

I will present initiatives rather than technical details

Retrieval of Acoustic Features from Music Audio Signals

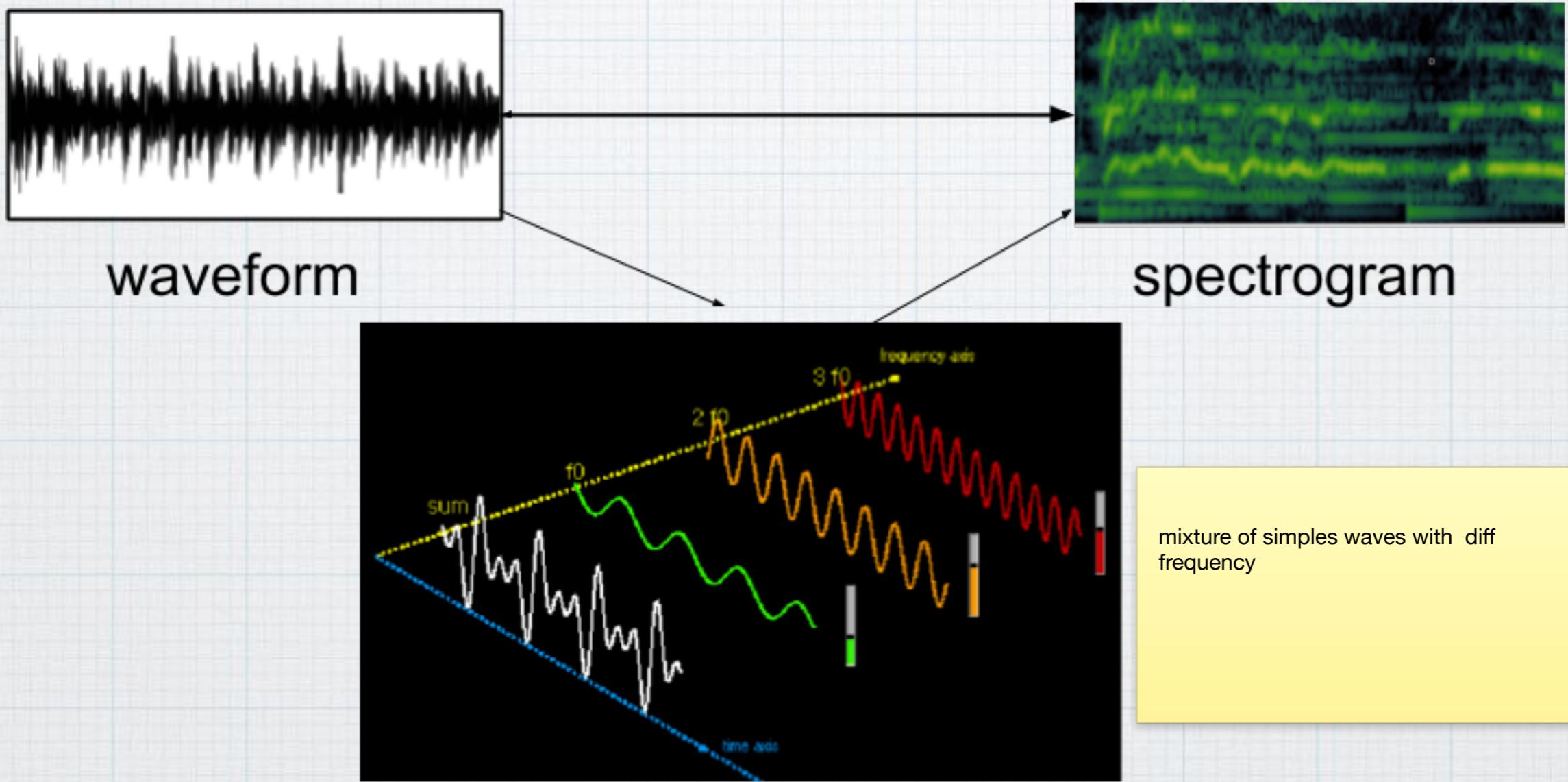
Georgi Dzhambazov
Music Technology Group (MTG),
Universitat Pompeu Fabra, Barcelona, Spain

https://twitter.com/georgi_d_
github.com/georgid/
georgi.dzhambazov@upf.edu

Outline

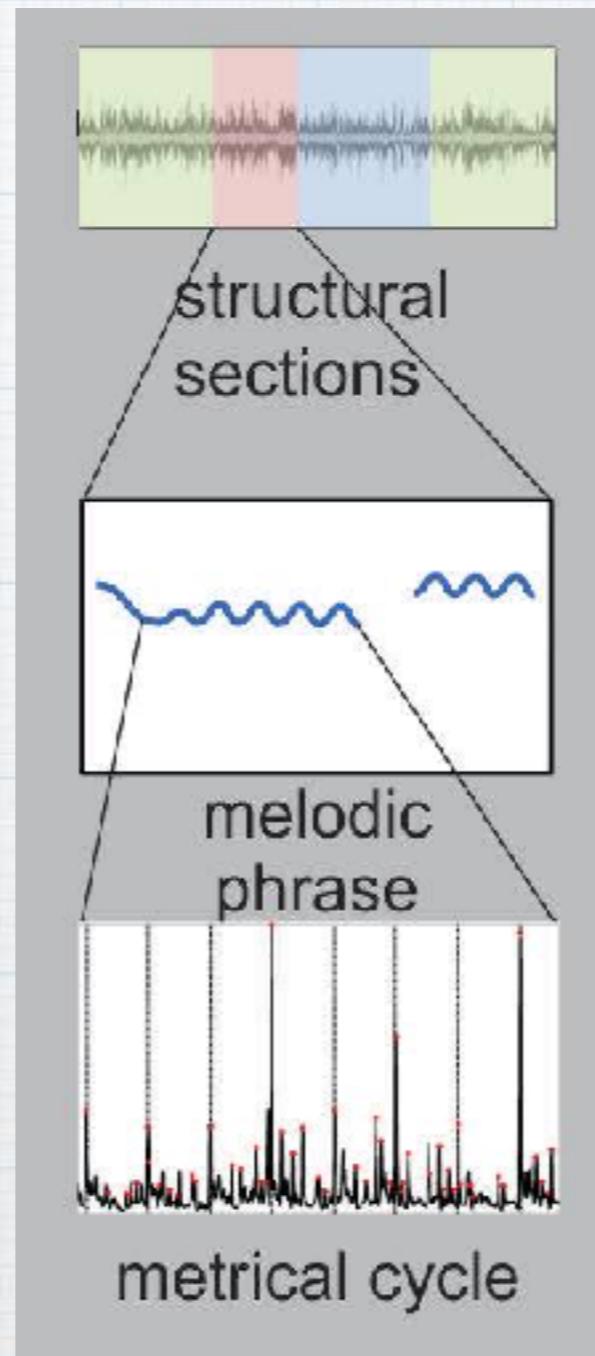
- * Introduction to music events
- * Acoustic feature extraction
 - * with essentia
 - * with other open source tools
- * initiatives of the Music Technology Group
 - * freesound.org
 - * Lyrics-to-audio alignment

