Atlasnet: A Papier-Mâché Approach to Learning 3D Surface Generation

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http://imagine.enpc.fr/~groueixt/atlasnet/

**Motivation**

**Goal:** Generate directly a mesh with a neural network

**Previous work:** mainly generate voxels and points

**Challenges:**
1. How to generate a mesh with a neural network?
2. How to generate beyond a fixed set of points?

**Key Ideas**

Learn to generate points [1]

Learn a surface transformation

Learn an atlas

**Pipeline**

1. Latent shape representation
2. Generated 3D points
3. MLP
4. K generated 3D points
5. Ensembled 3D shape
6. Circuit Truth
7. Circuit Truth
8. Circuit Truth
9. Loss

**Advantages:**
- unlimited number of points can be sampled on the surface.
- natural UV parametrization
- theoretical guarantees:
  1. can approximate any surface
  2. locally a surface

**Results**

**Qualitative results**

Single-View Reconstruction

Image => 3D mesh

3D surface reconstruction

3D point cloud => 3D mesh

**Applications**

Optimising texture maps

Shape interpolation

**Follow up:** Shape correspondences from learnt template-based parametrization

**State of the art results on FAUST inter correspondences, available on ArXiv**

**Code and results in the project webpage**


**Ground Truth**

Poisson Surface Reconstruction

Ours

1 Sphere

25 squares

**Quantitative results**

Single-View Reconstruction

Quantitative Auto-encoder results

Quantitative Generalization results

**Code and results in the project webpage**

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