Skeletal Animation Using Inverse Kinematics in the Unity Engine

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Contents

Chapter 1

Intro

Motive

In standard skeletal animation the skeleton is represented by a tree-like structure of transforms. Animation sequences are usually performed by updating the position and rotation attributes of these transforms starting from the root and propagating to the leaves. When applying inverse kinematics to skeletal animation, as the name suggests, the transforms are updated starting from a leaf and then back up the chain up to a selected node. This allows for a procedural approach to creating animation sequences which better reflect a realistic interaction between an animated object and its surroundings without the need to manually bake the sequence. Interactions such as a character pressing a sequence of buttons or pulling a lever are very well suited for the application of inverse kinematics. Adjusting a characters limbs to uneven terrain is another popular use for the technique. However, finding the proper parameter values for the skeletal transforms is not always a trivial task and may require advanced optimization methods. The purpose of this dissertation is to acquire a more in-depth understanding of the basic algorithms used in inverse kinematics, as well as discovering the built-in functionalities that the Unity engine offers which are geared towards such implementations.

Goal

Scope

Chapter 2

Problem Analysis

- Describe the problem
- Don't mention the solution
- Assume the reader has no knowledge of the subject. Describe the problem domain and only then proceed to describe the comp sci version of the problem

Chapter 3

Existing Solutions

3.1 Overview

3.2 Comparisons

- Consider the pros and cons

3.3 Optimizations

Chapter 4

Planned Solution

4.1 FABRIK algorithm overview

4.2 Advantages and Disadvantages

4.3 In-depth algorithm explanation

Chapter 5

Project Design

- Apply knowledge from IO

5.1 Project Structure

5.2 Implementation Strategy

5.3 Implementation Details

5.3.1 Scene Setup

5.3.2 Scripts

5.4 Additional Algorithm Modifications

5.5 Tests

Chapter 6

Technologies Used

- Description of used technologies, should be critical and indicate as to why the given technology was chosen
- Follow up with a more in depth explanation on the technologies and why they were chosen

6.1 Unity Engine

6.1.1 Scripting

6.1.2 Scene Hierarchy

6.1.3 Animation Rigging Package

- Implementation solutions
- Integration
- Tests
- User instructions

Chapter 7

Conclusion

- Conclusions - what was done
- Tie it back to the goals described at the beginning. "The goal was..." "... and these were the things that got done..."
- What didn't work out and potential improvements to be done in the future?
- Conclusion should be 1-2 pages

7.1 Sources