In Search of the Goosebump Factor
A Blueprint for Emotional Music Recommenders

Stephan Baumann
Competence Center Computational Culture (C4)
German Research Center for AI (DFKI)
WHY?
IS IT POSSIBLE?
I DON'T KNOW ...
MAYBE IT IS TOO EGOCENTRIC?
Reviews

All Music Guide

*Riot on an Empty Street* ends a long period of inactivity for Kings of Convenience. During their three-year layoff Erland Øye could be found making solo records and DJing while Eirik Glambeck Boe was finishing his psychology degree. Luckily for fans of beautiful vocals and thoughtful indie pop, they decided to get back together. What this band is all about is the sound of Boe and Øye's voices blended together in harmony. Their first album (in both incarnations) rerouted on the side of consistency. Here the band seems to have learned the all-important lesson of pace and variety. The arrangements are fuller too with pianos, strings, the occasional electric guitar, and lovely guest vocals on two tracks from Broken Social Scene member Leslie Feist. Not to say that they have gone crazy with change. They still stick pretty closely to the acoustic guitars and vocals path, and the tone of the album is autumnal and restrained as before. They have just added more songs like the gently driving "Misread," the lilting waltz "Stay Out of Trouble," and the downright peppy "I'd Rather Dance With You." Øye's side trip into electronica only rears its head on the non-electronic but modern-sounding "Love Is No Big Truth." No matter what the song, though, when their tender, fragile voices harmonize it can be breathtaking. And heartbreaking. The moment in "Surprise Ice" when Eirik is joined by Erland will raise goose bumps. There are many others like that on *Riot*, and they are what sells the record. If you sort of liked the first record but wished it was more interesting, that it had more punch of both the sonic and emotional variety, then your wishes have come true. *Tim Sendra*
NO!
It's something like „xtreme longtailing“
Story #1: „a short episode of my evolving musical identity“

1) 2002: my first ISMIR at IRCAM!
2) 2003: invited MIR Research at IRCAM
3) Buying Hotel Costes Vol.1 at FNAC
4) 2005: Buying Hotel Costes Vol.8
5) The Think Twice Tune of Ralph Myerz got me in ...
6) Buying Ralph Myerz at Amazon
7) Googling Ralph Myerz
8) Exploring the official Website
9) Spotting the next concert and venue
10) Checking friends in Oslo
11) Booking tickets
12) Booking airplane
13) 2006: Visiting gig
14) Taking images
15) Uploading images to Flickr with tags
16) Writing a blog posting
17) Writing a forum posting with link
18) Norwegian and belgian traffic comes in
19) Receiving an email of „el presidente“
20) Chatting about fandom
21) Receiving the exclusive promo DVD
Semantics of context, content, ...

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Story #2: „a long episode of my evolving musical identity“

- 1972 Organ lessons, experiences with music notation and fun
- 1977 - 1981 Self-taught piano player
- 1982 - 1993 Cover bands, Soul Funk Jazz, Level42, Chic, Commodores
- 1994 Frustration, the keyboard player as a sidekick phenomenom
- 1997 - 2005 Several projects, HipHop, Lounge, Jazz, leisure time only
- 2005 Bass lessons
- The Sting 57 Precision Re-Issue
- Buying a used bass at EBAY
- Annual Music School Concert for the proud parents/kids
- Leadsheet „Nur ein Wort“ / Wir sind Helden
- Buying the CD
- Playing a cover version live
- 2006 Meeting: Wir sind Helden at an openhouse event
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STRONG EXPERIENCES OF MUSIC
[Sloboda 1985-2001]
[Gabrielson 1989-2000]
[Schönberger 2003]
Some new empiric findings from a neglected area of musicpsychological research

[Schönberger2003]

<table>
<thead>
<tr>
<th>Sample population:</th>
<th>193 persons (age of 16 to 60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td>95 male</td>
</tr>
<tr>
<td>Musical training:</td>
<td>78 no</td>
</tr>
<tr>
<td></td>
<td>98 female</td>
</tr>
<tr>
<td></td>
<td>115 yes</td>
</tr>
</tbody>
</table>

