Technical Specification

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**Related documents**

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# INTRODUCTION

## Objectives

The purpose of this document is to outline the technical specifications for the Wavetable Synthesis library to be used on the Teensy 3.2 microcontroller. It is primarily meant as a guide for the developers of the library and will cover the following areas:

* Definitions of all objects within the library along with their interfaces.
* Interactions with the existing Audiostream.h library API.

## Scope

The purpose of this project is to provide a C++ library and accompanying Python utility scripts allowing realistic instrumentation audio to be synthesized on the Teensy 3.2 Arduino Digital Analog Converter (DAC). This library will be exposed to developers, and will allow pitch shifting, looping, tremolo, and vibrato effects to be imposed on a raw byte buffer of recorded samples.

# Functionality

## Soundfont Decoding

The basic functionality of the SoundFont Decoding script is defined in the Wavetable Synthesis on Microcontroller Requirements document (Section #). A brief summary is provided here.

* User executes the script in a console
* User loads a .sf2 file into the utility by passing it’s location to the script
* If the .sf2 adheres to pre-defined limitations for what the Wavetable Library accepts, then allow the user to select which instrument to import
* Parse samples into logical units
* Output the resulting samples into C++ arrays within a .cpp file for use within the Wavetable Synthesis Library

## Wavetable Synthesis Library

The basic functionality of the Wavetable Synthesis Library is defined in the Wavetable Synthesis on Microcontroller Requirements document (Section #). A brief summary is provided here.

* Load audio data from the file produced by SF2 extraction process
* Play silence in the event of read error
* Create interpolated audio data on the Teensy
* An audio sample’s sustain data can be looped
* Audio data can be modified with a tremolo effect
* Audio data can be modified with a vibrato effect

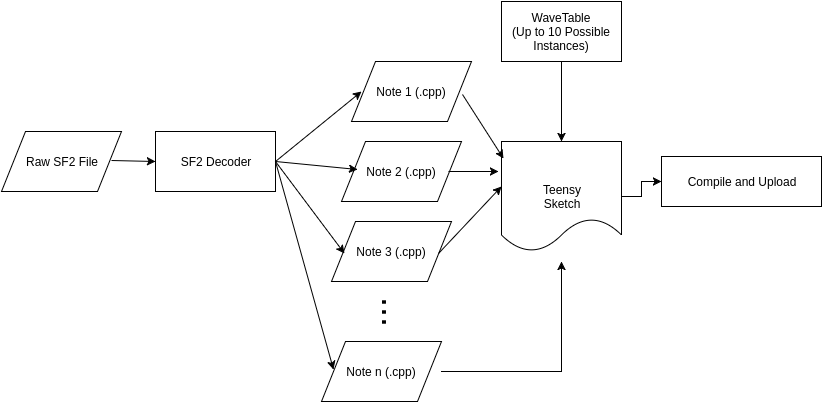
# Architecture

## Architecture Overview

**SoundFont Decoding:**



**Teensy C++ Library:**



## Application Interfaces

*A description of all the application interfaces.*

**Python SF2 Decoding**

*-Teensy C++ Library*

# Design

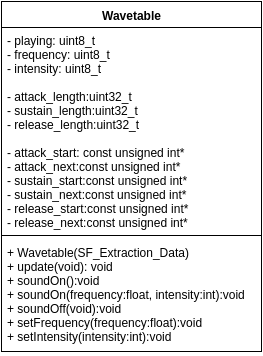
## Class Diagram

**Soundfont Decoding:**

The SoundFont decoding script will be contained within a single Python class. An open source library, “

**Teensy C++ Library:**

The Wavetable Synthesis library consists of one primary class called Wavetable. A class diagram that lists the fields and methods of this class is given below. This is followed by a brief description of each element within the diagram.



# CODE

## File Names and Structure

This section lists the name, purpose and structure of all expected files for this project.

**SoundFont Decoding Utility**

File: SF2Decode.py

Purpose: Main Python script file which the user will actually interact with to decode samples from a soundfont file.

Structure:

**Teensy C++ Library**

File: Wavetable.h

Purpose:

Structure:

File: Wavetable.cpp

Purpose:

Structure:

## Executable File Names and Structure

*The purpose names and structure of all the executable files*

*-Python SF2 Decoding*

*->*

*-Teensy C++ Library*