Sound content: waveform and spectrograms



Anatomy of music audio

music is repetitive



semantic structure

repeating building block with
relatively similar pattern
silences

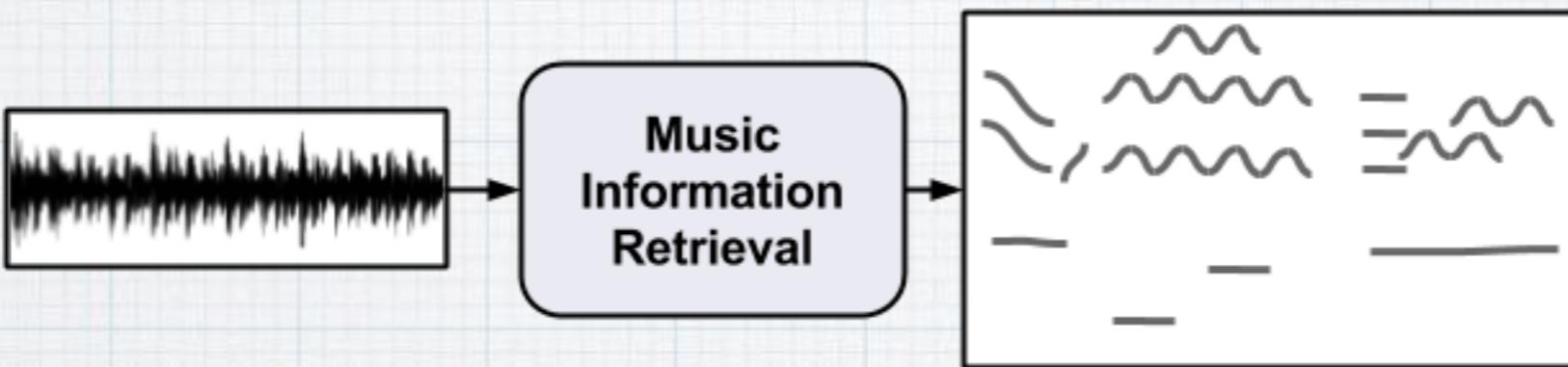
Music events

- * music notes
- * beats
- * chords
- * lyrics

Acoustic features

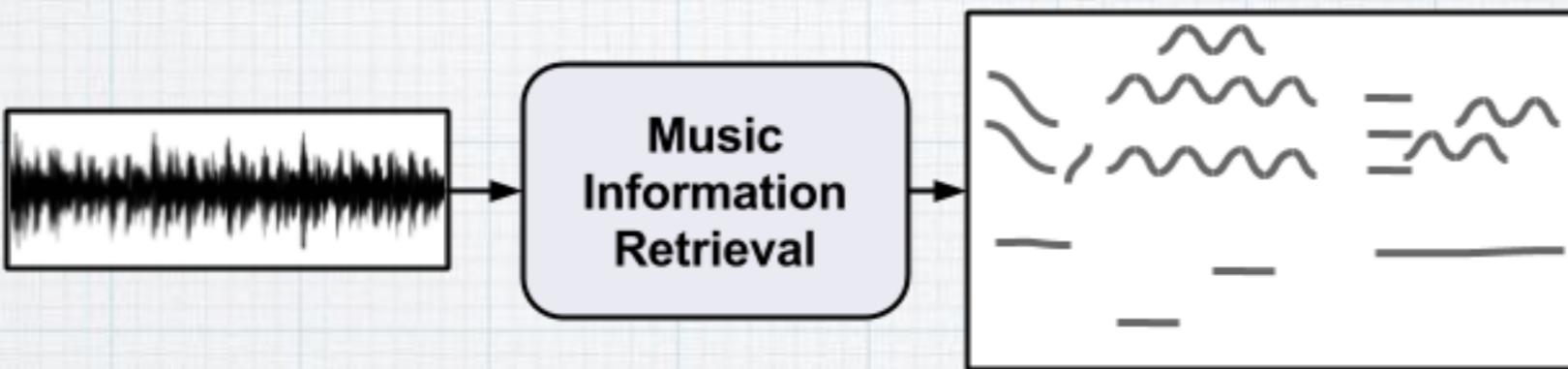
- * music notes
 - * beats
 - * chords
 - * lyrics
- 
- * fundamental frequency
 - * percussive onsets
 - * pitch classes (more than one)
 - * phoneme timbre

Music Information Retrieval (MIR)



- * MIR = signal processing + machine learning + music theory

Music Information Retrieval (MIR)



