

## Animation Lab - articulated character animation via hierarchical modeling

### Goals

The goals for this lab are:

1. Read and understand a p5.js code example
2. Practice using hierarchical animation to animate an articulated character

### Modality

**Your choice, if you choose to work in a team, you must design a new creature.**

### Overview

In general, this lab focuses on articulated character animation and 'secondary action' from the 12 Principles of Animation. In general, objects do not move rigidly in the world, but most animals have skeletons that move in a way generalized as 'articulated character' animation. In addition, when a character is moving, other parts of the character's body will move as a consequence of that motion (think about your arms swinging back and forth as you run for example). The application of animating other parts of the character (such as a ducks neck as it walks) gives the character a more life like appearance.

In order to build the articulated character, we will use what is called 'hierarchical modeling' in order to model how the various joints of the character are connected together – **as opposed to modeling each joint individually with respect to the world - the joint should be modeled relative to another part of the character's body**. In general, some objects are more naturally modeled hierarchically. Think about a tree:

- The trunk starts out at the ground
- The large branches start out from the trunk
- The small branches start out from the large branches
- The leaves start out from the small branches

A person likewise can be modeled as such (i.e. you can think about your chest is rooted in your hips, and your upper arm is rooted in your chest and your lower arm is rooted to your upper arm, etc.) This is a fairly advanced modeling process that is supported in p5.js by the matrix stack. For today, we will just play with this concept, by adding onto an existing model or 'using' the existing hierarchy to model your own character.

## Details

**Tasks:** This lab involves adding to existing p5.js code. Please be sure to download the base code. This code is fully functioning as is and you should start by running the code to see what it does. To run the code click the mouse once. You will see that the duck moves across the screen and both flaps its wings and rotates its neck back and forth. You need to add legs and feet!

This is a two part lab. To complete this assignment, please:

- add code to draw and animate two legs on the duck which 'walk' as the duck moves across the screen (You will want to make sure that you place the joints for the legs of the duck in the correct place, such that the walk cycle looks correct). You can look at how the duck's neck is moving as an example of an articulated joint animating - you should model the legs very similarly. You may just attach feet to the bottom of the legs (they do not need to animate *but you must add feet as well as legs*).
- Now add variables to the animation to make the duck's beak move (open and close as if quacking) as it walks as a further 'secondary motion' to make the scene seem more life like (walking and talking).
- Add more to the scene to make it look like a more interesting world change the colors and add more context/scenery

I encourage you to consider looking for video as a reference for how a duck looks when it moves - feel free to exaggerate the motion to achieve the desired look and feel you want. Also please continue to play with this code and try to get it to look or behave significantly differently. If you are working as a team, you must re-write the animation to apply to a different creature.

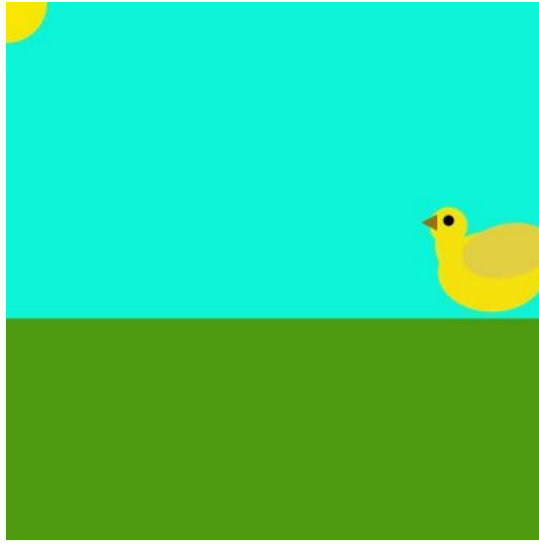


Figure 1: The program starts with a partial duck - it needs your help to build its legs to walk correctly. Then bring the duck to life by adding another secondary animation.

### **Grading:**

In order to receive credit for this lab, you must put your sketch on your website. For every lab, your score will be broken down 75% for meeting the technical requirements and 25% for aesthetics. In this case, the aesthetic judgement will be applied to the realism of the animation and added features.

- 30 points: add animated legs (with feet) that move while the duck walks
- 30 points: add beak movement (opening and closing)
- 20 points: scene additions to make a unique setting/story
- 25 points: sketch is interesting and marvelous (quality of the animation and scene)

### **Resources:**

Base code and principles of animation link:

[https://en.wikipedia.org/wiki/12\\_basic\\_principles\\_of\\_animation](https://en.wikipedia.org/wiki/12_basic_principles_of_animation)