

DSP Dude: A Digital Re-Programmable Audio Pre-Amplifier

Valentina Chamorro, Yanni Coroneos

DSP Dude is a re-programmable pre-amplifier that can be daisy-chained with other units. Users can draw the desired frequency response in a design program such as Matlab and an algorithm will solve out FIR filter coefficients, while taking into account the sampling frequency of the system. The audio input will happen over SPDIF/TOSLink, which is a fiber-optic connection to the source. E

Each input sample to the FPGA control loop will be oversampled by an algorithmically determined amount in order to increase SNR and the final transformed output will be sent to an AKM4396 codec over SPI. The AKM 4396 codec supports sampling rates of up to 192KHz at 24bits and it can output a differential, balanced signal which can be fed into an audio power amplifier in order to drive speakers. Also DSP Dude can perform a frequency sweep over the audio band and measure the response with the microphone on the Nexys 4. By knowing the frequency response of the amplifier, the FPGA can now calculate the frequency response of the room and compensate audio output to have a flat magnitude and phase response.