Findings in this study:
- 91% of the sample report about having SEMs experienced
- SEM is not depending on musical training
- Female persons are more sensitive to the experience of SEM (higher „thrillpeaks“)
- Structural features in the music often trigger the SEM (for classic and pop/rock)
  - e.g. harmony descending cycle of fifth to tonic
  - e.g. sudden dynamic or textural change (contradicting the expectation)
- Lyrics and personal memories trigger the SEM especially for pop/rock
- Social setting is important, most of the SEM reports refer to a „live situation“
- 60% seek for SEM to happen when listening to music!
Songs

- Edel, Billy
- Jackson, Michael
- Jamiroquai
- Jamiroquai
- Kelly Family
- Kelly, M.
- Kasimatis
- Korn
- Kovanent, The
- Kruder & Dorfmeister
- Lachrimosa
- Larem, John
- Lennex, Anne
- Les Negromoses Vantes
- Life Of Agony
- Lindenberg, Udo
- Lindeski, Linda
- Lonestar
- Lopez, Jennifer
- Makeba, Miriam
- Mano Negra
- Manowar
- Manu Chao
- Marley, Bob
- Massia, Addis
- Massive Attack
- May, Brian
- McKeown, Loreena
- Meatloaf
- Meshuggah
- Matheny, Pat
- May, Reinhard
- May, Reinhard

Sem Reports

28)
Ich kann nicht sagen, welches das intensivste überhaupt war, da die Erinnerung bekanntlich erneut verzeichnet. Aber bei den meisten handelte es sich um Konzerte, bei denen ich selbst mitwirkte und jemand anders ein Solo spielte.

29)

30)

31)

32)

(contains the complete data collection, but available only in german!)
OUR PREVIOUS WORK
[Ph.D, ISMIR 2002-2005]
MIR Ph.D: Artificial Listening Systems [Baumann 2002-2005]
"I am not interested in lyrics in general, because my English is too bad to understand something" (remark: German native-speaker)
"I know all these recommendations from title, I don’t have to listen to it, which saves my time"

"The sound similarity is really impressive, on its own it is able to deliver songs I did not know before which fit my taste"
"After a while I got used to this and played around just like browsing into music"

"I used the lyric facet to get more interesting results beyond the mainstream"
"by adding a lyrics a bit, the results get more interesting"
MIR 2007 ROCKS ...

### Audio Mood Classification

<table>
<thead>
<tr>
<th>Rank</th>
<th>Participant</th>
<th>Avg. Raw Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tzanetakis, G.</td>
<td>61.50%</td>
</tr>
<tr>
<td>2</td>
<td>Laurier, C.</td>
<td>60.50%</td>
</tr>
<tr>
<td>3</td>
<td>Lidy, Rauber, Pertusa &amp; Iñesta</td>
<td>59.67%</td>
</tr>
<tr>
<td>4</td>
<td>Mandel &amp; Ellis</td>
<td>57.83%</td>
</tr>
<tr>
<td>5</td>
<td>Mandel &amp; Ellis (spec)</td>
<td>55.83%</td>
</tr>
<tr>
<td>6</td>
<td>IMIRSEL (svm)</td>
<td>55.83%</td>
</tr>
<tr>
<td>7</td>
<td>Lee, K. (1)</td>
<td>49.83%</td>
</tr>
<tr>
<td>8</td>
<td>IMIRSEL (knn)</td>
<td>47.17%</td>
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<tr>
<td>9</td>
<td>Lee, K. (2)</td>
<td>25.67%</td>
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### Audio Onset Detection

