AFRICAN MASTER'S FOR MACHINE INTELLIGENCE

AMMI AIMS-SENEGAL

COURSE: COMPUTER VISION/WEEK 2

REPORT: Lab 1 on Deform Source Mesh to Target Mesh

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April 13, 2022

PART A: 3D Operators

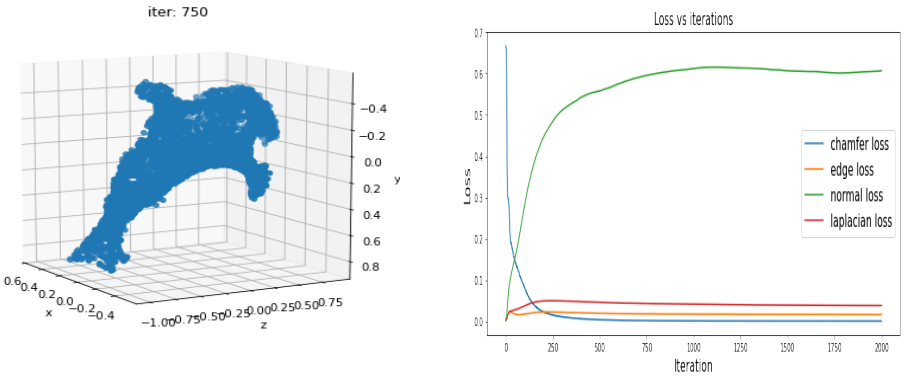
1. Describe what the purpose of each loss is in a couple of sentences per loss term.

   - *Chamfer Loss*: is a loss related to the shape. Is purpose is how to deform the mesh in order to get a shape that is very similar to the target shape. Its role is to bring the shape closer to the target shape (dolphin) at any cot.
   - *Edges Loss*: is used to minimize the length of each edge in the face.
   - *Normal Loss*: is used to force the normal of adjacent faces to be aligned thus penilizing large curvature changes.
   - *Laplacian Loss*: is used to maintain relative location between neighboring vertices during deformation. Laplacian loss also imposes smoothness constraints.

2. What happens if you set all loss weights to 0.0 except for the chamfer weight?

   When we set all regularizers to 0, it means we only optimize the *Chamfer loss*, we get a faster convergence rate. And we get a good quality of predictions (like a dolphin) just after 750 iterations whereas the surface of the predicted shape stays irregular (Not smooth).

   The predicted is not smooth because, one of the regularizer has high loss, and we know that when the regularizer has low loss it means during the training, the final shape finds its balance between approximating target shape (dolphin) and the smoothness.



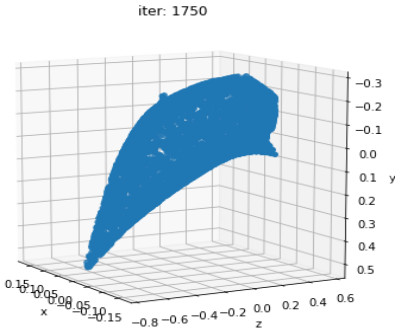
(a) Predicted shape about 750 iterations.

(b) Convergence rate

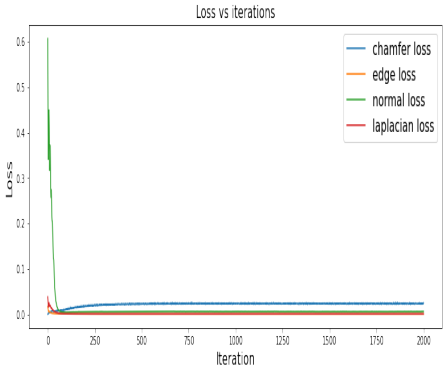
Figure 1: The

3. What happens if you set *w_edge* to 100.0? Discuss the quality of the predicted shape and the convergence rate.

   When *w_edge* = 100.0 the predicted shape is smooth but it didn't seem like a dolphin. There is not convergency.



(a) Predicted shape about 1750 iterations.

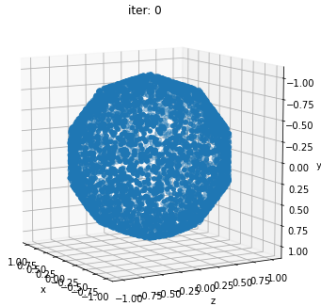


(b) No convergency

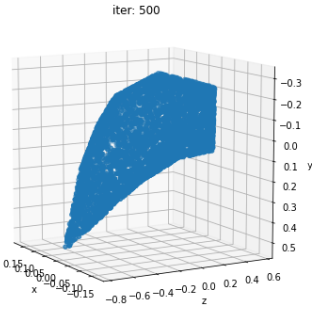
Figure 2: Visualizations of the training annotations

Part B: 3D Data Structures

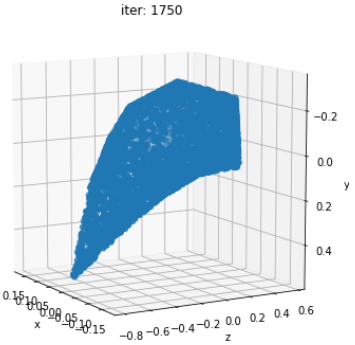
1. When the level of sphere is 4, the number of vertices and faces are respectively 2562 and 5120.
2. When the level of sphere is 1, the number of vertices and faces are respectively 42 and 80.



(a) Input shape.



(b) Predicted shape at 500th iteration



(c) Predicted shape at 500th iteration

(d) Faster convergence

The predicted shape doesn't look like a dolphin even after many iterations, as the figures 3b and 3c shown. This happen because the input shape is not sphere (just 42 vertices) 3a, so it cannot produce the dolphin at the end (dolphin is has a complex shape). Whereas the convergence is very fast.