Washington Experimental Mathematics Lab
Number Theory and Noise

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Number Theory and Noise

This project investigates the possibilities arising from representing sets of positive integers as sound.

A digital audio file is created from a given set A of positive integers by setting sample number i to a non-zero constant c for all i in the set. All other samples are set to zero.

The tools we used to create our text files of our sequences were:

- MATLAB
- Mathematica
- GP/Pari

From there we used CSound to create our text files into audio files. Furthermore, we use Audacity to analyze the wave form of our audio files as well as, create our spectrograms seen in the following slides.

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For example, the waveform for the primes starts like this:
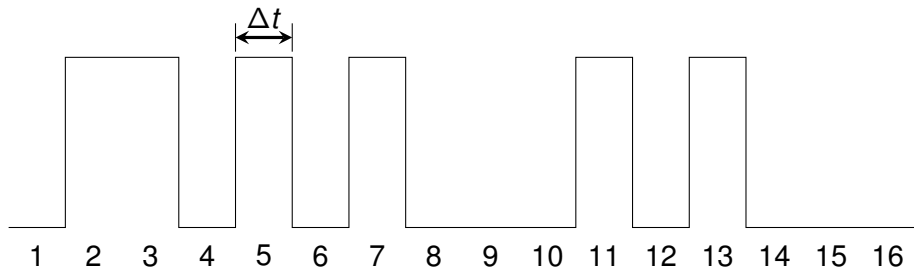
We use the standard CD-audio sampling rate of 44100 samples per second, so $\Delta t = \frac{1}{44100} = 0.0000226757...$ seconds.

For many sets, the result is what most people would describe as *noise*.

A003624: Numbers n such that they are composite and coprime with $\sigma(n)$ where, $\sigma(n)$ is the sum of all divisors of n. Also known as the Duffiniam Numbers.

A267086: Numbers such that the number formed by digits in even positions divides, or is divisible by, the number formed by the digits in odd positions; zero allowed.
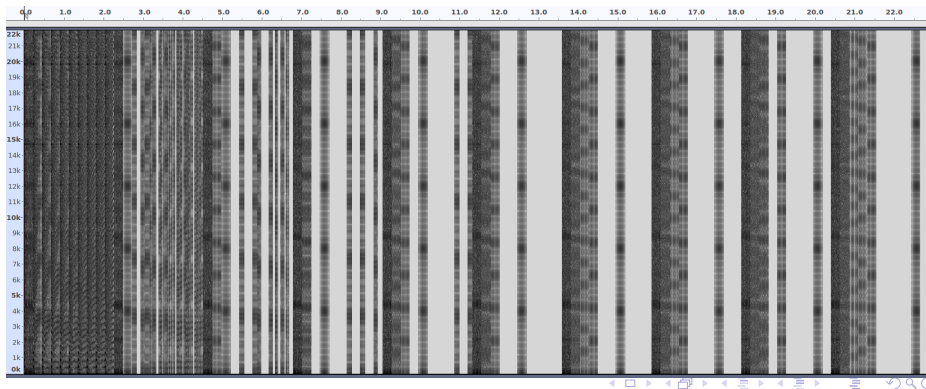
Numbers Congruent to 4 or 7 mod 87
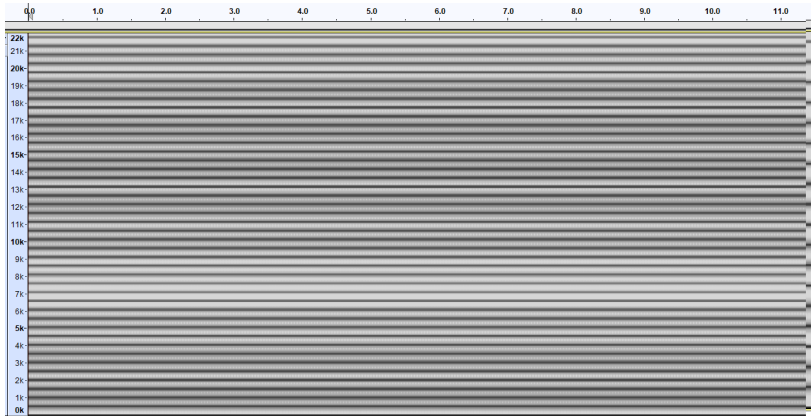
Future goals

- Describe the diagonal lines on A061910's spectrogram

- Investigate the distribution of A267086's terms and the local frequency of the sound.

- Investigate the sums complement and how they relate to the Beatty Sequences

- Add more sounds into our database to make it accessible for future analyzation.