- * MIR = signal processing + machine learning + music theory

Automatic feature extraction

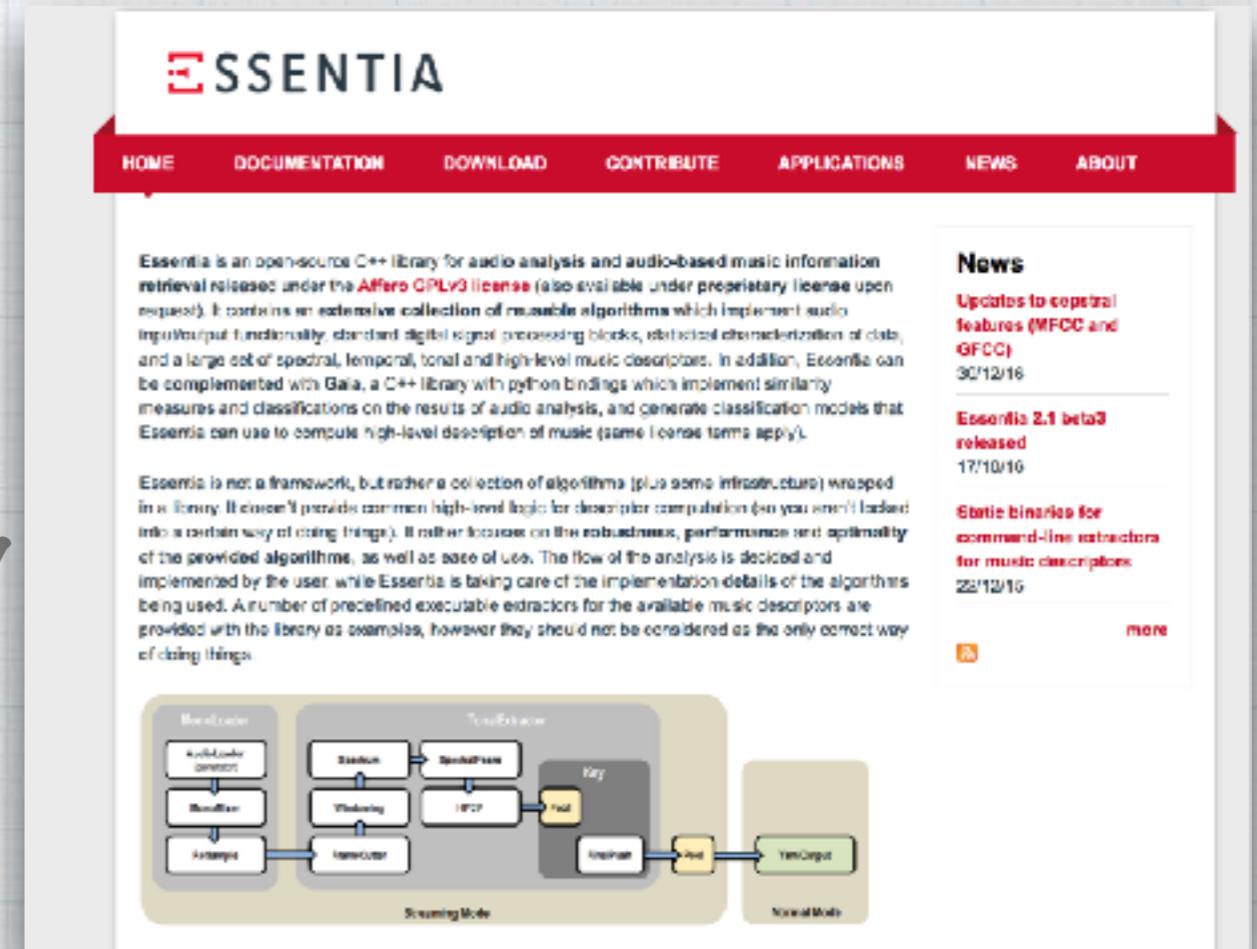
Essentia: Collection of audio analysis algorithms

essential spectrogram
then beats and chords

* Open source C++ library

* python wrapper

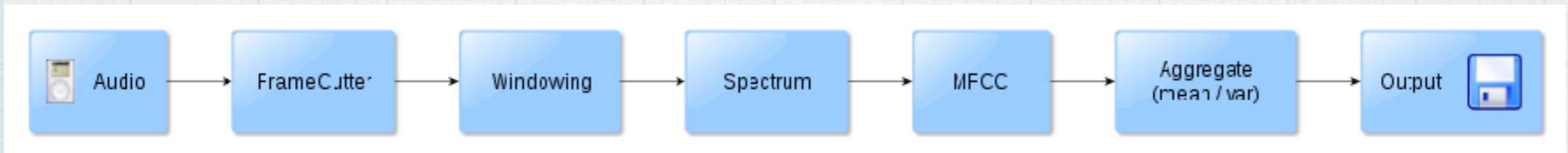
* realtime processing as external for Pd and Max/MSP



Automatic feature extraction

Essentia: Collection of audio analysis algorithms

essential spectrogram
then beats and chords



https://github.com/georgid/essentia_hacks/

[https://github.com/georgid/essentia_hacks/blob/master/
MH_Sofia.ipynb](https://github.com/georgid/essentia_hacks/blob/master/MH_Sofia.ipynb)

Automatic Feature Extraction Other Tools

- * Sonic Visualiser VAMP (C++) [http://
www.sonicvisualiser.org/](http://www.sonicvisualiser.org/)
- * librosa (python) [http://librosa.github.io/
librosa/](http://librosa.github.io/librosa/)
- * Music Bricks (misc.) [http://
musictechfest.net/toolkit/](http://musictechfest.net/toolkit/)
- * ...

