“Music 2.0: Music and the (Semantic) Web (2.0)”

Music recommendation and discovery... in which Web?

Òscar Celma (Music Technology Group, UPF)
music recommendation and discovery...in which web? :: òscar celma. aes 122 vienna workshop

outline

• introduction
  ◆ motivation
  ◆ music recommendation
  ◆ music discovery
  ◆ the (musical) semantic gap

• web 2.0
  ◆ music context
  ◆ music recommendation and discovery
  ◆ the (musical) semantic gap

• semantic web
  ◆ music context
  ◆ music recommendation and discovery
  ◆ the (musical) semantic gap
introduction:: motivation

• in recent years the typical music consumption behavior has changed dramatically

• personal music collections have grown thanks to improvements in:
  - networks, storage, portability of devices, Internet services and peer-to-peer networks
introduction:: motivation

• in recent years the typical music consumption behavior has changed dramatically

• personal music collections have grown thanks to improvements in:
  - networks, storage, portability of devices, Internet services and peer-to-peer networks

⇒ the way users search, find, and discover new music has changed too!
**introduction:: motivation**

- in recent years the typical music consumption behavior has changed dramatically
- personal music collections have grown thanks to improvements in:
  - networks, storage, portability of devices, Internet services and peer-to-peer networks

⇒ the way users **search**, **find**, and **discover** new music has changed too!

⇒ but...the recommendation algorithms are **still** the same, and there’s a **lack** of tools for music discovery
introduction: music recommendation

- personalized choice assistance playlist
  user profile interests filtering large music collections
  semantic audio analysis social media user preferences mates
introduction:: **music recommendation**

- personalized *choice assistance* playlist
  
  user profile interests filtering *large music collections*

  semantic audio analysis *social media* user preferences mates

⇒ *it is* *impossible* to be up-to-date of the potentially interesting new music
music recommendation and discovery... in which web? :: òscar celma. aes 122 vienna workshop

Introduction:: music recommendation

- personalized choice assistance playlist
- user profile interests filtering large music collections
- semantic audio analysis social media user preferences mates

⇒ it is impossible to be up-to-date of the potentially interesting new music
⇒ moreover, deal with the looooong tail effect...

“IF YOU LIKE BRITNEY, YOU’LL LOVE...”

Just as lower prices can entice consumers down the Long Tail, recommendation engines drive them to obscure content they might not find otherwise.
introduction:: music discovery

• anonymous laid-back podcasting browsing hype-machine
serendipity sunday evening social media mp3-blogs
music recommendation and discovery...in which web? :: òscar celma. aes 122 vienna workshop

introduction:: music discovery

• anonymous laid-back podcasting browsing hype-machine
  serendipity sunday evening social media mp3-blogs

• (vs. music recommendation):
  personalized choice assistance playlist
  user profile interests filtering large music collections
  semantic audio analysis social media user preferences mates
• explore the **long tail**, by means of (content-based) audio similarity
introduction:: music discovery:: long tail

• now, let’s see a video...
introduction:: music discovery:: long tail

• Bruce Springsteen
  ❖ # total songs played in last.fm = 4,172,964
  ❖ # plays for “Better days” (seed song) = 26,865

• The Rolling Stones
  ❖ # total songs played in last.fm = 8,653,621
  ❖ # plays for “Mixed emotions” (similar song) = ~1,000

• Mike Shupp
  ❖ # total songs played in last.fm = 312
  ❖ # plays for “Letter to Annette” (similar song) = 0?

(BTW, applying CF we would never reach him!)
introduction: the (musical) semantic gap
introduction:: the (musical) semantic gap

• bottom-up approach
  v signal/audio processing
  v machine learning
  ⇒ no context at all
• top-down approach
  v free
    ▪ users’ annotations
    ▪ folksonomies/persononomies
  v controlled
    ▪ ontologies
    ▪ taxonomies
**Introduction:** the (musical) semantic gap

- **bottom-up approach**
  - extracting mid-level features from the audio, text, and images
  - but...are these descriptors close enough to the user?
introduction: the (musical) semantic gap

• top-down approach
  ❖ users’ annotations (tagging)
    ▪ last.fm
    ▪ new audio games (similar to ESP for labeling images)
      ❖ majorminer.com
      ❖ listengame.com
  ❖ ontology-based
    ▪ defining concepts of your domain
music recommendation and discovery... in which web? :: òscar celma. aes 122 vienna workshop

outline

• introduction
  ✤ motivation
  ✤ music recommendation
  ✤ music discovery
  ✤ the (musical) semantic gap

• web 2.0
  ✤ music context
  ✤ music recommendation and discovery
  ✤ the (musical) semantic gap

• semantic web
  ✤ music context
  ✤ music recommendation and discovery
  ✤ the (musical) semantic gap
web 2.0: introduction

- folksonomies
- social networks
- personomies
- JSON
- tag cloud
- web syndication
- del.icio.us
- RSS
- JavaScript
- Atom
- AJAX
- flickr
- google maps
- eventful
- mashup
- wiki
- last.fm
- blogging
- XML
- OpenAPI
- communities
- CSS
outline

