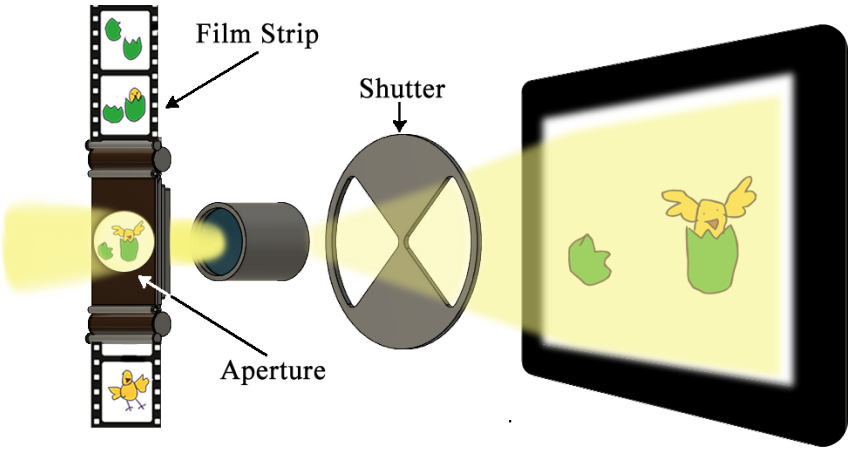
SIMULATING ANIMATION

One of the goals of the Animation Lab is to create a physical animation machine inspired by historical animation mechanisms. It can often be helpful to create a digital simulation before attempting to construct a physical device. A computer simulation makes it possible to explore the elements of a mechanism without the time and overhead required to fabricate a physical object.

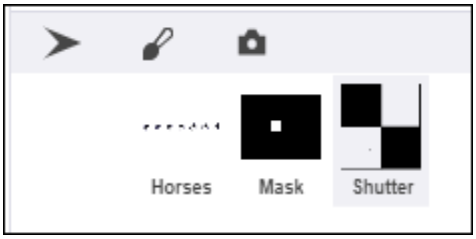
A film projector consists of three crucial elements: (1) a sequence of images on a film strip, (2) an aperture (i.e., an opening) through which a light passes to project the image, and (3) a rotating shutter that blocks the light while the image is advanced to the next frame.



A computer simulation with these elements can be accessed through the link below:

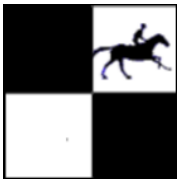
Computer Simulation

The sprite corral below the Snap*!* stage depicts sprites that represent each of the three elements.

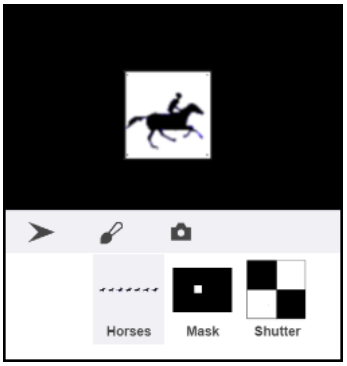


The costume of the first sprite consists of the sequence of photographs captured by Muybridge at Leland Stanford's Palo Alto Horse Farm in 1873.

A second sprite serves as a shutter. A black square rotates into place to cover the image while the film strip advances. After the film strip is advanced, the shutter rotates again to reveal the next image in the sequence.



A third sprite serves as a mask to create an aperture through which the image is viewed.



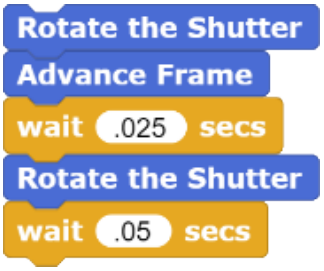
A physical film strip consists of a series of frames with an image in each frame. Perforations in the border of the film strip are used by sprockets to put the film forward one frame at a time.

In Snap!, the **Change X** code block can be used to change the horizontal position of the strip of images to advance it. A code block to advance the strip by one frame would look like this.

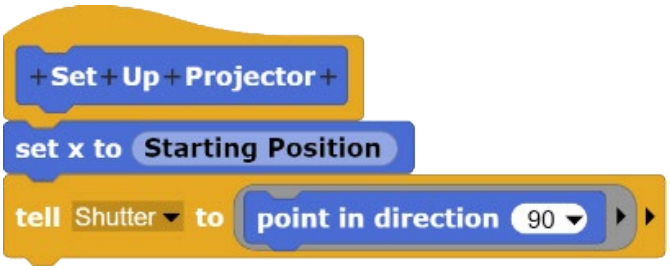
In this example, the width of one frame is 71 pixels. A reporter block can be created to report this value, which is then used by the **Advance Frame** block.

