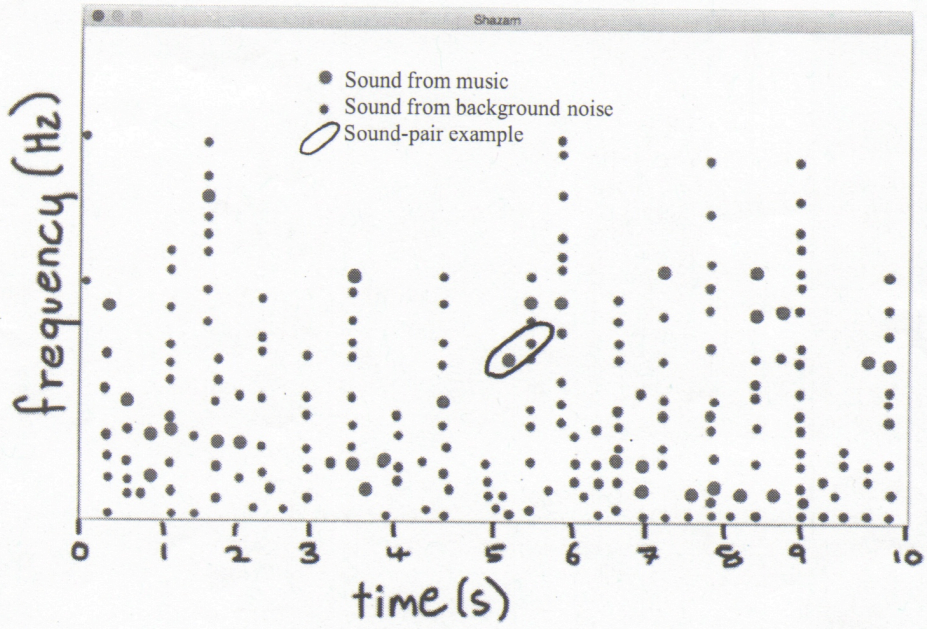
3. **Shazam** (26 points)

Shazam is an app that listens to a 10 second sample of background music playing (for example in a restaurant) and guesses the song. A user has just sent in a sample which we will use to explore how Shazam works. Within the 10 second sample there are:

50 sounds heard from the background ***music*** and
2000 sounds heard from background ***noise***

A "sound" is a frequency heard at a particular time. Here is a visualization of our 10 second sample (a few sounds are omitted for visual clarity):



a. (3 points) There are 2050 total sounds in the sample. How many distinct ***pairs*** of two sounds are there? Sounds can not be paired with themselves. Sound-pairs with the same two sounds are ***not*** distinct.

The number of distinct sound-pairs is

$$\binom{2050}{2} = \frac{2050 \times 2049}{2} = 1025 \times 2049$$

b. (4 points) How many distinct sound pairs exist such that ***both*** sounds in the sound-pair are from the music (as opposed to being from background noise)?

$$\binom{50}{2} = \frac{49 \times 50}{2} = 25 \times 49$$