• introduction
  - motivation
  - music recommendation
  - music discovery
  - the (musical) semantic gap

• web 2.0
  ⇒ music context
  - music recommendation and discovery
  - the (musical) semantic gap

• semantic web
  - music context
  - music recommendation and discovery
  - the (musical) semantic gap
web 2.0: music context

- **tagging music collections**
  - folksonomies / persononomies
    - tag clouds
  - ease navigation of large music collections

- **geographic information**
  - my digital collection in a map
  - tracing routes (playlist generation)

- **mashups**
  - based on content syndication from music related sites

- **collaborative efforts for editorial data** (vs. AMG editors)
  - musicbrainz.org
  - musicmoz.org
web 2.0: **music context:: tagging**

- **tagging music collections**
  - folksonomies / persononies
    - tag clouds
web 2.0: music context: tagging

- tagging music collections
  - folksonomies / persononomies
    - tag clouds
  - based on the “wisdom of crowds”

but...what if the crowd becomes a herd? (i.e not that wise?)
web 2.0: music context: tagging

**The Dogs D’Amour** (read more)
38,560 plays scrobbled on Last.fm

The Dogs D’Amour are a sleaze rock band founded in 1983. The Dogs D’Amour went through various instrumentation changes over the years which has resulted in their sound shifting over time. Front man Tyla still leads the band as “Tyla & the Dogs D’Amour”. Their original style was a... (read more)

Listen Now (change settings)

**User Tags** (see more)
emo female vocalists hair metal hard rock metal punk rock rap rock

Weekly Top Listeners (see more)
1,933 listeners total

Related Journals (read more)
Mainstream by happydufus, 2 comments
Similar Artists by jewtunk, 1 comment
Animals by raison_deetre, 44 comments
Tyla does Area 51 by Diamond Dave
web 2.0:: music context:: tagging
music recommendation and discovery...in which web? :: òscar celma. aes 122 vienna workshop

web 2.0: **music context:: tagging**

- tagging music collections
  - automatically extracted from the ID3 metadata

![SearchSounds](image-url)
web 2.0: music context: tagging

- tagging music collections
  - folksonomies / persononomies
    - tag clouds
  - based on the “wisdom of crowds”

but…what if the *crowd* is only a few thousands users?
“wisdom of crowds”

- but...what if the crowd is only a few thousands users? (scalability problems!)
- only partially annotated DB!
web 2.0: music context: tagging

• “wisdom of crowds”
  ❖ but... what if the crowd is only a few thousands users? (scalability problems!)
  ⇒ propagate tags based on audio similarity

(for this idea applies too for Pandora’s Music Genome Project effort)
from tagging to words and sentences
(example taken from Pandora):

- The Stranglers “Golden brown”
  - “This is folky, soft rock song that is calming and tender. It features horn section, acoustic guitar, organ, a nice acoustic guitar solo, and emotional, falsetto vocals. It is a song with an acoustic texture and with low energy that you might like listen to while going to sleep.”
web 2.0: music context:: tagging

• WAII’T!!! but...this is NOT from Pandora!
• it is automatically generated based on audio analysis and semantically meaningful words!!!
  ♦ The Stranglers “Golden brown”
    ▣ “This is folky, soft rock song that is calming and tender. It features horn section, acoustic guitar, organ, a nice acoustic guitar solo, and emotional, falsetto vocals. It is a song with an acoustic texture and with low energy that you might like listen to while going to sleep.”
  ♦ (from the guys at Computer Audition Laboratory, San Diego. http://cosmal.ucsd.edu/cal)
web 2.0: music context: maps

- geographic information
  - my iTunes music collection in a world map
  - trace routes (playlist generation)
music recommendation and discovery...in which web? :: òscar celma. aes 122 vienna workshop

web 2.0:: music context:: maps

- (part of) my iTunes music collection in a map
  - colours are genres
  - size could be based on listening habits
music recommendation and discovery...in which web? :: òscar celma. aes 122 vienna workshop

web 2.0:: music context:: maps

• tracing routes for playlist generation
outline

• introduction
  - motivation
  - music recommendation
  - music discovery
  - the (musical) semantic gap

• web 2.0
  - music context
    ⇒ music recommendation and discovery
  - the (musical) semantic gap

• semantic web
  - music context
  - music recommendation and discovery
  - the (musical) semantic gap
web 2.0: music recommendation

• what is more important in (web2.0) music recommendation?
  ▶ the artists’ recommendations, playlists, etc.?
  ▶ ...or, being part of a community, the social network interaction, meet people, etc.?
web 2.0: music recommendation::issues

- context awareness
  - different profiles of a user
    - work
    - home (I use to play some tunes for my child!)
  - location
  - mood
  - time (morning, evening, late night, etc.)
  - ...

