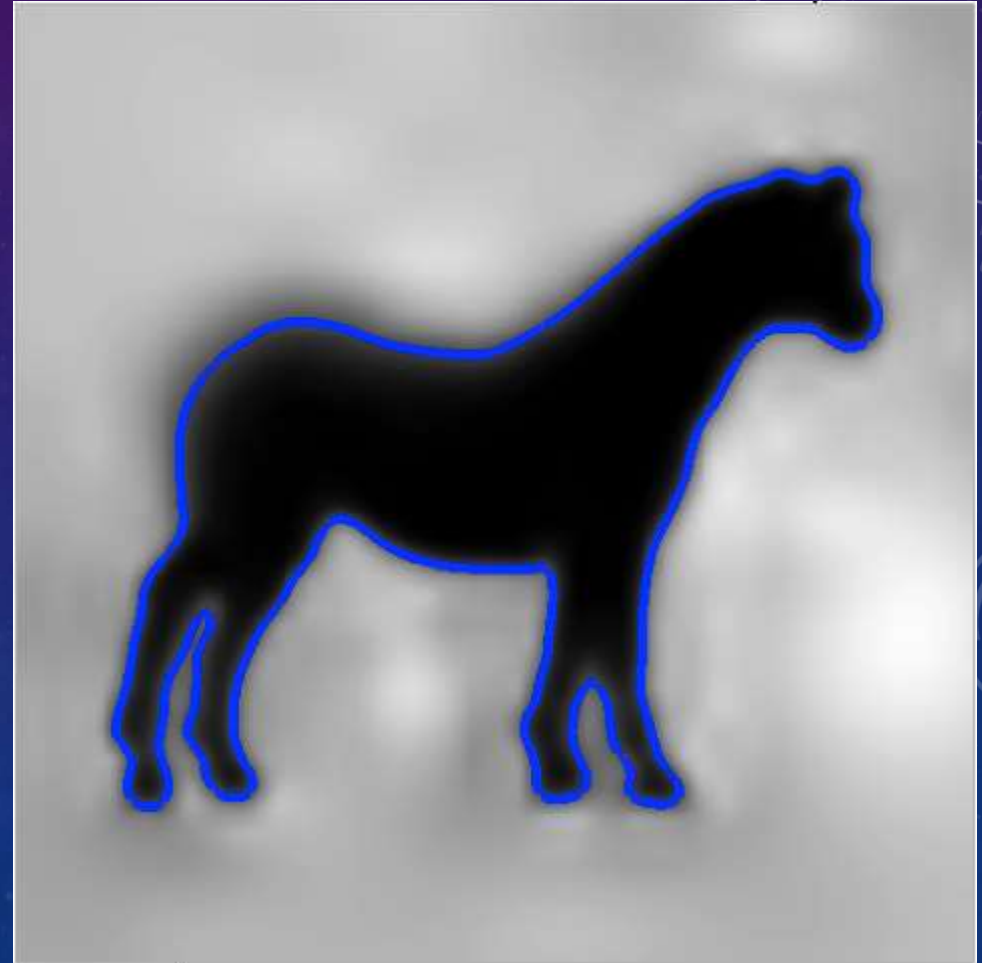
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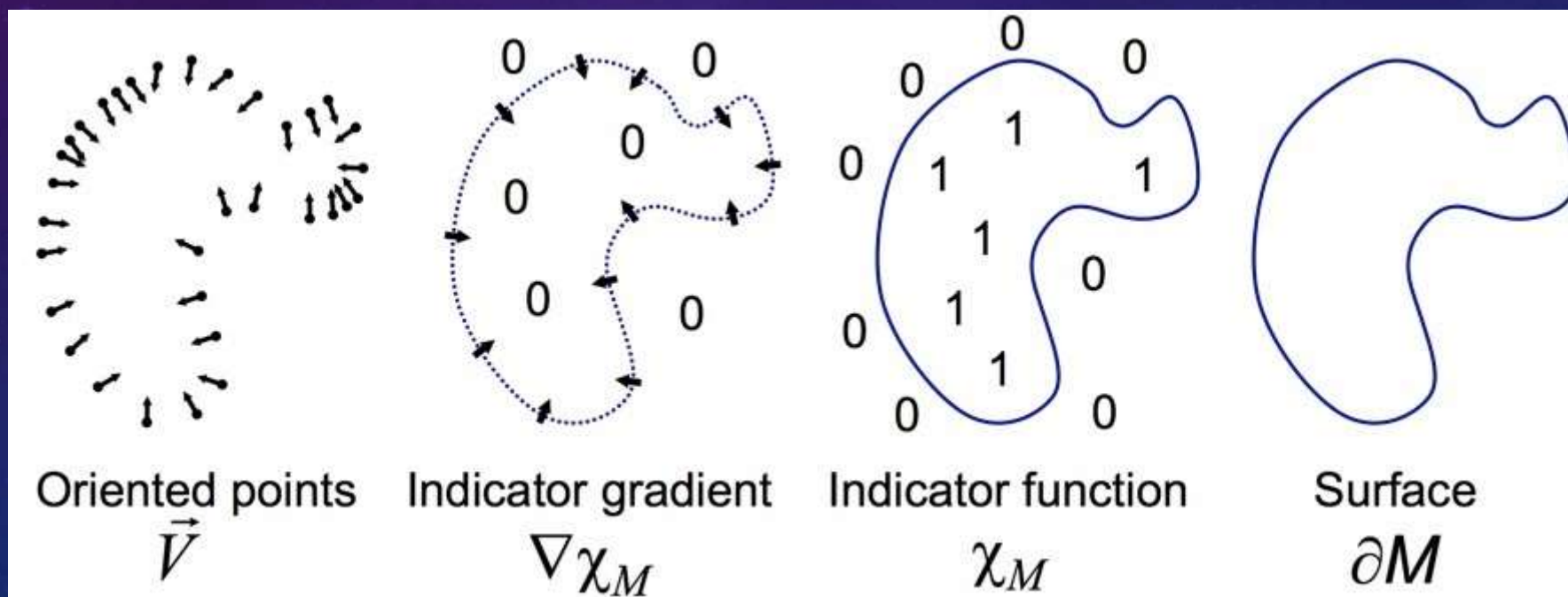
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Summary

- Paper: Kazhdan et al. 2006 [Poisson Surface Reconstruction](#)



Assignment requirements

- Email: ID_name_homework#2_(win or mac).zip
 - Pdf : Input + parameter + output
 - Source code (no exe)
- Deadline: 2024.03.24, 23:59