Script For Podcast on Shazam- Name that Tune.

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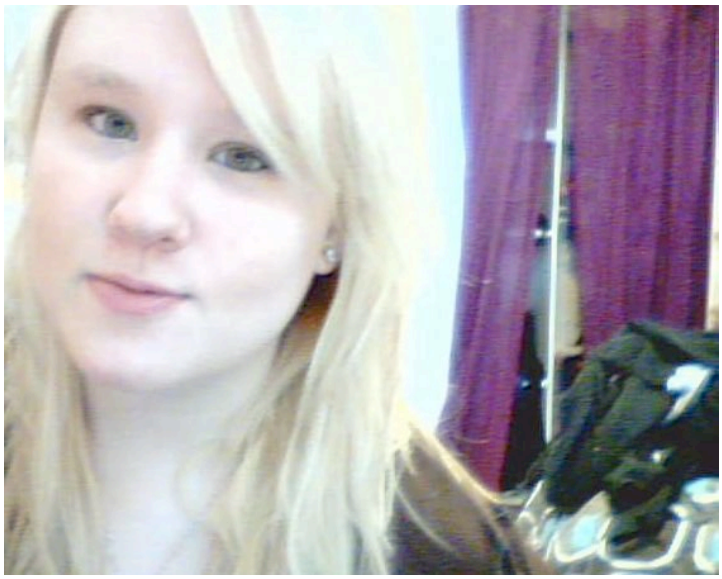
Hello my name is Nikole Daws, and welcome to my podcast for Math 2590.



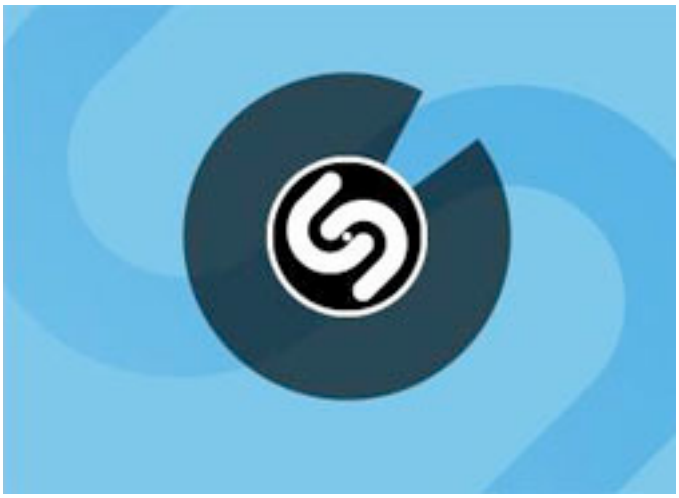
Imagine for a moment that you and your partner are sharing an intimate night out at a local hot spot.

Dinner arrives and suddenly, a song plays, that neither you nor your partner recognizes. Immediately what began as a lovely evening out suddenly evolves into tip of the tongue song names and artists to boot.

Now suppose a technology existed that within seconds of hearing a brief sample of such a song, it could produce almost instantly, the title and artist, all in the palm of your hand…

Sounds pretty great huh?

The solution to this dilemma was solved in 2002 when Shazam Entertainment Ltd. introduced the product “Shazam” to the United Kingdom as an application for the popular I Phone.



Essentially one presses a button on their phone, and within seconds you'll get the artist and song title, "other than video games, it's the most useful thing you do on your phone."

In 2009 it was announced that 50 million people worldwide had used the service, and it is now accessible on android, blackberry, windows mobile, essentially any Smartphone.

Here's how it works: Beforehand, Shazam fingerprints a comprehensive catalog of music, and stores the fingerprints in a database.

The user "tags" a song they hear, which fingerprints a 10 second sample of audio.

The Shazam application uploads the fingerprint to Shazam's service, which runs a search for a matching fingerprint in their database.

If a match is found, the song info is returned to the user, otherwise an error is returned.

