# Quick Start Guide

Breakdown

This library allows a user to map an animation to a LocoNet train decoder functions 0 through 8 (inclusive). An animation is a branching set of consecutive tasks. Said tasks either control PWM driver and pin output behaviour, or simply act as a delay between the two. From the top-down perspective, animations can be divided into animation chains and animation nodes.
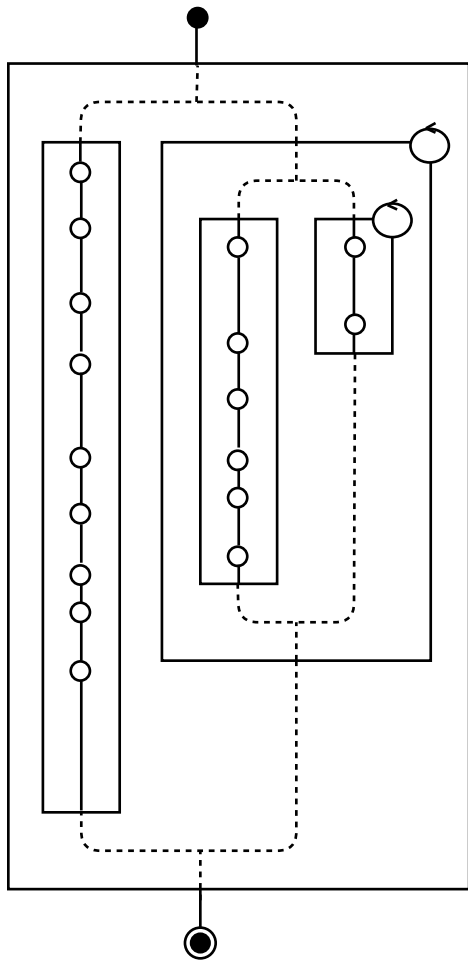
Animations
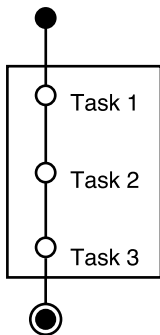
Animation Chain

An animation chain controls a set of tasks added by the user. When an animation chain runs, it runs Task 1, then Task 2, then Task 3. In an animation chain, a task will not start running until the task before it has finished running. Tasks are mapped to the animation in the same order they are added. It's also possible to store other animations in animation chains.
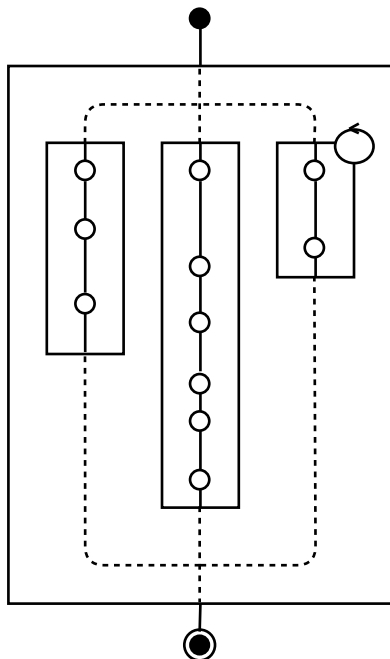
Animation Node

An animation node allows multiple animations to run in parallel. While all the animations in a node will start at the same time, they will usually not end at the same time, due to their differences in length. The first two chains are specified as non-repeatable (non-loopable in code), meaning that they run only once, and wait. The third chain is set to be repeatable (indicated by the loop in the top right corner, and named 'loopable' in code), meaning that when the the chain finishes running, it will restart from the beginning if at least one non-repeatable animation in the node is still running. This means that repeatable animations will be the last to finish, as they need to wait for all non-repeatable animations to finish beforehand. When all the non-repeatable and repeatable animations have stopped running, the node finishes running.

It is even possible to have animation node within other animation nodes, and make them repeatable.

Using such a node based system allows a user to create complex animations from simple components.

Runnable Tasks

There are three types of tasks:

PWM Task - A task that runs a PWM handler, a.k.a. device (see PWM Handler below) from its last position to a new one at a given speed (any number from 0 to infinity). The speed is directly proportional to the step size at which the task approaches the target position. A newly initialized device's initial last position is set to 0 by default. If you want to change your servo's initial position, add a PWM task that sets it to the position at a speed at least as great as the position value - this will cause the device to go straight to the position instantly.

Delay Task - A task that waits for a certain amount of time before running the following task.

Pin Task - A task that changes a pin's value to high or low.

PWM Handlers

PWM handlers manage PWM values based on the given device. Each device has a hard-coded minimum and maximum PWM value for mechanical safety, as well as an user specified offset where necessary. PWM commands passed to the handlers are added with the base value and offset value before passing them to the Adafruit PWM driver. If the corrected value is greater than the max value, the PWM value is simply set to the max value.

There are three types of PWM Handlers for three different devices:

Servo Handler: handles SG90 servo positions; declared with a pin number, offset, and driver; use PWM values from 0 to 500

Rotational Servo Handler: handles SG90 servo speeds; declared with a pin number and driver; use PWM values from 0 to 4096; stops at 2096

LED Handler - handles LED brightness; declared with a pin number and driver; use PWM values from 0 to 4096; fully on at 4096; counter clockwise from to ; clockwise from to

If larger values are used as a target, they will be ignored, and the servo will be set to its maximum position.

LocoNet Interface

The LocoNet Interface is used for mapping animations and pin inputs to LocoNet train decoder functions. It handles connecting to LocoNet automatically, and will show up as a throttle on the system. This library only supports mapping to the first 9 decoder functions (0 through 8) due to the implemented LocoNet library limitations. Additionally, it allows you to disable all PWM outputs by switching the direction to reverse. Attempting to use the other functions or changing the speed will do nothing.

Additional Notes on Use

The LocoNet library and Adafruit PWM Servo Driver library need to be imported separately in order for this library to work.

It is advised to avoid mapping the same animation to two functions.

It is advised to avoid running two animations that use the same pin outputs.

Pin input is picked up on high.

If more complex animations have strange errors and refuse to load, use the freeMemory() from the MemoryFree library to find out how much free memory the device has by the end of the setup.

Uncomment the print statements in the library to get visual output. Arduino libraries are found under "Documents\Arduino\libraries" by default.