In a physical film projector, each time the film is advanced by one frame, the shutter is rotated into place to block the light as the film moves. A similar action can be created in Snap*!*.

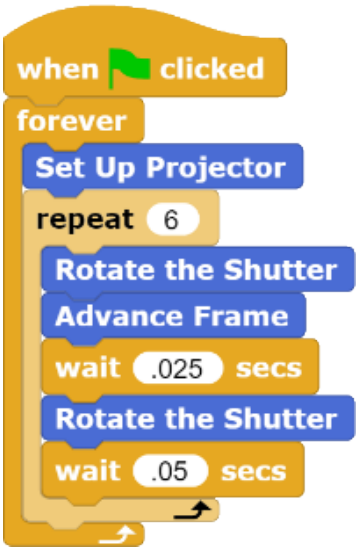
This provides all of the functions needed to play the film. The shutter is rotated into place to block the image as the frame is advanced. In a physical projector, this takes a discrete amount of time. In the program, a **Wait** of 0.025 seconds is inserted to simulate this delay. The shutter is than rotated a second time to reveal the image. The image remains in place for 0.05 seconds.



In a physical film presentation, the film must be loaded into the projector before beginning. In the simulation, the Set X block is used to place the film strip in its starting position. The shutter is also pointed in a direction of 90 degrees so that it is in a known state when the film begins.



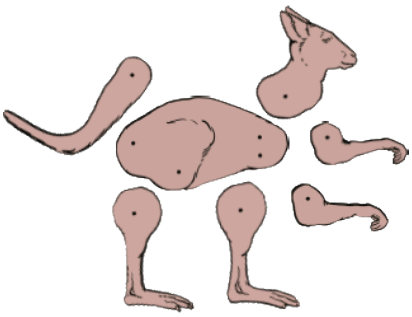
The complete film projection sequence can now be created. The film strip is advanced six times. At that point the end of the film strip is reached, and the film strip is reset to the beginning.



Try changing the delay of 0.05 seconds to a different value. What is the effect of changing the amount of time that each frame is displayed?

Creating an Animation

An animation method known as stop motion photography is a technique that was used to create animations. This method consisted of placing an object in one position, taking a photograph, adjusting the position of the object, and repeating. The parts of a kangaroo were used to create an animation in this example.



The kangaroo is one of many objects in a book, *Jointed Toy Patterns for Coloring, Cut Out, and Construction Work* written by Bess Bruce Cleveland. A digital copy of the book is available here:

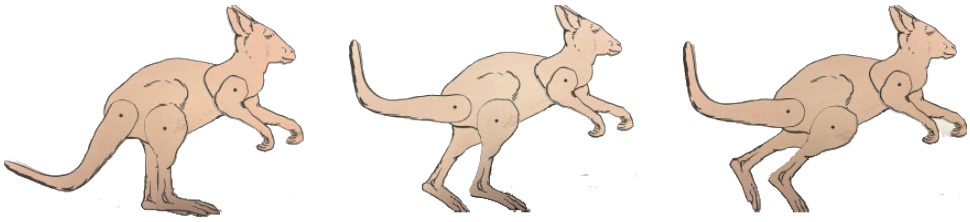
https://www.dropbox.com/s/orz400p7bxndn8q/Jointed-Toy-Patterns-Book.pdf

Files with the several of the animals that can be cut out by hand or with a digital die cutter such as a Silhouette or a Cricket are available here:

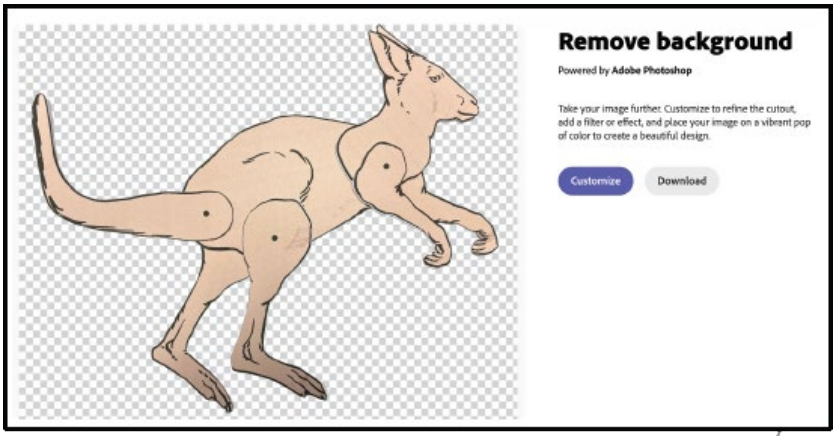
https://www.dropbox.com/sh/ydmyd6sndy8bggb/AABGqfms2LK_webSXExQWt_Ra

Cut out each part of the animal separately and then arrange them on a flat surface.

