

# Custom Rigging System

Adam Mally

Advised by Norman I. Badler and Aline Normoyle

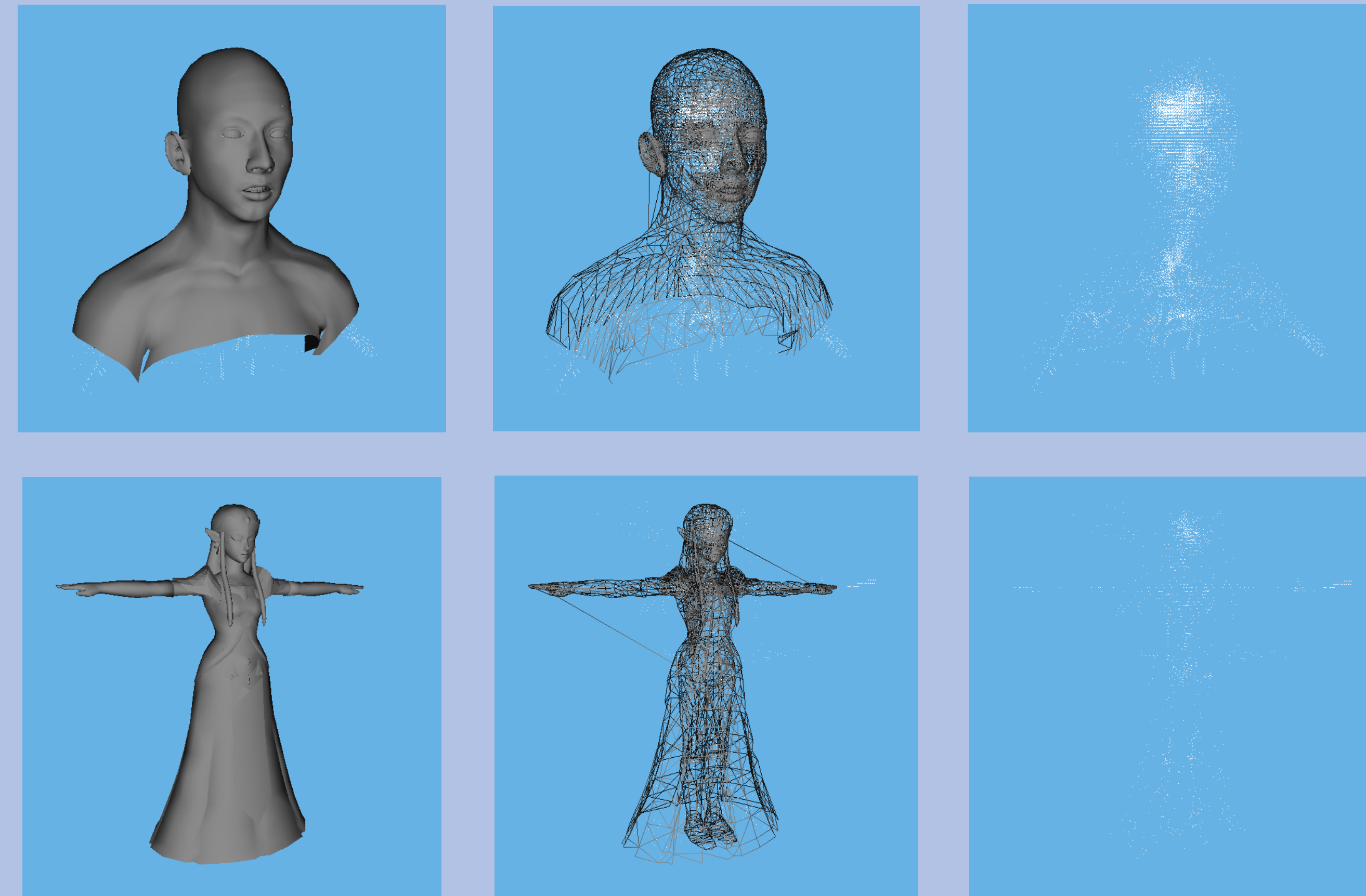
## Abstract

When preparing a character model for animation, it is most commonly rigged with a virtual skeleton to drive its motions. However, creating the skeleton and weighting the character's mesh to the skeleton is a tedious and difficult task. The goal of this rigging system is to automate the process of skeleton creation and skin weighting so less time can be dedicated to rigging characters and more time can be given to animating them.

