As we have seen throughout this class, an embedded system uses its input/output devices to interact with the external world. Input devices allow the system to gather information about the world, and output devices can affect visual, mechanical, chemical, auditory, and biologic processes in the world. In this chapter we will literally “Shape The World”. We present a technique for the system to generate an analog output using a digital to analog converter (DAC). Together with periodic interrupts the system can generate waveforms, which are analog voltages that vary in time and in amplitude. We will then connect the waveform to a speaker and generate sound.

Learning Objectives:

- Develop a means for a digital computer to interact with the analog world.
- Study digitization: Quantization, range, precision and resolution.
- Introduce sampling and the Nyquist Theorem.
- Study the basics of sound: electromagnets, speakers, AC vs. DC power, perception of sound.
- Understand how to create sound: loudness, pitch, envelope, and shape
- Use SysTick to create sounds by programming variable frequencies.