AcousticBrainz Precomputed Features

<https://acousticbrainz.org/>

- * crowd source acoustic features
- * based on musicBrainz IDs

Music Technology Group

Master program

- * Core courses
 - * Audio Signal Processing for Music Applications
 - * Music Information Retrieval
 - * Music Perception and Cognition
 - * Real-time Interaction
- * Optional
 - * Music Recording and Mixing
 - * Machine Learning

<https://www.upf.edu/smrc/program/>

Music Technology Group

Courses

The screenshot shows a Coursera course page. At the top, there's a navigation bar with the Coursera logo, a search bar labeled "Catalog" and "Search catalog", a magnifying glass icon, and links for "Institutions" and "Log In". Below the navigation, the course title "Home > Computer Science > Software Development" is displayed. The main title of the course is "Audio Signal Processing for Music Applications". On the left, there's a sidebar with links for "Overview", "Syllabus", "FAQs", "Creators", and "Ratings and Reviews". The main content area contains a detailed description of the course, mentioning audio signal processing methodologies specific to music and their relevance for sound description and transformation. It also notes that the course is aimed at advanced undergraduate or master students and professionals interested in signal processing, programming, and music. At the bottom, it says the course was created by Universitat Pompeu Fabra of Barcelona, Stanford University, with logos for UPF and Stanford University.

coursera

Catalog Search catalog

Institutions Log In

Home > Computer Science > Software Development

Audio Signal Processing for Music Applications

Overview

Syllabus

FAQs

Creators

Ratings and Reviews

Audio Signal Processing for Music Applications

Enroll Now

Starts Mar 27

About this course: In this course you will learn about audio signal processing methodologies I specific for music and of use in real applications. We focus on the spectral processing techniques relevance for the description and transformation of sounds, developing the basic theoretical knowledge with which to analyze, synthesize, transform and describe audio signals. In the cont

▼ More

Who is this class for: This course is primarily aimed at advanced undergraduate or master students with professionals interested in signal processing, programming and music.

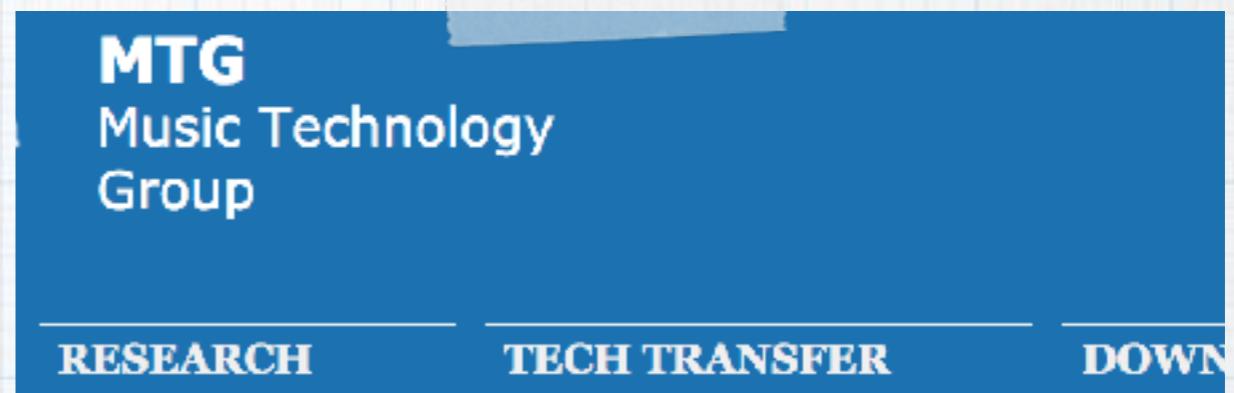
Created by: Universitat Pompeu Fabra of Barcelona, Stanford University

Universitat Pompeu Fabra Barcelona

Stanford University

Music Technology Group

Spinoffs



Spinoffs

The MTG has created three spinoffs.



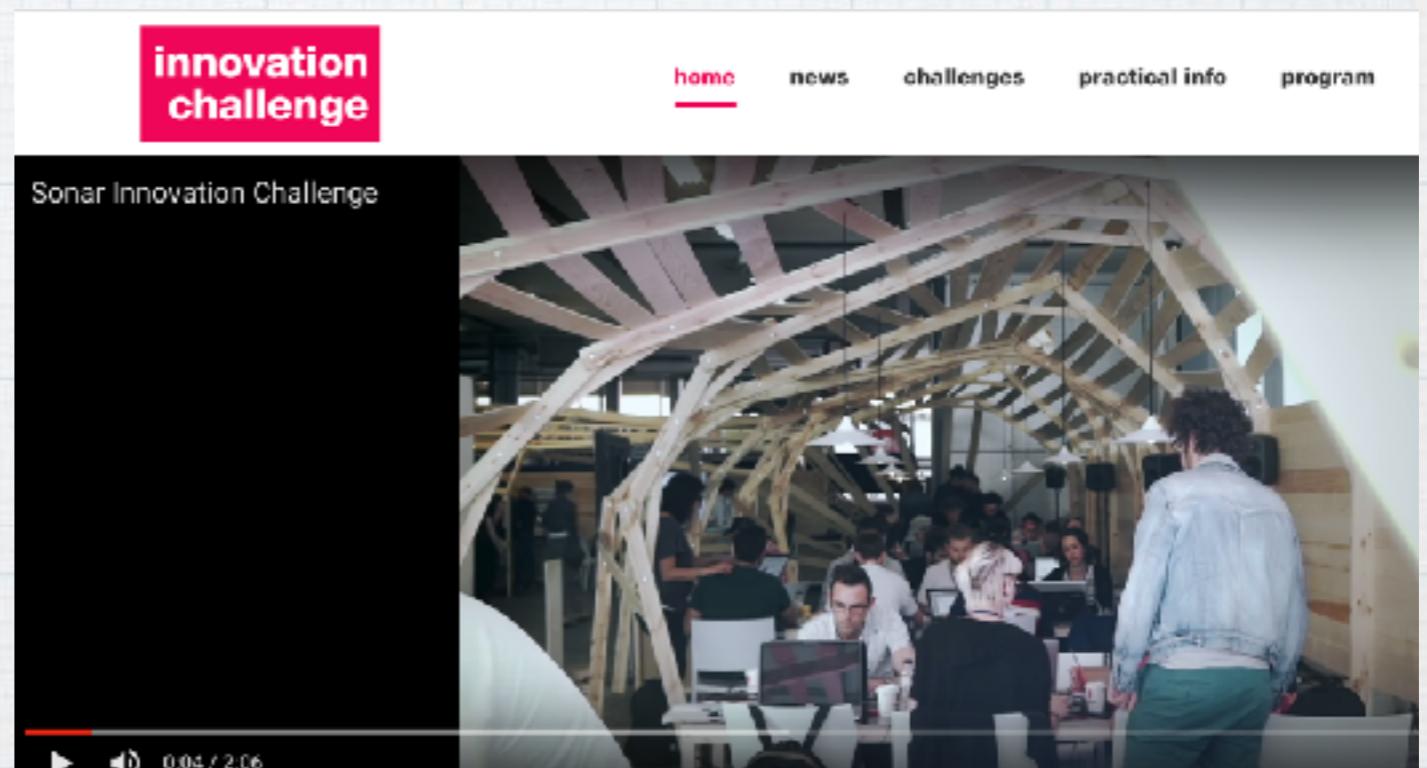
BMAT is an audio technology company that operates worldwide to provide services in the field of live sound. BMAT counts on a young, dynamic and highly qualified team that integrates music and technology as core values. The company's main service is the monitoring service position, which is considered one of the best in the world, serving major international organizations in the world, such as the United Nations, the World Cup, the Olympic Games, among others. In Latin America and the Caribbean, BMAT serves major organizations in the world, such as the United Nations, the World Cup, the Olympic Games, among others.



