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# TEMAT: SKELETAL ANIMATION USING INVERSE KINEMATICS IN THE UNITY ENGINE

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# 1. Introduction

## 1.1 Motivation

Animation is the technique of displaying different positions of a character or object in rapid succession to create the illusion of movement. It is used in various forms of entertainment, such as movies and video games. In the latter, unlike in the former, the animation sequences are performed in real time and therefore impose additional constraints. Without the freedom to process a single frame for minutes or hours during the rendering of the scene, the animator must compromise on the quality and realism of the sequence in order to optimize for gameplay. Furthermore, the interactive nature of video games makes it impossible for the artist to create predefined animation sequences for every possible situation that may occur in the game. As a result, predefined animation sequences are often generic and do not allow the character or object to interact naturally with their surroundings.

Game developers have come up with many methods to improve the realism of animation in games such as playing cutscenes for critical interactions between a character and the world. However, this paper will focus on the use of procedural animation and, more specifically, the application of inverse kinematics to skeletal animations in video games.

## 1.2 Problem Formulation

Skeletal animation is a popular technique for animating character models in computer graphics. Animation sequences are preformed by manipulating a tree-like structure of interconnected bones, represented by transforms, to create the desired motion of the character. In standard skeletal animation, these manipulations are done starting from the root node to a leaf node. When applying inverse kinematics, they are instead done from the leaf node to a selected ancestral node. The technique calculates the joint angles required to achieve the desired position of the end effector. This dissertation's aim is to gain a better understanding of the basic algorithms used in inverse kinematics, as well as discover the built-in functionalities that the Unity engine offers for such implementation.

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