

6.UAP Final Report: MusicTrail...

Visualizing and Experiencing Musical Influence

(<http://web.mit.edu/odim/www/inspiration>)

Rebecca Odim '13
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Faculty Advisor Tod Machover
Supervisor Ben Bloomberg

Composers, producers, and musicians all have their own story and their own inspiration when it comes to creating new work. Nothing can fully stand on its own because the inspiration came from somewhere. For an avid music listener sometimes it is possible to recognize what inspired that song, whether an entire genre, a different artist, or a specific song had a large impact in the creation. Recognizing samples and inspiration is another layer to enjoying music, but sometimes it is hard to organize all the samples one knows in their mind, let alone unknown samples. Even with a list of all samples in text, it is hard to conceptualize all of the connections. Music listeners can benefit from an easier way to recognize and organize samples. For some, this means enjoying another level of the music, for those that already pay much attention to samples it means a method of discovery that doesn't distract from the music.

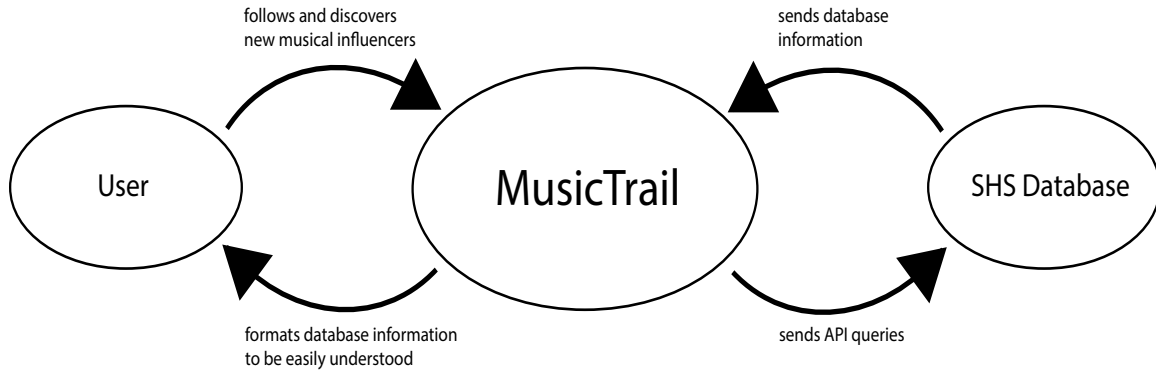
There are two current solutions to browsing music samples. One is whosampled.com, a free website where users can look at a song and see songs that are samples of, are sampled by, or are covered by other songs. The other solution is a disjointed group of sample lists all over the Internet, which are all in different formats. It's very hard to parse through all of this unorganized information. Some people will choose to organize samples within their own music library, but this is tedious and usually lacking in some information. This platform will provide an easy way to see an organized visualization of samples, which is much easier to understand than a list. It will also bring light to the inspirations behind many different samples and bring greater appreciation for how music is created. Under the advisement of the Opera of the Future Group through MIT's Media Lab, MusicTrail has come to life, consisting of two segments of a web platform for users to experience samples and music inspiration in different ways.

I. Problem Analysis

A. Overview

Context Diagram

Below is a depiction of how MusicTrail interacts with external factors.



Key Features

Searchable database of musical influence, visualization network, “The Infinite Sample.”

APIs and Libraries

SecondHandSongs (SHS) APIⁱ

SHS is a database of documented samples and covers of music. The SHS API allows MusicTrail to search and retrieve information from the SHS database by artist or by song name.

D3.js Libraryⁱⁱ

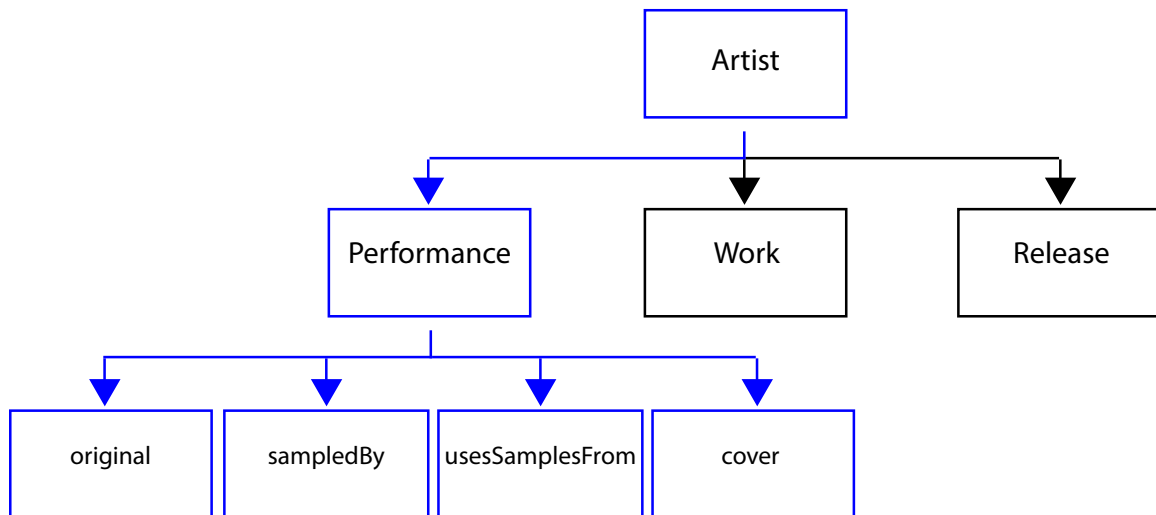
D3.js is a JavaScript library for manipulating and displaying data on the web. MusicTrail uses this library to bring the database full of json data on samples and cover songs into an easily processed visualization network.