Reactable Systems' mission is to revolutionize the way people interact with music. Human-Computer Interaction is the core of their work, developing interactive products and software for various fields such as entertainment, education, and research. They emphasize the mediation of culture and knowledge through music, with a strong emphasis on musical creativity and personal expression. Their most notable achievement is the commercial launch of the Reactable Live! system, a modular digital synthesizer that allows users to create complex sounds and music using touch and movement.

Music Technology Group

Hackathons



[what is the sónar innovation challenge?](#)

[how does it work?](#)

<http://new.musichackday.org/>



2005 at Music Technology Group

Sounds

340k+ sounds (4400+ hours of audio)



[Drumloop_remix_190BPM.wav](#) ★★★★☆ DirtyJewbs

[Browse latest comments](#)

6.5M+ registered users (17k+ uploaders)

remix reverse hi hat snare

[Give me a random sound!](#)

100M+ sound downloads



[Waves on the Dutch coast at Dishoek. Sound recording is 100 meters from the surf. However, there is no surf.](#) May 8th, 2017 0 downloads

50k+ unique visits per day



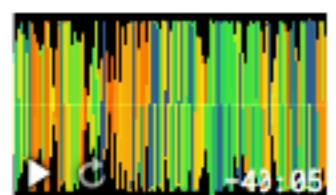
[MARS_20170421_UTC-15_0000.flac](#)



aguasonic

Creative Commons - reuse

Lagenorhynchus-obliquidens ambient
Monterey-Bay California aguasonic



[170430_0147.flac](#)



theshiter

This is a Sound i recorded with 96 kHz 24-Bit WAV-Format from the roof of this house. I had to ...

May 6th, 2017 4 downloads 0 comments

ambience street field recording LS-14 door



Latest changed packs

- beach North Sea by klankbeeld (40)
- MARS_Hydrophone by aguasonic (19)
- Ambience by theshiter (1)
- 3May2017 by csengeri (2)
- free loops/beats/sequences/patterns/synthesizer-sounds/percussion-loops/thingers by waveplay (43)
- Korg_Volca_FM Samples by tatimeow (8)
- sub_bass by tatimeow (7)
- vowel_A by tatimeow (7)
- vowel_E by tatimeow (7)
- vowel_I by tatimeow (7)
- O_Vowel by tatimeow (7)
- Ambient Sound Loops Pack 11 by Erolkin (30)
- whale by aguasonic (1)
- anechoic chamber by aguasonic (1)
- Misaki by aguasonic (1)
- Prague field recordings by Owl (12)

freesound.org

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Automatic by relevance

[search](#)[Show advanced search options](#)[previous](#) [next](#) [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) ... [32](#) | 1495 sounds[ZOOM0001_LR.WAV](#)[spiid](#)

April 25th, 2016

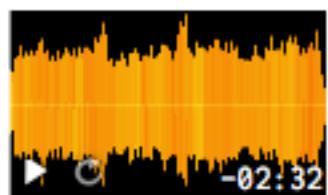
1459 downloads

2 comments



jungle in a daytime with river flowing

water river flow jungle flowing

[Jungle Yuwientsa Ecuador...](#) [TheTunk](#)

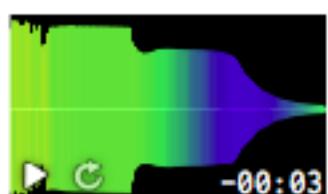
March 27th, 2013

6920 downloads

13 comments



Recorded in 2011 on the documentary "Arutam" project. With a Rode Stereo XY mic thru a Boom. It's around ...

jungle atmo field-recording ecuador rainforest
stereo animals insects night primary-rainforest[+ 6 more results](#) in the same pack "Jungle"[Jungle Bass Hit C1.wav](#)[LukeSharples](#)

February 9th,

2012

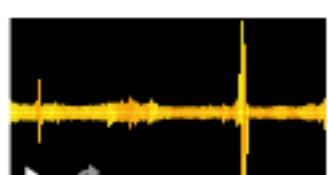
35 downloads

0 comments



jungle Bass [Instrument]

Instrument Jungle Bass

[+ 7 more results](#) in the same pack "Jungle Bass [Instrument]"[jungle_1.wav](#)[itsmrjack](#)

