

Phased Array in Sound

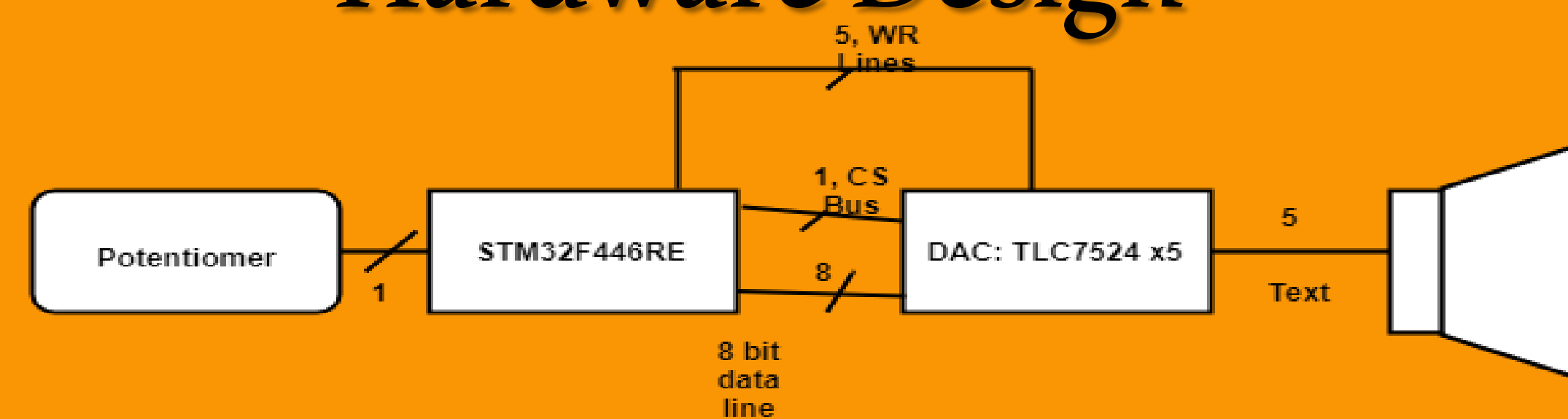
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Abstract

The phased array in sound generates a tone via the STM32F446RE microcontroller that can be phased adjusted by the user through a potentiometer. This creates a sense of directional sound outputting from a line array of speakers which is useful in demonstrating how a phased array system works. Applications of phased arrays are found in many places, such as broadcasting, radar systems, and ultrasonics.