## Goals

- Allow the user to import a character model and quickly rig it
- Remove the need for extensive user input while providing a usable character rig
- Quickly produce an automatically generated skeleton and skin binding

## Results

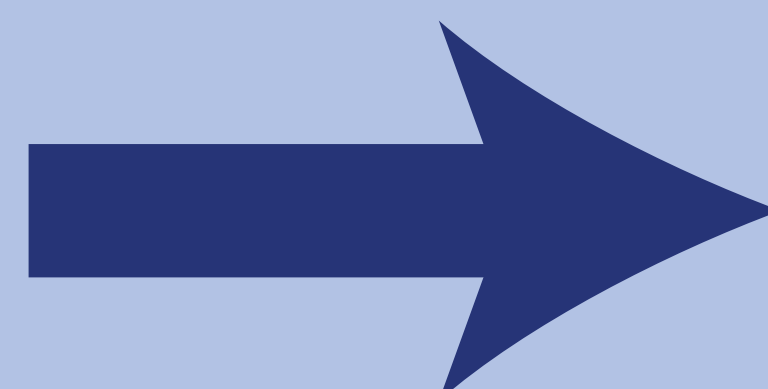


Polygonal meshes are imported by the user. During the import process, a KD tree is generated to speed the process of skeleton generation. After import, the user defines elbow and knee positions. A medial axis for the mesh is then computed. This is used to find appropriate positions for skeleton joints in the mesh, along with the user-defined joints.