June 28th, 2011

1800 downloads

4 comments

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- [Attribution Noncommercial \(130\)](#)
- [Creative Commons 0 \(481\)](#)
- [Sampling+ \(95\)](#)

tags

ambient amen bass beat birds break
breakbeat diy-synth dnb drum
drums dub dubsirene effect field-
recording fx jungle lofi loop
loops onedrop rainforest rasta reggae roots
siren soundsystem space squarewave tropical

type

- [aif \(31\)](#)
- [aiff \(13\)](#)
- [flac \(49\)](#)
- [mp3 \(148\)](#)
- [wav \(1253\)](#)

samplerate

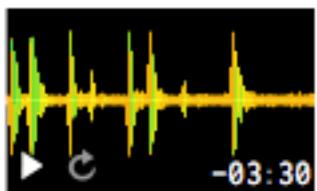
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[hail](#)+ [heavy](#)+ [heavy-rain](#)+ [human](#)+ [insects](#)+ [inside](#)+ [jungle](#)+ [leaves](#)+ [**lightning**](#)+ [loop](#)+ [loud](#)+ [natural](#)+ [**nature**](#)-
[neighbourhood](#)+ [night](#)+ [noise](#)+ [outdoors](#)+ [outside](#)+ [owl](#)+ [peaceful](#)+ [pouring](#)+ [purist](#)+ [**rain**](#)- [rain-storm](#)+ [raindrops](#)+
[rainfall](#)+ [rainforest](#)+ [**raining**](#)+ [**rainstorm**](#)+ [rainy](#)+ [recording](#)+ [relaxing](#)+ [river](#)+ [rolling](#)+ [rolling-thunder](#)+ [roof](#)+
[rumble](#)+ [rumbling](#)+ [**shower**](#)+ [sound](#)+ [sounds](#)+ [soundscape](#)+ [splash](#)+ [spring](#)+ [stereo](#)+ [**storm**](#)+ [stream](#)+ [street](#)+
[strike](#)+ [suburb](#)+ [summer](#)+ [**thunder**](#)+ [**thunder-storm**](#)+ [thunderclap](#)+ [**thunderstorm**](#)+
[trees](#)+ [tropical](#)+ [umbrella](#)+ [urban](#)+ [**water**](#)+ [**weather**](#)+ [wet](#)+ [**wind**](#)+ [woods](#)+ [zoom](#)

Sounds with these tags

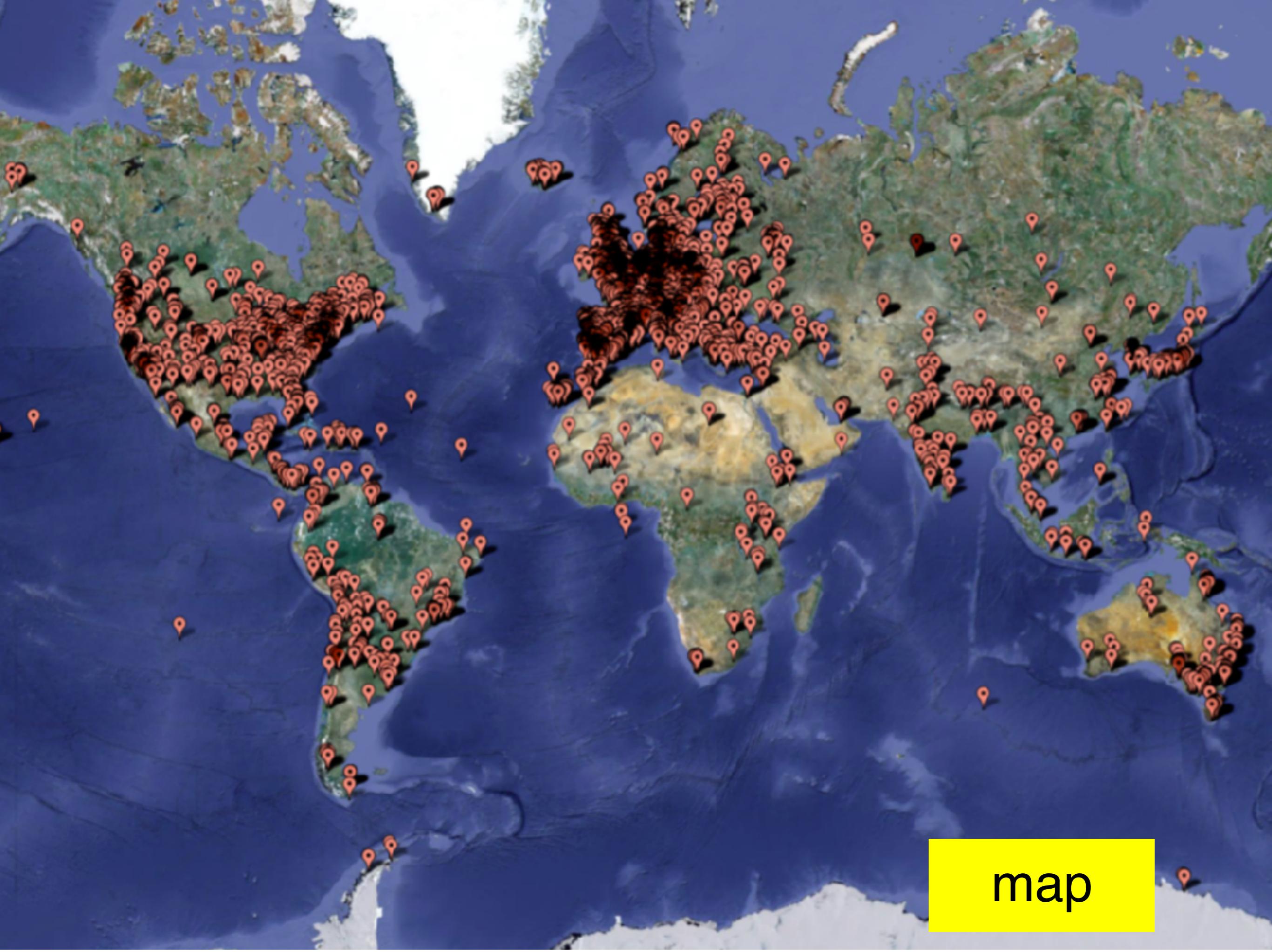
[nature](#) [rain](#)[Follow tags](#)[previous](#) [next](#) [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) ... [40](#) | 874 sounds**rbh thunder storm.wav**

RHumphries

June 9th, 2005
129893
downloads
873 comments

rain and several thunder claps. Stereo.
Recorded with a minidisc recorder and an AT822
mic. Edited in Protools and saved ...
[field-recording](#) [heavy-rain](#) [lightning](#) [nature](#) [purist](#)
[rain](#) [siren](#) [stereo](#) [storm](#) [thunder](#) [thunder-storm](#)