Hardware Design

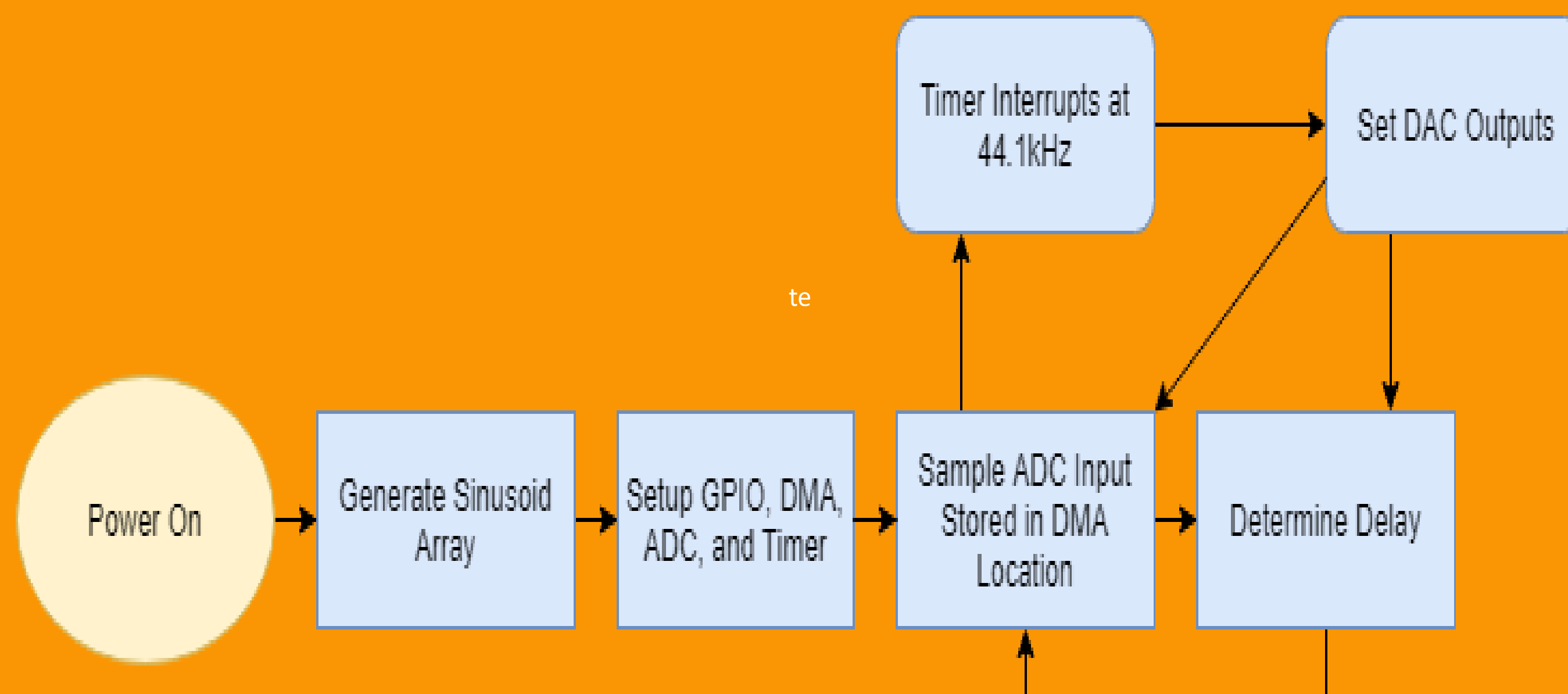


- Five DACs were hooked up to an 8 bit data bus, a chip select bus, and write bus from the STM32F446RE
- The DAC's outputs were sent across a passive RC lowpass filter with a cutoff of approx. 22.1 kHz and then to the speakers via 3.5 mm jack

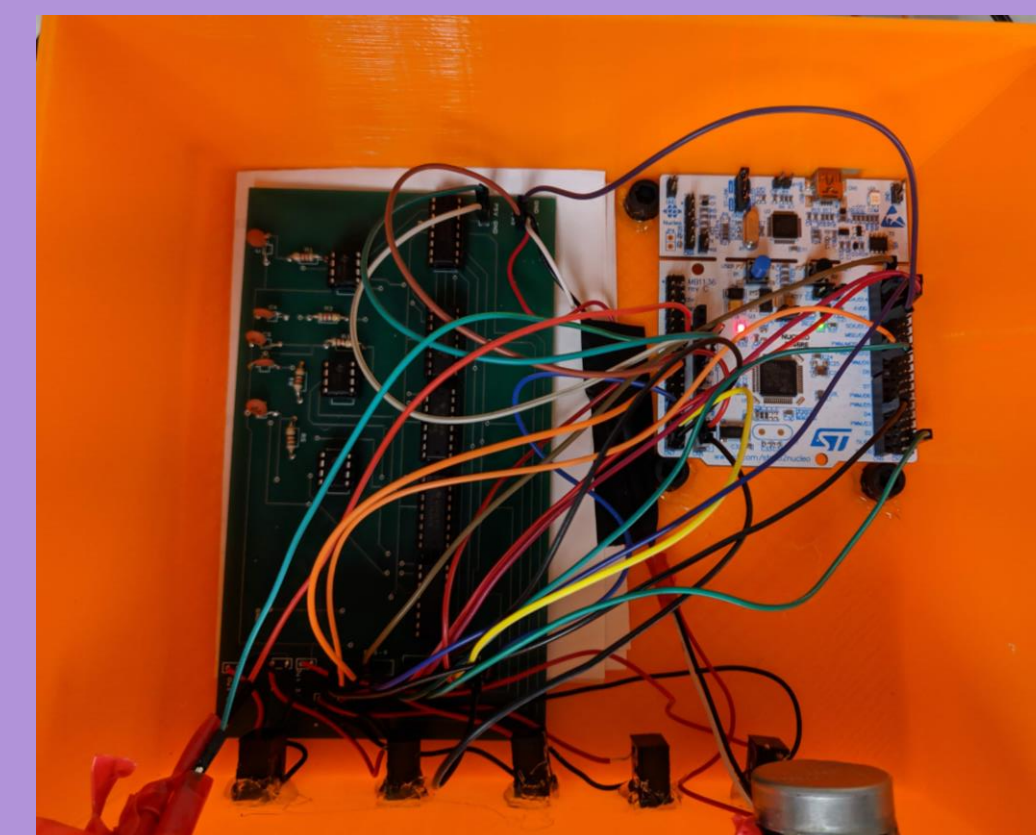
Features

- Approximately 1 kHz 8-bit sinusoidal output tone sampled at 44.1 kHz via a timer interrupt
- Works with any five speakers with internal input amplifiers and a 3.5 mm jack
- Adjustable by potentiometer

Software Design



Final Design and Results



- This project is tested by having a listener walk across the array to detect a change in the direction of the sound
- An oscilloscope was used to prove that the sine waves are phase shifted