Creation of three separate frames is sufficient to create a convincing illusion of motion. To create these frames, assemble the kangaroo parts into three sequential poses and photograph each pose.



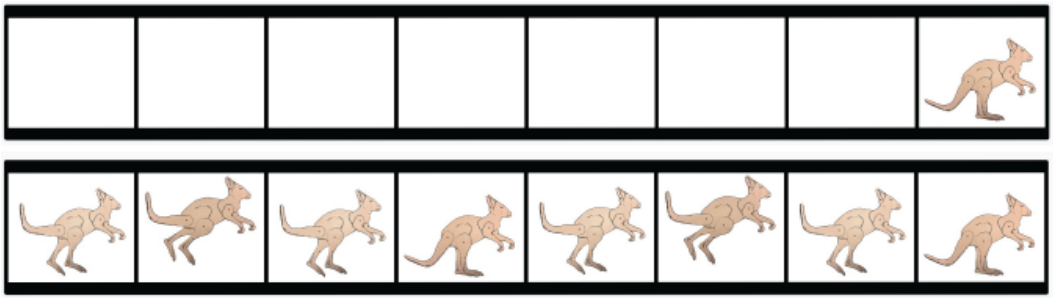
Once a photograph is taken of each pose, the background should be removed to isolate the animal. There are a number of image tools that can be used do this. Adobe Express is a free application with a good background removal tool.



Once a sequence of images has been created, a template in Google Slides can be used to organize the images in a strip:

https://bit.ly/AnimationStripCreation

Drag your animation images into Google Slides. Drag and resize your images to make them fit inside the borders of each box on the strip. Repeat the images to create the animation strip.

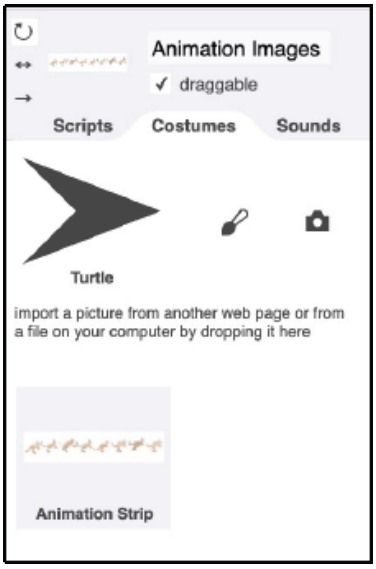


Go to *File* → *Download* → and save your strip as a *Scalable Vector Graphic* (SVG).

Open the Snap*! Animation Simulation* program again:

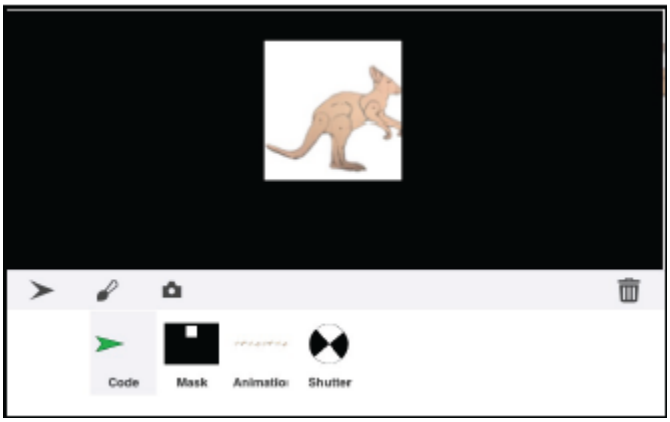
Animation Simulation

Select the *Costume Tab* in Snap*!* and drag the SVG image with the strip of animated sequences into Snap*!*



You may have to use the **Set Size** block (found under the *Looks* palette) to resize the animation strip.

The image furthest to the right on the strip should fit inside the window that represents the projection aperture.



The **Hide Sprite** block will allow you to hide the *Mask*, *Animation Images*, and *Shutter* sprites.

The **Show Sprite** block will allow you to show the *Mask*, *Animation Images*, and *Shutter* sprites.

The **Reset Sprites** block will reorder the *Mask*, *Animation Images*, and *Shutter* sprites and display them in the correct order.

Click the *Green Flag* to start the simulation.