Bootstrap Frameworkⁱⁱⁱ

Bootstrap is a front-end framework for HTML, JavaScript and CSS development. Using this framework has allowed me to focus my attention on the site functionality and user experience before style, while still having a site that is nice to look at.

B. Domain

Object Model



** Only the objects highlighted in blue were used from the SHS API^{iv}.

User Flow

Influence_network (basic_song_info sample_info)* infinite_sample

infinite_sample (play_song (choose_sample | choose_original))*

C. Behavior

Feature Description

The Influence Network

The Influence Network is a method of organizing samples and music. It is a network map of songs that is filtered in terms of music artists. The network has links between any two artists who have influenced each others music (in terms of samples or covers).

The Infinite Sample

The Infinite Sample is a method of sample and inspiration discovery. A user will choose a song. That song will play, with an option to choose a sample or original version of that song. After the selection the user will be brought to the next songs page, and that will continue as long as related songs exist. Users will be able to experience different styles and different genres all from a single source, showing musical connections.

II. Design Analysis

A. Overview

Design Challenges

Web Framework vs. Visualization Library

Initially, the plan was to use the Ruby on Rails framework to create this site, with the Sigma.js visualization library. After some trial and error, writing in straight HTML5 from scratch was much more compatible with libraries. The issue of database file type.

Sigma.js only took certain file types, which weren't so simple to create from the initial SHS API requests, which returned JSON.

CORs

The SecondHandSongs API gave access to most of the information on its website, but the Cross Origin headers were not sufficient to use all of the information. The site can be tested in Chrome or Chromium with *--disable-web-security* argument. But this is problematic for public use.

Data Overflow

There are many options to filter songs by that can tell a user something meaningful. These include song artist, producer, writer, year, genre, location, etc. Though seeing sample information clustered by any of these criteria would teach the user something, the application is currently not implemented clustering samples by each artist.

Sample Lists

Given a list of samples for a given artist, one main functionality of MusicTrail is to display this information in a way that is easier and more intuitive than one of the online text based systems. In order to remedy the problem of artists with way too many interactions to fit on one page, each artist has different levels of information. A user can hover over an artist and get general information about number of songs, number of samples, and number of originals, click to get more information about the artist, and hover over another artist to get the list of those two artists' history of influence together.

B. Details

Data Representation

JSON

Much of the site uses information from the SHS API, which uses a JSON representation, and when stored in variables for later, MusicTrail stores that information in associative lists.

D3.js Links

There are a few different formats D3.js can use to get network information, parse it, and display it. MusicTrail uses a list of Links that is populated given a certain query to the SHS API. These links are formatted in an associative list. The links list is a list of these data structures:

```
{source: "Alicia Keys",  
  target: "Donny Hathaway",  
  type: "original",  
  suri: "http://www.seconhandsongs.com/artist/6521",  
  turi: "http://www.seconhandsongs.com/artist/592"}
```

Key Design Decisions

D3.js Links

Given the option to parse JSON directly from the SHS database or take all of the information from a query and create a new data structure, the latter served the purpose.

Though it is more time upfront, it prevents the need to query the database as much during

the user's interaction with the visualization. It makes it easier to keep track of adjacent nodes without any additional queries.

getArtistInfo(node)

This function is found in the visualization section of the code, and made it much easier to interact with nodes and information. Similarly to the d3.js links, *getArtistInfo(node)* gets all information from a given node at one time and saves it in an *artist* variable to make it easier to change the information shown to the user at any given time without additional queries. This allows for smoother transitions and shows reliability to the user.

Artist Info User Interface

getArtistInfo(node) was implemented because of the method in which artist information needed to be shown. In order to make the UI intuitive it made sense to show increasingly more information depending on how much of a “commitment” the user has made to a given node. If the user hovers over a node, it shows general information such as “song count,” “sample count,” and “originals count.” If the user selects a node, the program shows much more information about this artist, including a list of songs. Lastly, with one artist selected, the user has the option to select a neighboring artist. This will show a side-by-side comparison of the two artists, along with song interactions such as samples and covers. The ability to go back and forth between detailed and general sample trends greatly enhances the pattern discoveries that can be made.

III. Implementation

A. Design

Use Cases

Persona 1 *Music Analyst*: User likes to analyze and compare music types and genres.

The Music Analyst can use this platform to look at long term trends in sampling, and compare artists and genres directly.

Persona 2 *Avid Music Listener*: User is always on the lookout for new music.

