RUTGERS
School of Engineering

Spring 2018 ECE Capstone Program
Project Abstract & Info

Project Number: 62

Project Title: dB-P6: A Small Format Digital Audio Mixer

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Project Keywords: ARM/FPGA SoC

                        Digital Signal Processing

                        Digital Design

                        Software Engineering

                        Embedded System

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Abstract

A small format digital audio mixer was designed and implemented using a ZyBo Z7-20 FPGA development board. The system incorporates many areas of electrical engineering, and covers concepts such as embedded systems design, software engineering, digital signal processing, and analog electronics.

Though loose in definition, a "small format" digital audio mixer (also known as an audio console or soundboard) is one whos input channel count typically ranges from two-to-eight, with an equal or lesser amount of output channels. The current design (though modifiable) consists of six input channels and two output channels.

Of the six inputs, four are mono (single channel), with the remaining two being a stereo pair. The mono inputs are simultaneously converted from differential to single ended and amplfied to an optimum level by an external audio preamplifier. The input is subsequently sampled and quantized though the use of an external 12-bit analog-to-digital converter. DSP functions are performed via the Zynq ARM/FPGA SoC found on the development board.

The user interface consists of two main sections - channel control and a touch screen display. Digital encoders take the place of faders on a typical mixer design, controlling each of the channels output (pre-accumulation) gain. Pre-amplification level is controlled by potentiometers. All DSP parameter modification is done though the use of a multi-touch display system and a single digital rotary encoder.

Design, Synthesis, and Implementation was done via the Xilinx Vivado toolset.