Audio Volume Control

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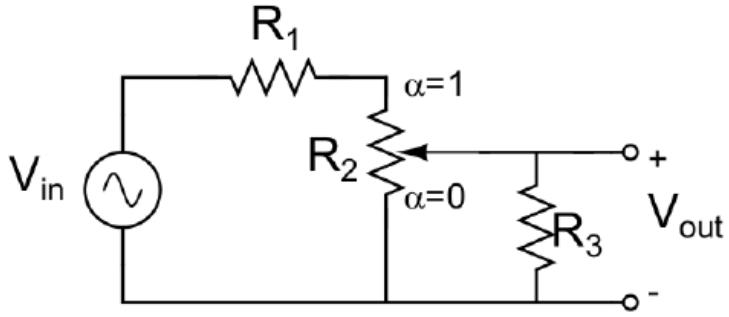
Introduction:

We built a volume control circuit for audio applications.

Design/measurements:

The circuit design was provided. The main principle of operation is that the circuit acts as a voltage divider. When we turn the knob, the voltage output will increase or decrease, hence the volume of the song will do the same.

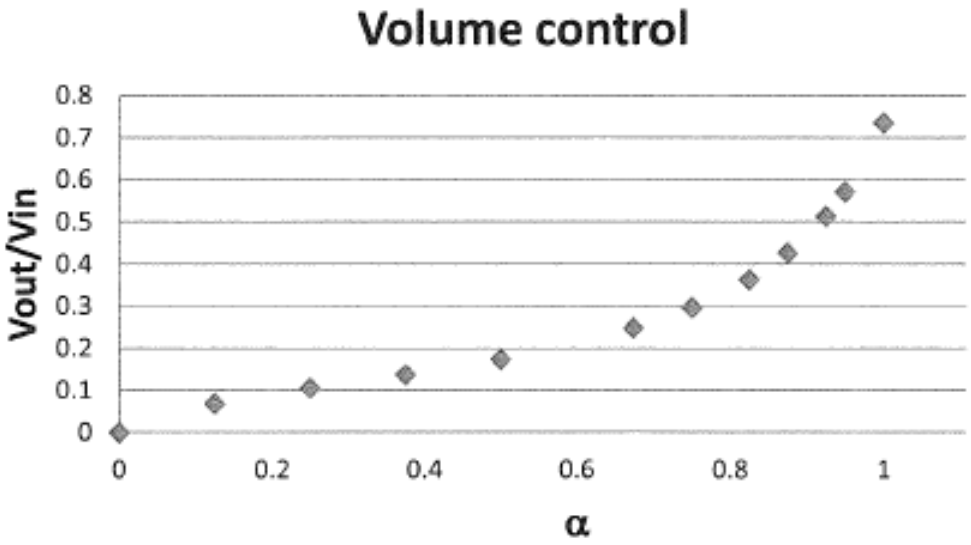


We measured the voltage output, which can be assumed to be proportional to audible volume.

Measurements were taken at alpha values of 0-1 in increments of about 0.1. We varied alpha by turning the potentiometer. We expect Vout/Vout to follow a voltage divider equation.

Results:

Here are our results for the measurements. We see that the output voltage increases with alpha, as expected. When the knob is maxed out, we get a value of Vout/Vin of about 0.73. Also, we did a test drive of our volume circuit. We did this by using a computer playing audio as input. An audio amplifier was connected to the output. As the knob turned, we could clearly hear the difference in audible volume.



Discussion:

In general, our circuit worked as expected. We see a fairly exponential increase in Vout/Vin vs. alpha. Correspondingly, when our ear takes the logarithm, we get a linear increase in sound volume vs. alpha as desired. Our results shown above, and our test-drive confirmed this.

There were some % differences in the actual circuit compared to what was predicted based on theory alone. This might be due to inaccurate measurement of alpha. It might also be due to our voltage readings being a bit off.

The circuit might be better if we could achieve a larger Vout/Vin when the knob is turned all the way up so that we don't waste voltage in the circuit.

Appendix:

The expression for Vout/Vin provided comes from a voltage divider equation:

Vout/Vin = Rp/Rs+Rp, where Rs = R1 + (1-alpha)R2, and 1/Rp = 1/alpha*R2 + 1/R3.

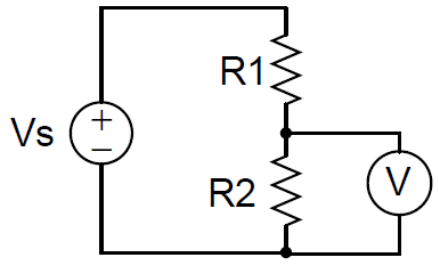


Figure 1. Basic voltage divider circuit