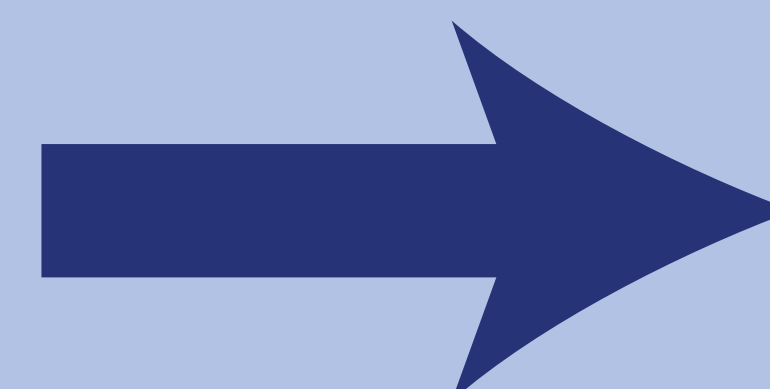
## Method for Skeleton Creation



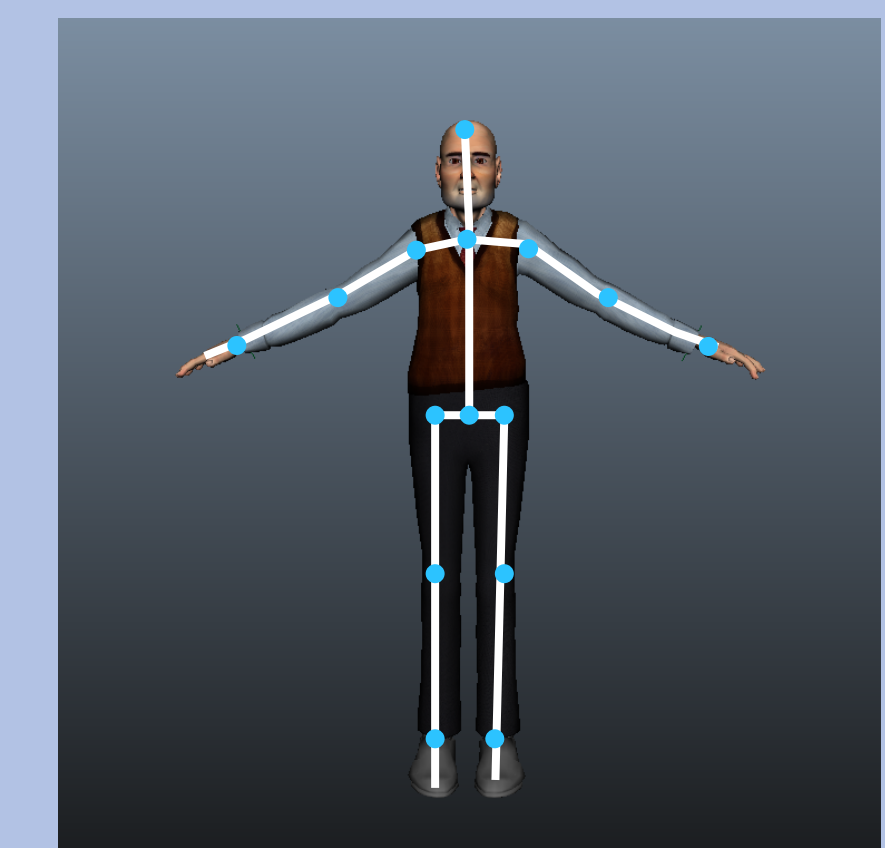
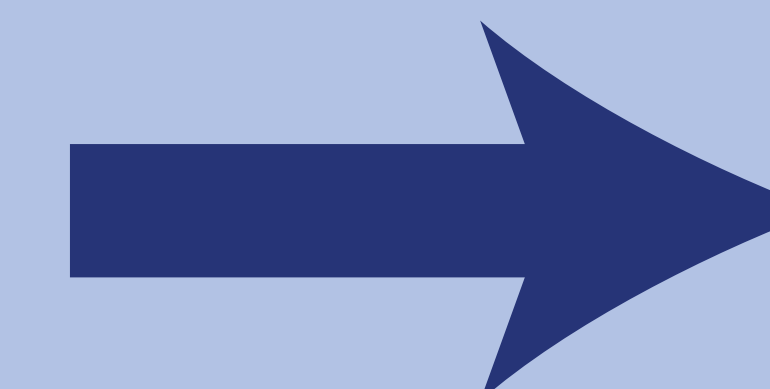
Compute the cubic bounding box of the mesh



Divide the bounding box into an  $i \times j \times k$  grid



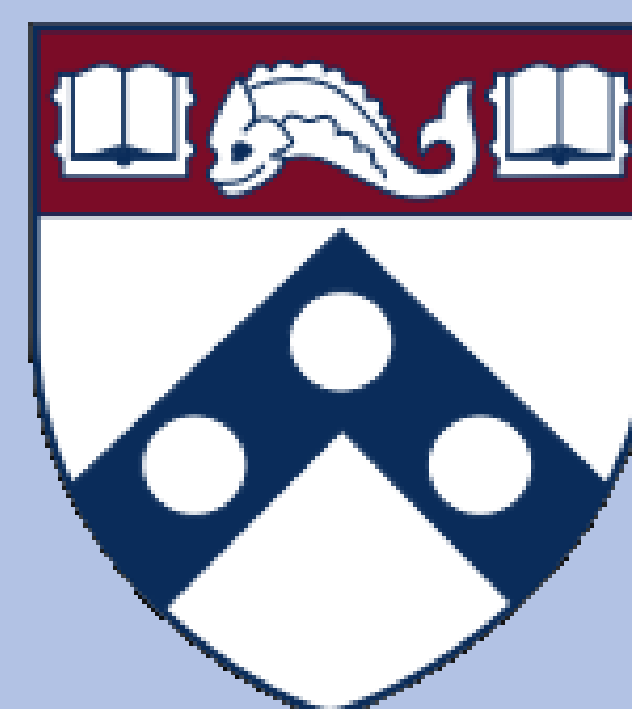
Compute the medial axis of the mesh by treating the faces as the loci of a 3D voronoi grid. The vertices of the voronoi diagram are the points of the medial axis. The grid cells are the places we compute the diagram.



Use the medial axis diagram as the basis for skeleton creation. Use user-defined points for mid-limb joint placement.

## Future Work

- Implement accurate automatic skin weighting
- Improve accuracy of skeleton generation system
- Increase efficiency of skeleton generation and skin weighting
- As an aesthetic touch, render model textures if available



Senior Project Poster Day 2013  
Department of Computer and Information Science  
University of Pennsylvania