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map



frederic.font

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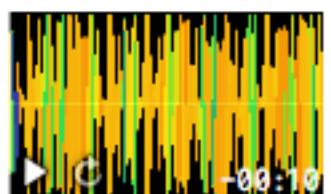
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search sounds



Query sound

**Drumloop_remix_190BPM.wav** ★★★★★

A remix of my own loop. It came out pretty good. I used Grossbeat from FL Studios. I think it ...

drumstep dubstep delay effects glitch bit crush
remix reverse hi hat snare

DirtyJewbs

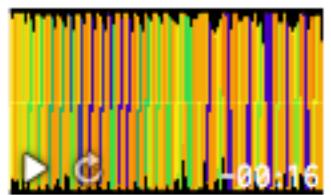
July 31st, 2011

181 downloads

1 comment



Similar sounds

**119 bpm house beat** ★★★★★

(lame version - watch out for a better one in the future) what do you guys think - should i ...

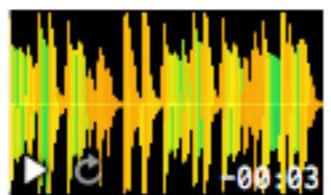
old dance house rave oldschool dub 119 lemon8
lemon sub electronic deadmau5 goa sidechain 8

waveplay

December 23rd, 2013

91 downloads

1 comment

**Breaks Energy Beat 02.mp3** ★★★★★

big beat, dance, funk, breaks

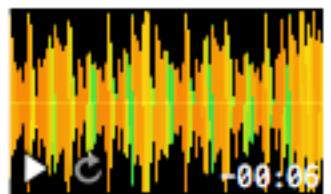
beat big breaks dance funk

DCDJ

October 23rd, 2006

193 downloads

0 comments

**duppyHouse01_140bpm.wav** ★★★★★

Very funky bouncy house/dance beat with triangle, timbales, cowbell accents.

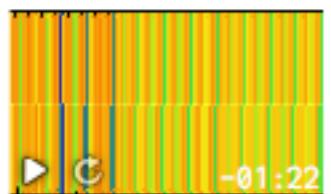
140bpm beat break breakbeat cowbell dance
drum funky house loop timbales

djduppy

October 10th, 2006

571 downloads

0 comments

**Crazy Beat 70bpm** ★★★★★

I made this beat out of a lot of other beats I got off of Freesound, as well as some ...

complex electronic 70bpm freesound synth

godspine

February 28th, 2013

101 downloads

1 comment



similar sounds

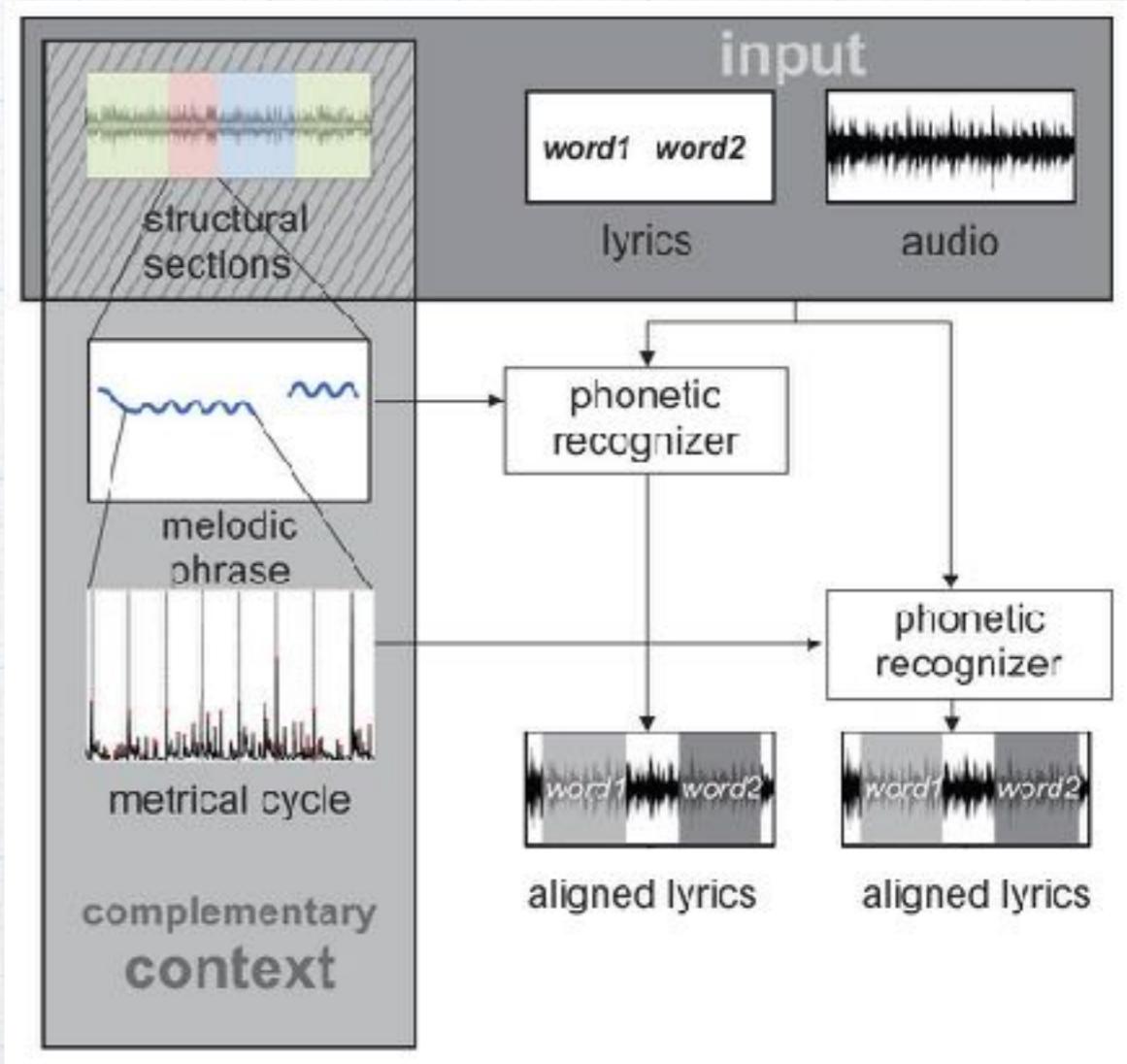
My research: Automatic lyrics-to-audio alignment

