Tutorial on Geometry and Shape Analysis in Biological Sciences

8 - 9 June 2017, IMS Auditorium, NUS

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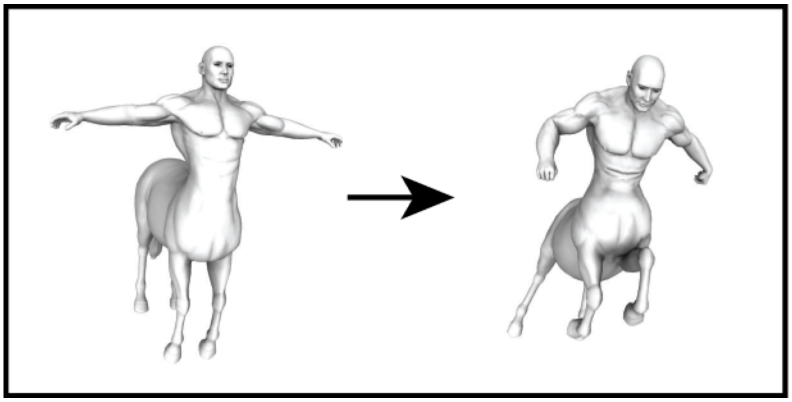
http://nook.cs.ucdavis.edu/~koehl/IMS2017/Tutorials/



Structural information on biological shapes can be obtained via a number of experimental techniques. However, it is the geometric and topological modeling that interprets and translates the data generated by those techniques into a meaningful model that enable their integration into physical models that shed new light on the mechanisms of life. In this series of tutorials, we will describe geometric and topological problems that arise in attempting to analyze biological data, and outline methods for solving those problems.

Tutorial 1: Geometry and Topology in Biology: *June 8, 10 am -12:30 pm*

In this tutorial, we will focus on the geometric description of biomolecules and on bones and their use in 3D morphometrics.

Tutorial 2: Biological shape descriptors: *June 8, 2 pm -4:30 pm*

The description of a shape increases in complexity as the object departs from regularity. The objective of most scientists is not necessarily to describe such shapes completely but to identify a small set of attributes of the shape that are information-rich with respect to the problem at hand. We will explore different options for defining such attributes.

Tutorial 3: Comparing biological shapes (1) *June 9, 10 am -12:30 pm*

In a chapter titled “The Comparison of Related Forms”, D’Arcy Thompson explored how differences in the forms of related animals can be described by means of simple mathematical transformations In this tutorial, we will cover several of those mathematical transformations, with the goal of defining a measure of similarity between two shapes.

Tutorial 4: Comparing biological shapes (2) *June 9, 2 pm -4:30 pm*

We will study the problem of defining a correspondence between two surfaces. Such a correspondence allows a mesh representing one of the surfaces to be transported to the second surface. We will describe approaches to this problem through circle packing and Ricci flow.