<table>
<thead>
<tr>
<th>Rank</th>
<th>Participant</th>
<th>Avg. F-1 Measure</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Zhou &amp; Reiss</td>
<td>0.818</td>
</tr>
<tr>
<td>2</td>
<td>Lee, Shu &amp; Kuo (0.3)</td>
<td>0.802</td>
</tr>
<tr>
<td>3</td>
<td>Lee, Shu &amp; Kuo (1.0)</td>
<td>0.790</td>
</tr>
<tr>
<td>4</td>
<td>Lee, Shu &amp; Kuo (2.0)</td>
<td>0.780</td>
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<tr>
<td>5</td>
<td>Lee, Shu &amp; Kuo (3.0)</td>
<td>0.769</td>
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<td>6</td>
<td>Lee, Shu &amp; Kuo (4.0)</td>
<td>0.753</td>
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<td>7</td>
<td>Lee, Shu &amp; Kuo (5.0)</td>
<td>0.734</td>
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<tr>
<td>8</td>
<td>Lee, Shu &amp; Kuo (6.0)</td>
<td>0.717</td>
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<tr>
<td>9</td>
<td>Lee, Shu &amp; Kuo (7.0)</td>
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### Audio Genre Classification

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<th>Avg. Raw Accuracy</th>
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<tr>
<td>1</td>
<td>IMIRSEL (bytem)</td>
<td>68.29%</td>
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<td>2</td>
<td>Lidy, Rauber, Pertusa &amp; Iñesta</td>
<td>53.77%</td>
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<td>3</td>
<td>Mandel &amp; Ellis</td>
<td>51.46%</td>
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<td>4</td>
<td>Mandel &amp; Ellis (spec)</td>
<td>49.46%</td>
</tr>
<tr>
<td>5</td>
<td>IMIRSEL (knn)</td>
<td>49.00%</td>
</tr>
<tr>
<td>6</td>
<td>Lidy, Rauber, Pertusa &amp; Iñesta</td>
<td>45.46%</td>
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<tr>
<td>7</td>
<td>Lidy, Rauber, Pertusa &amp; Iñesta</td>
<td>43.00%</td>
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### Audio Classical Composer Identification

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<th>Avg. Raw Accuracy</th>
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<tbody>
<tr>
<td>1</td>
<td>PhysioSim &amp; Klagvart</td>
<td>0.540</td>
</tr>
<tr>
<td>2</td>
<td>Yeoh, C.</td>
<td>0.529</td>
</tr>
<tr>
<td>3</td>
<td>Iwanski, K.</td>
<td>0.509</td>
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### Multi F0 Estimation

<table>
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<tr>
<th>Rank</th>
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<tbody>
<tr>
<td>1</td>
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<td>0.509</td>
</tr>
</tbody>
</table>

### Audio Cover

- Non-compaction
- Robustness
- Tolerance

Results incrementally useful for failures

- Library dependency issues
- Pre-compiled MEX files not running
- JAVA object serialization/de-serialization issues
- Low quality and trustworthiness of the metadata for music
- General shortage of new test sets
- Effectively managing results output: From standard out to Wiki
Papers related to sociological findings at ISMIR2007

[McEnnis, Daniel ; Cunningham, Sally Jo]
Sociology and Music Recommendation Systems

[Lee, Jin Ha ; Downie, J. Stephen ; Jones, M. Cameron]
Preliminary Analyses of Information Features Provided by Users for Identifying Music

[Cunningham, Sally Jo ; Bainbridge, David ; McKay, Dana]
Finding New Music: A Diary Study of Everyday Encounters with Novel Songs

Papers related to mood categorization/classification/detection at ISMIR2007

[Hu, Xiao ; Bay, Mert ; Downie, J. Stephen]
Creating a Simplified Music Mood Classification Ground-Truth Set

[Hu, Xiao ; Downie, J. Stephen]
Exploring Mood Metadata: Relationships with Genre, Artist and Usage Metadata

[Govaerts, Sten ; Corthaut, Nik ; Duval, Erik]
Mood-ex-Machina: Towards Automation of Moody Tunes

[Skowronek, Janto ; McKinney, Martin F. ; van de Par, Steven]
A Demonstrator for Automatic Music Mood Estimation
BUT THIS IS NOT ENOUGH!
HOW-TO
THE BLUEPRINT

1 SOCIAL CONTEXT
2 IN SPACE AND TIME
3 IN „FIRSTLIFE
4 EMBEDDED MIR
5 KNOWLEDGE BASE
6 QUANTITATIVE EVALUATION
SOCIAL CONTEXT: Blogs & Lifestreams aggregated in WhoAmI
Welcome Tobi - who are you?