The Avid Music Listener can use this platform to discover new music through samples and covers.

Persona 3 *Curious Listener*: User listens to music regularly and is open to new styles.

The Curious Listener would come to this platform on the recommendation of someone or interest in a specific artist. From there they just browse and see what exists.

User Interviews^v

Through user interviews, it seems that there are some people who would be interested in seeing the evolution of music through different eras, who could benefit greatly from this platform. There are others who don't have as much of an interest in sampling, but who are interested in discovering new music through sampling and covers. Though I didn't interview any potential users that could use this sample information for research purposes, I believe it would be of great use in that case as well.

Final Design

Rebecca Odim, Massachusetts Institute of Technology 2013 UAP.
Used [Bootstrap](#), [D3.js](#), and [SecondHangSongs](#).

MusicTrail...

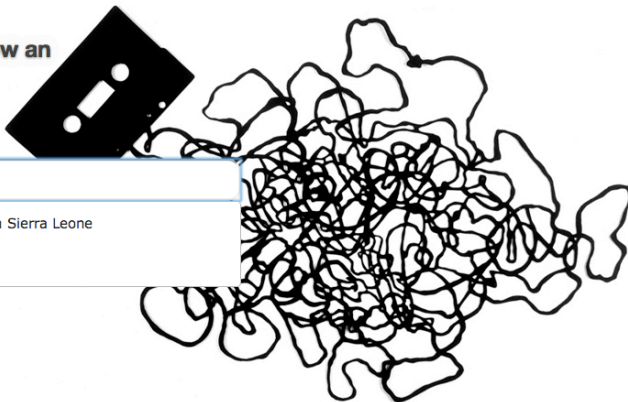
Name a band, name a song, and either follow an "Infinite Sample" or visualize its Influence Network.

Kanye West

Follow Network

diam

Diamonds From Sierra Leone



Rebecca Odim, Massachusetts Institute of Technology 2013 UAP.
Used [Bootstrap](#), [D3.js](#), and [SecondHangSongs](#).

MusicTrail...

"Infinite Sample"

Kanye West feat. Jay-Z's Diamonds From Sierra Leone



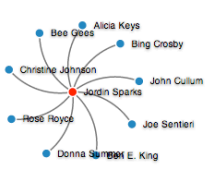
Songs that this work samples:
[Shirley Bassey Diamonds Are Forever](#)




MusicTrail...

"Influence Network"

[See All](#)



A central red dot labeled 'Jordin Sparks' is connected by lines to ten surrounding blue dots, each representing an artist: Bee Gees, Alicia Keys, Bing Crosby, John Cullum, Joe Senterf, Sam E. King, Donna Summer, Rose Royce, Christine Johnson, and Jordin Sparks.



Jordin Sparks

8 songs, 5 samples, 0 originals, 0 covers

Winner 6th season of American Idol (2007)

Fallin'! Who Have Nothing
She Works Hard for the Money
Wishin' on a Star
To Love Somebody
On a Clear Day
You'll Never Walk Alone
I'll Be Home for Christmas

IV. Future Work

The Influence Network

The Influence Network could benefit from some more research on the way users interact with networks vs. the way they interact with music.

The Infinite Sample

In future iterations the “Infinite Sample” should start playing the song at the very point that starts the sample, so the musical influence is more immediately evident.

SecondHandSongs API

I hope to foster a better relationship with the people in charge of SecondHandSongs API, allowing me more freedom to test. The throughput limitation and Cross-Origin-Access-

Control issues were definitely barriers to the productivity of putting together this platform. In the future this can be made more efficient.

Other APIs

It would be great to have the largest possible database of samples to work with, so using information from other websites such as the-breaks.com and whosampled.com would benefit the platform. These currently do not have API's so getting that information would have to be done through scraping techniques. API's currently exist that make it possible to play pretty much any song online if you have the title and artist name. So incorporating something like Echonest into this platform would definitely make it more appealing, as users wouldn't have to skip through songs that don't have a video.

V. Conclusion

The MusicTrail platform allows users to interact with and discover musical influences in a whole new way. The Influence Network shows a general depiction of the world of musical samples, highlighting large-scale trends and patterns, whereas The Infinite Sample highlights the audible similarities between two to several pieces of music. This platform is beneficial to many different types of music listeners, from the music researcher to the listener who is just curious to see what is out there.

VI. Acknowledgements

I would like to take the time to thank my faculty advisor, Tod Machover, and my supervisor, Ben Bloomberg for giving me the opportunity, resources, and inspiration to pursue this project and research as my undergraduate thesis.

VII. References

ⁱ SecondHandSongs (SHS) API
(<http://www.secondhandsongs.com/wiki/API/Main>)

ⁱⁱ D3.js Library
(<http://d3js.org/>)

ⁱⁱⁱ Bootstrap Framework
(<http://twitter.github.io/bootstrap/>)

^{iv} SHS

^v User Interviewees:
Ashley Powers – 22, Senior MIT Student,
Karis Stevenson – 23, Medical School Student,
Tochukwu Okoro – 20, Junior MIT Student,
Anna Merrifield – 22, Senior MIT Student