- * inputs: waveform + lyrics
- * output: timestamps of words

My research: Automatic lyrics-to-audio alignment

- * inputs: waveform + lyrics
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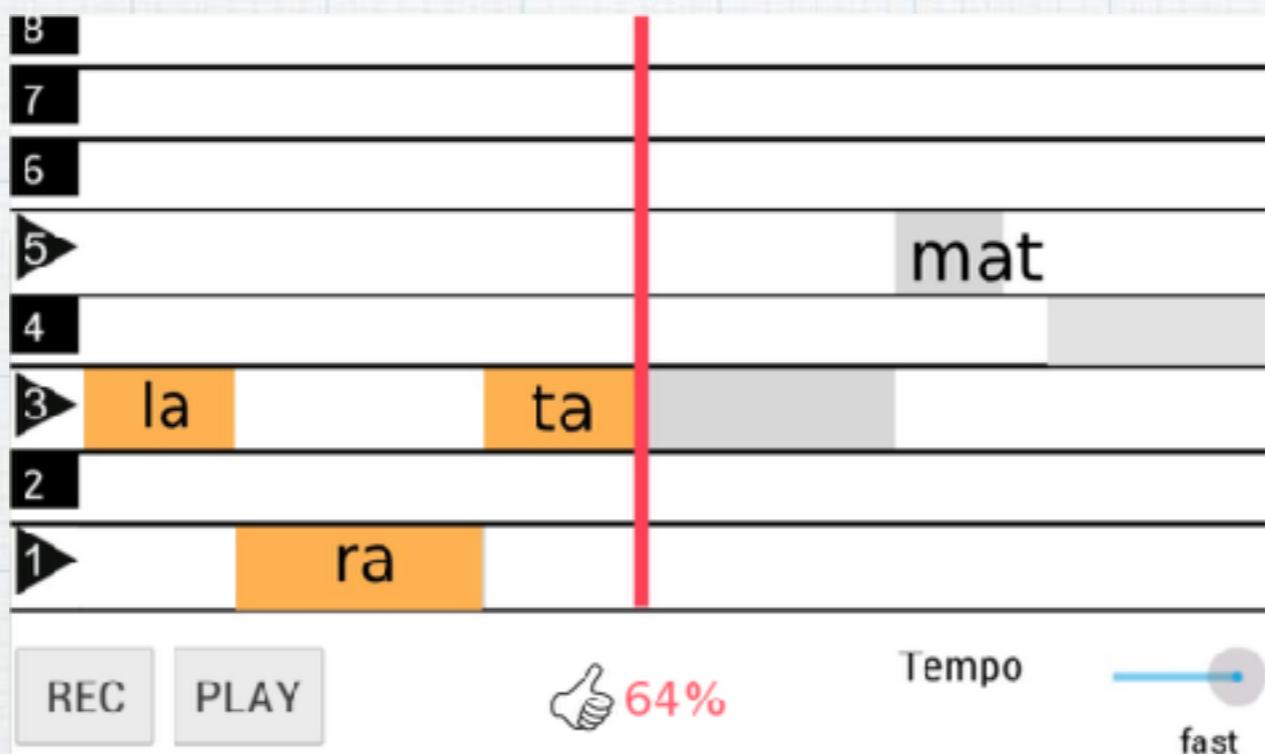
<https://vimeo.com/169459368>



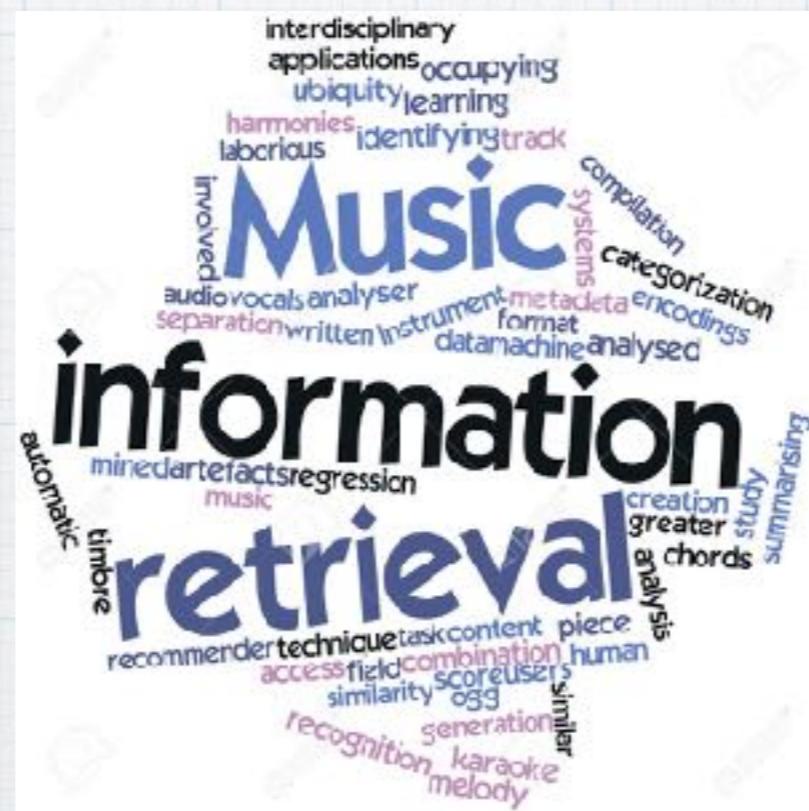
tunePuzzle: music game

* demo: <https://vimeo.com/202084560>

Sing Master: learning singing by karaoke



Q & A



slides about freesound.org courtesy of Frederic Font

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