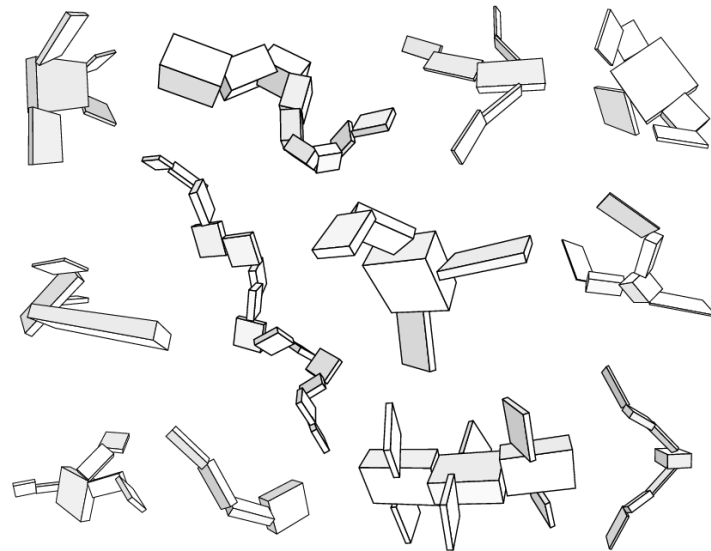


Assignment #02: Hierarchical Creatures

Due Date: 3rd March 2023

Coursework %: approximately 20%

The purpose of this assignment is to learn how Hierarchical animation and Inverse Kinematics work in practice.



Inspiration for creature design: Karl Sims' [Evolving Virtual Creatures](#) (SIGGRAPH 1994)

1. This assignment is strictly **individual** (no groupwork).
 - You are required to design and animate two hierarchical 3D creatures, using simple primitives such as blocks, spheres and cylinders. One creature can have a simple 3-bone (with two links) structure, with a 1-1 relationship between each parent-child. The second creature should be more complex, with at least 5 bones and at least one 1-many relationship (e.g., torso with two independent links).
 - You should animate the creatures using both forward and inverse kinematics (IK). Analytical solutions to IK are the most straightforward and can be used for the simple model. For the more complex creature, other approaches (CCD, Jacobian) should be investigated.
2. You will also be required to submit 3 separate files - your **pdf report, zipped code and youtube link** on Blackboard by midnight on March 3rd. See [Sample report](#) at end. Submissions must be on Blackboard as we will not be accepting submissions via email. Your submission should include:
 - i) A youtube link to a <2min video of your project running, showing clearly each of the required and advanced features, ideally with voice-over or captions (if we can't see it, we can't grade it).
 - ii) a pdf report with screen shots of the features and of code snippets
 - iii) A zip folder with your code (cpp and h files used). Please do not submit the entire Visual Studio project.
3. Be aware that submitting a project that was not created by you is considered **plagiarism** and will be reported as such. Please credit any resources you use in your report. Late submissions will not be accepted.

NOTE: Do not wait until the last minute to start this assignment. This assignment is **difficult** and will require some time to get the concepts and implementation correct. Be sure to attend labs and ask the demonstrator for help via the discussion board. If you fail to submit all items on time, you will be reported as absent and will receive a grade of 0%.

Requirements and Examination

Your application should be **written in C++ with shader-based OpenGL** and have the following features:

1. Animation** of your simple creature using:
 - i. forward kinematics, and
 - ii. IK with one of the following: Analytical solution, CCD, FABRIK or Jacobian(6 marks)
2. Animation** of your complex creature using:
 - i. forward kinematics, and
 - ii. IK with one of the following: CCD, FABRIK or Jacobian(14 marks)

**Animation details for both creatures:

- For forward kinematics, any kind of hierarchical motion is acceptable;
- For basic IK, e.g., reaching for a point that you move around on the screen;
- For advanced IK, e.g., scripting the motion of end effectors using splines or similar.
- Extra marks for quality of animation, natural movements, complexity of model, etc.

Note: The [approximate] marking scheme provided shows the maximum marks that can be obtained for each section if completed perfectly. Merely attempting a section does not imply the full score indicated.

CS7GV5 Report Example

Name:	
Student ID:	
Youtube link:	

Required feature: Simple 2-bone IK in 2D
<i>Screenshot(s) of feature:</i>
<i>Describe your implementation:</i>
<i>Code Snippet:</i>

Required feature: Multi-bone IK in 3D
<i>Screenshot(s) of feature:</i>
<i>Describe your implementation:</i>
<i>Code Snippet:</i>

Required feature: Scripted animation
<i>Screenshot(s) of feature:</i>
<i>Describe your implementation:</i>
<i>Code Snippet:</i>