arm Education

Embedded Systems Essentials with Arm: Getting Started

Module 5

SV4 (5): Exercise

Now let's start looking at the exercise. For this lab, you will be using the Mbed simulator, a simulation of a microcontroller and hardware peripherals.

Here you can see a diagram mapping out the design of the simulated microcontroller. The pin descriptions can also be seen.

As previously mentioned, in this lab we will be utilizing analog I/O to generate electrical waves which can be turned into sound by a speaker. Be aware, that the frequency of the wave must be within a specific range so that humans can hear it! The volume and the pitch will be tunable via potentiometers.

We will also utilize pulse-width modulation, but don't worry about this too much as we will cover it in more detail in the next module!

Begin by opening up the simulator and loading the "Module 5 – Skeleton" lab demo.

We will now go through the code required for completing this project.

To build upon the skeleton code, you must first define your analog inputs, as well as the PWM outputs.

We define a PwmOut object which will be our speaker. We also define two AnalogIn objects which we be our potentiometers. These are assigned to the pins specified in the diagram.

The next thing to do is populate the main function. We start with some variables that will be used to store the current value of the potentiometers.

After this, we create a 'while loop'. In this loop the first thing we will do is use the previously defined variables to read the value the user has input through the potentiometers. One potentiometer is for the pitch, and the other is for the volume.

Then we create a 'for loop' which will generate a saw-tooth sound wave. You can try out different values to see the results for yourself, but in this case these are the values we are using. We use the PWM period function to set the PWM period and also use the equals assign operator to assign a value to the speaker.

Then afterwards we use the 'wait ms' command.

With the code written, you can now add the relevant components and try running the code! Remember to adjust the potentiometers to alter the sound.