- a complete user profile? (exploit web 2.0!)
  - (i.e not only tracking listening habits, explicit rating, demographic information, etc., but...)
  - user’s accounts (del.icio.us, flickr, youtube, blogger, livejournal, etc.)
  - user’s blog entries
  - ...

music recommendation and discovery...in which web? :: òscar celma. aes 122 vienna workshop
web 2.0: music discovery

• exploiting information from mp3-blogs
  v hypem.com (hype machine)
  v searchesounds.net

• mashups
  v www.musicportl.com
    ▪ artist related info (wikipedia, flickr, youtube, amazon, iTunes, etc.)
  v www.sleevenotez.com
    ▪ last.fm + artist related info (wikipedia, flickr, youtube, amazon, iTunes, etc.)
  v lasttv.net
    ▪ last.fm + youtube
  v www.snappradio.com
    ▪ last.fm (or radioparadise.com) + flickr
  v ...and lots more! (don't forget to try Yahoo! Pipes...)
web 2.0: music discovery:: mp3-blogs

- exploiting information from mp3-blogs
  - hypem.com (hype machine)
  - searchesounds.net
web 2.0: music discovery:: mp3-blogs
web 2.0: music discovery:: mp3-blogs

- searchesounds
  - exploits MP3-blogs
    - analyse text (keyword based search)
    - analyse audio (navigate through the audio space similarity)
now, let’s see a video

- keyword search “traditional Irish”
  - get relevant blog entries (plus its audio links)
- navigate through the audio similarity space
  - get most similar audios
outline

• introduction
  ❖ motivation
  ❖ music recommendation
  ❖ music discovery
  ❖ the (musical) semantic gap

• web 2.0
  ❖ music context
  ❖ music recommendation and discovery
    ⇒ the (musical) semantic gap

• semantic web
  ❖ music context
  ❖ music recommendation and discovery
  ❖ the (musical) semantic gap
web 2.0: the (musical) semantic gap

• (informal) top-down approach
  - users set the *meaning* to the content, via tagging
  - “wisdom of crowds” idea

• but…metadata has *no formal* meaning
  -difficults the data *integration* of different sources (e.g. musicbrainz, cdbaby, magnatune, jamendo, garageband, etc.)
  -…is *semantic web* a possible solution?
outline

• introduction
  - motivation
  - music recommendation
  - music discovery
  - the (musical) semantic gap

• web 2.0
  - music context
  - music recommendation and discovery
  - the (musical) semantic gap

• semantic web
  - music context
  - music recommendation and discovery
  - the (musical) semantic gap
music recommendation and discovery... in which web? :: òscar celma. aes 122 vienna workshop

**semantic web:: introduction**

- linked data rest **rdf** xml jena redland **sparql** rss1.0 **ontologies**
- graph **subject-predicate-object** skos owl **w3c** timbl
- foaf **rdf/a** music ontology grddl http303 content-negotiation
• the (in)famous stack
• some comments (about the upper layers of the stack)
  
  - **Dave Beckett** (http://journal.dajobe.org)
    - “The semantic web is: a webby way to link data. That is all.”
  
  - **Jim Hendler** (http://www.mindswap.org/blog/2006/12/13/the-dark-side-of-the-semantic-web/)
    - “(...) in short, [a web of data] is the Semantic Web vision of Tim’s, before Ora and I polluted it with all this ontology stuff”
semantic web: introduction

- so...the actual reality is this?

from: danbri (http://www.flickr.com/photos/danbri/428172848/)
music recommendation and discovery...in which web? :: òscar celma. aes 122 vienna workshop

semantic web:: music recommendation

**foafing the music: web 2.0 + semweb**

- "Bridging the semantic gap in music recommendation" 😊
- **music information from thousands of RSS feeds**
  - new album releases, podcast sessions, audio from MP3 blogs, news about artists and upcoming concerts
- **music recommendation and discovery by means of:**
  - user profiling (derived from the user's FOAF profile)
  - context based information (extracted from music related RSS feeds and available APIs)
  - content based descriptions (extracted from the audio itself)
- **consolidated using a simple ontology (OWL DL) that describes (part of) the music domain**
  
  *(N.B: see Yves' talk about THE Music Ontology...)*
- **won the 2nd prize of the Semantic Web Challenge 2006**
semantic podcast

• discover music available *inside* podcasts (i.e. a long mp3 file)
  - automatic speech/music discriminator
  - temporal description of the podcast contents
• based on the Music Ontology proposal
semantic web: the (music) semantic gap

- top-down approach
  - domain ontologies (RDFS, OWL) / taxonomies (SKOS)
  - formalization of user profiles (FOAF)
final conclusions

• there is only one web!
• semweb hand in hand with web2.0
• music+semweb still at research stages? (see Yves’ talk to find a reasonable answer...)
the end...

- Gràcies!
- Danke schön!
- Thanks!
:: Workshop ::
“Music 2.0: Music and the (Semantic) Web (2.0)”

Music recommendation and discovery... in which Web?

Òscar Celma (Music Technology Group, UPF)
email: oscar.celma@iua.upf.edu
http://mtg.upf.edu/~ocelma

AES 122 Vienna. Austria Center Vienna, May, 6th. 2007