Final Project Abstract

Trevor Walker, Ishwarya Ananthabhotla

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For our 6.111 final project, we intend to implement real-time Auto-Tune on the labkit. Users will be able to select a set of pitches (out of the twelve semitones in an octave), and the degree and rate of correction. We will use the built-in AC97 codec chip to sample and synthesize audio. After being acquired and before being reconstructed, the audio data will be low-pass filtered to remove frequencies above 20kHz, and windowed to avoid frequency-domain artifacts (producing input samples $x(t)$). The samples will be run through an FFT (generated by CoreGen or other generator) to determine the frequency content of the input $F(x)$. This Fourier transform will be traversed to find the peak, and the peak frequency used to index into a lookup table encoding both the closest desired pitch and the ratio between the detected pitch and closest pitch. With this information, the Fourier transform $F(x)$ can be multiplied by the degree of correction, a variable factor depending on the rate of correction, and the pitch ratio. This produces a scaled fix-point output that can be scaled down, inverse Fourier transformed, and output to the AC97.