Assignment #4: Cubic Stylization

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https://qingfang1208.github.io/

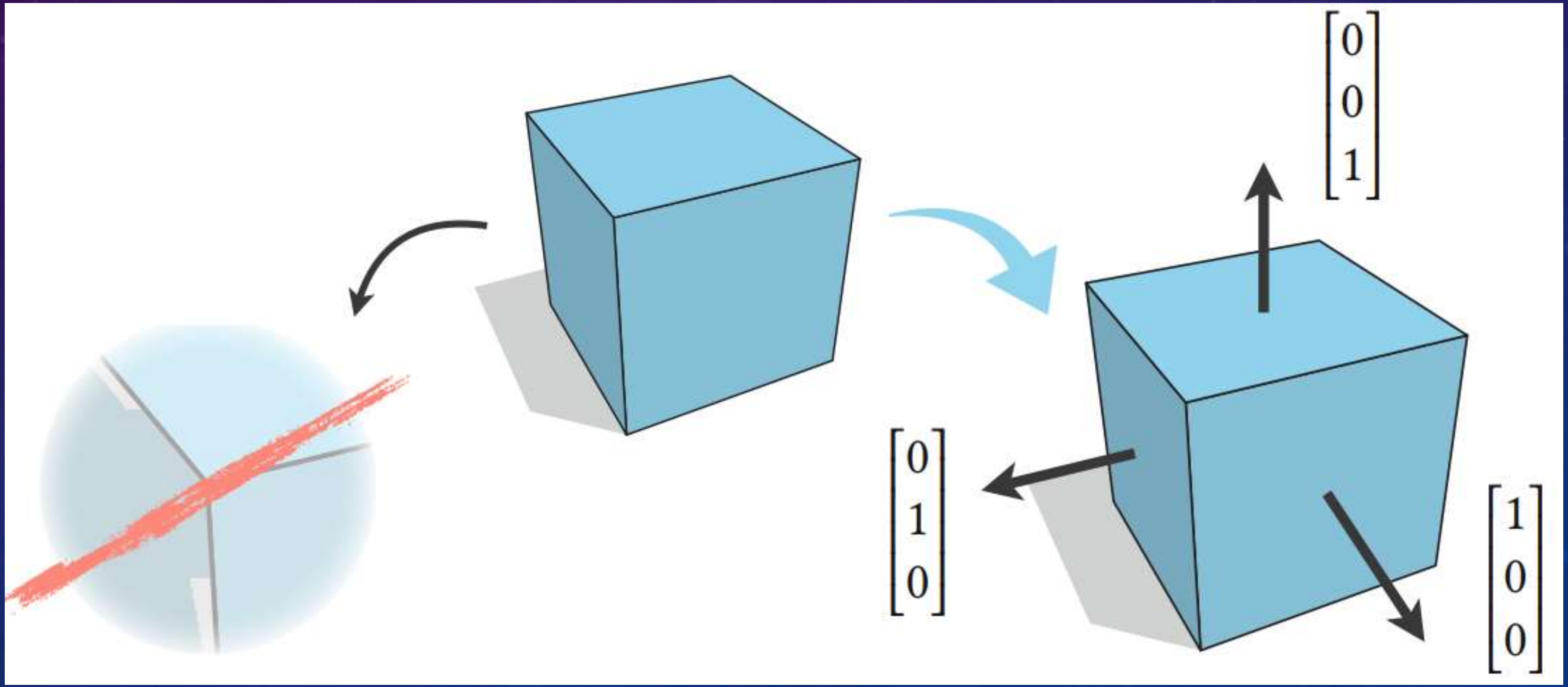
Cubic stylization

Cubic stylization

How to characterize a cube?

Cubic stylization

- Cubic geometry has axis-aligned surface normals



Cubic stylization

- Minimizing L1-norm

$$\|n\|_1 = |n_x| + |n_y|$$

Cubic stylization

- As-rigid-as-possible deformation

$$E(R,p') = \sum_i w_i \sum_{j\in\Omega(i)} w_{ij} \left\| (p_i' - p_j') - R_i(p_i - p_j) \right\|^2$$

- Vertex normal of deformed mesh $n_i' = R_i n_i$

$$E_{cubic} = \sum_i a_i \|R_i n_i\|_1$$

Cubic stylization

$$E(R, p') + \lambda E_{cubic}$$

Optimization

$$\sum_i w_i \sum_{j\in\Omega(i)} w_{ij} \left\|(p_i' - p_j') - R_i(p_i - p_j)\right\|^2 + \lambda \sum_i a_i \|z_i\|_1 , s.t.\, z_i - R_i n_i = 0$$

ADMM updates - penalty functions $\frac{\rho}{2}\|z_i - R_i n_i + u_i\|_2^2$

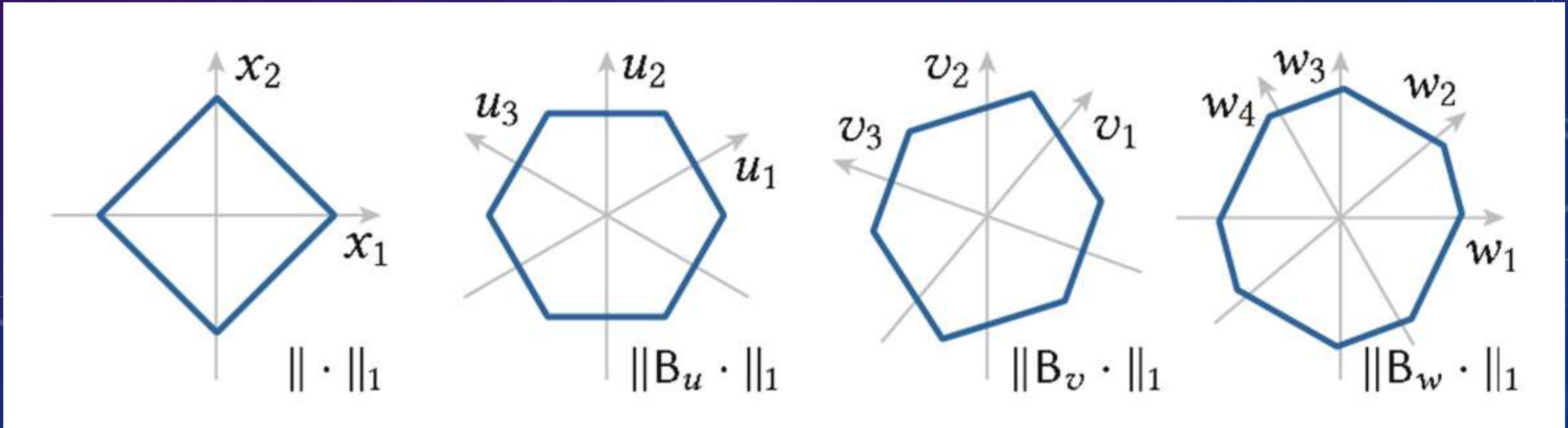
1. Local update R_i
2. Local update z_i
3. Update u_i and ρ

Orientation Dependent

Polygonal Boxes Stylization

Polygonal Boxes Stylization

$$\sum_i w_i \sum_{j \in \Omega(i)} w_{ij} \left\| (p'_i - p'_j) - R_i (p_i - p_j) \right\|^2 + \lambda \sum_i a_i \| B R_i n_i \|_1$$



Assignment requirements

- Cubic stylization algorithm
- Email: ID_name_homework#1.zip
  - Pdf : Input + parameter + output
  - Source code (no exe)
- Deadline: 2024.04.17, 23:59