**General Purpose I/O Project:**

**Slide Whistle**

**Issue 1.0**

# Overview

For this project you will create a device which makes sounds through a speaker based on how the user presses several switches.

# Details

## Hardware



Figure 1. Schematic diagram

Use three momentary switches SW1-SW3 (or one multi-way switch) to control the device. Drive a speaker SP1 from a GPIO output (labeled Audio) using capacitor C1 to block DC current. Resistor R1 is optional and reduces the volume of the sound.

## Software

Write code in C to do the following:

* The tone should sound while SW2 is pressed down.
* The frequency of the tone should rise while SW1 is pressed.
* The frequency of the tone should fall while SW3 is pressed.

The following software design is suggested:

* Create an initialization function which configures GPIO inputs and outputs based on which pins to which you’ve wired your switches and speaker.
* Create and calibrate a delay-loop function Delay\_us(unsigned int time\_del) which creates a delay of **approximately** “time\_del” microseconds. Tune your delay loop through experimentation and an oscilloscope or logic analyzer. Large amounts of error should be acceptable for this project.
* Create a function Play\_Tone(unsigned int period, unsigned int duration) which generates a square wave with the given period (specified in microseconds) and duration (milliseconds). This can be done by toggling the audio output pin, waiting for a time delay, and repeating this process. Calculate the necessary time\_del value to pass to Delay\_us based on period (inverse of frequency). Calculate the number of times to toggle the output based on period and duration.
* Create a function Slide\_Whistle(void) to repeatedly check to see if any switches are pressed and respond accordingly.
  + If SW1 or SW3 is pressed, adjust the period accordingly. Limit the value of period to within 100 microseconds and 10,000 microseconds.
  + If SW2 is pressed, call Play\_Tone() with the current period and a duration of your choice.
  + The processor executes this loop very quickly if SW2 is not pressed, so the value of period will quickly reach the upper or lower limit if SW1 or SW3 is pressed. To slow the code down, call Delay\_us (e.g. for 1000 microseconds).