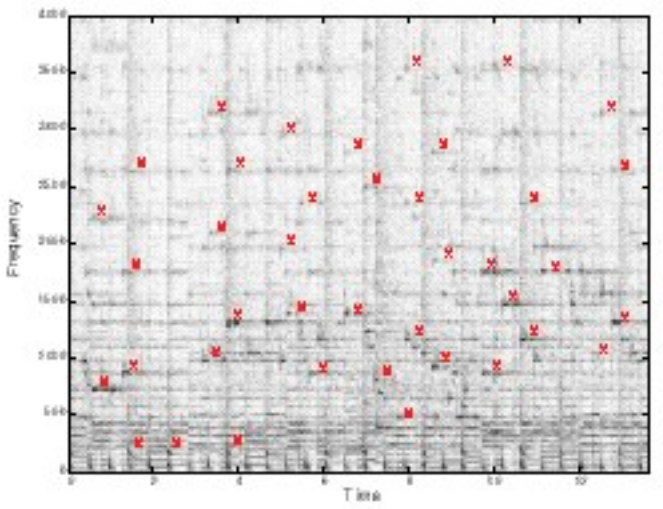
The question however is how are these "fingerprints" created.

The answer according to Avery Wang, chief scientist and co-founder of Shazam, is far from simple, as a single song has far too much information to compile a simple signature.

Therefore, according to Wang we must ignore nearly everything in the song and simply focus on a few key intense moments.

This is most easily done by creating a spectrogram of each song in the database and then again for the sample.

A spectrogram is a two dimensional visual representation of sound plotting frequency against time, amplitude it measured only approximately with color contrast.



We can think of any piece of music as a time frequency graph, where each point on the graph represents the intensity of a given frequency and a specific point in time.

Once the frequency, intensity and time have been graphed we can eliminate intensity to reveal a sparse set of coordinates; called a constellation map, as it resembles the night sky

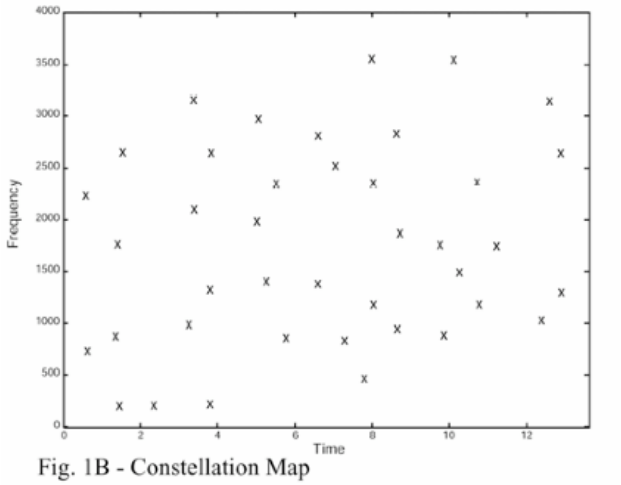


Fig. 1B - Constellation Map

We then must identify intense moments which we call “anchor points”

The anchors are what is monitored because it is proven that regardless of the noise or interference these intense moments remain intact.

From there a target zone is developed with no more then 10 points locating 3 per second of music.

Each anchor point is then sequentially paired with points within its target zone, creating a set of time-frequency points, by searching in pairs the speed is therefore doubled.

By keeping time sequence, we are ensuring that at some point, if it is a match the points will overlap.

If we were to overlay both constellation maps, the one created by the sample, and the one Shazam matches, they should be similar.

However a match is not sent back to the user unless a line is created by both the sample and the database, if no line exists an error is sent back.

A histogram is then created to monitor the coordinates, ensuring that intense moments coincide in both the database and sample.

Currently Shazam is able to search its database and identify your song within 500 milliseconds, depending on the quality, radio audio can be identified within 10 milliseconds. Live music can take up to 200 milliseconds.

The beauty of this process is it eliminates the possibility of false positives.

Currently Shazam is a free application available for all Smartphone users

So next time you can’t name that tune, think Shazam!

Reference-
http://www.ee.columbia.edu/~dpwe/papers/Wang03-shazam.pdf