Your Accounts (5): &nbs; &nbs; &nbs; &nbs; &nbs;

Your Lastfm - TobiTobes - Items: 324 - 150 are valid  edit  delete


All Vagues live

All Artists peeping tom bloc party arctic monkeys kaiser chiefs the subways blink-182 billy talent jojo kraus the streets john lee hooker battles maria mckee the chemical brothers the lives h-blockx mo horizons moby the smiths red hot chili peppers the presidents of the united states of america the raconteurs tari amos buena vista social club pixies coldplay pulp zwan no fun at all st. germain aphex twin big bad voodoo daddy the john butler trio réyksopp therapy? cake pearl jam genesis ryan adams baccic
Welcome Tobi - who are you?
Your Accounts (5):  

Mardy Bum - 14:00 03.06.2007
Arctic Monkeys
Whatever People Say I Am, That's What I'm Not

All Links
http://www.last.fm/music/arctic+monkeys/~/mardy+bum

All Artists arctic monkeys

related items
• via Artists:

• via Items after:
Welcome Tobi - who are you?

Your Accounts (5): 

This Is Hardcore - 13:00 24.12.2006
Pulp
Hits

All Links http://www.last.fm/music/pulp/album/this+is+hardcore

All Artists pulp

related items

• via Artists:

• via Items after:
Welcome Tobi - who are you?
Welcome Stephan - who are you?

Your Accounts (4): 📜 📜 📜 📜

Matthew Herbert in Mannheim 2006 - 15:49 11.10.2006 Incredible live show of matthew herbert

- Notes:
  - matthew
  - herbert
  - live
  - 2006
  - torpedo
  - love
  - lovers
  - you

- Locations:
  - mannheim

- Links:
  - http://www.youtube.com/?v=gunSPki2Yvo

Relations

- via Notes:

- via Locations:

- via Items after:

- via Items before:
2 IN SPACE AND TIME: GPS as used in CatchMeIfYouCan
CAN YOU SEE THEM?
> START RUNNING!

PLAY >>> CATCH ME IF YOU CAN <<< VIA YOUR MOBILE PHONE! JUST CALL 555-7378
3 IN ,,FIRSTLIFE: Physical proximity via bluetooth using BluetunA
BluetunA-on-the-go

(1) Download application

(2) Set up profile
   by ID3tags (automatic)
   by last.fm (connect)
   by offer&seek
   by flickr (connect)

(3) Search for people
    match of profiles

(4) Limits
    server XOR client mode
    8 connections in parallel
Profile: light
Profile: last.fm import
4 EMBEDDED MIR: Incremental Machine Learning with JGenre, Lyrics via LyricsWiki
<table>
<thead>
<tr>
<th>File</th>
<th>Genre</th>
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<tr>
<td>E\TEST\MP\3\myTest (short)01</td>
<td>R&amp;B - Nelly Furtado feat. Erich Ligg - R&amp;B</td>
</tr>
<tr>
<td>E\TEST\MP\3\myTest (short)01</td>
<td>R&amp;B - Timbaland feat. Nelly Furtado - R&amp;B</td>
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<tr>
<td>E\TEST\MP\3\myTest (short)01</td>
<td>Rock - Alice Cooper - Poison.mp3 - Rock</td>
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<tr>
<td>E\TEST\MP\3\myTest (short)01</td>
<td>Rock - Belinda Carlisle - Leave a little Rock</td>
</tr>
<tr>
<td>E\TEST\MP\3\myTest (short)01</td>
<td>Soundtrack - James Newton Howard - Soundtrack</td>
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<tr>
<td>E\TEST\MP\3\myTest (short)01</td>
<td>Soundtrack - O.S.T Meat Joe Blo - Soundtrack</td>
</tr>
<tr>
<td>E\TEST\MP\3\myTest (short)01</td>
<td>Trance - Cascada - A Neverending... Trance</td>
</tr>
<tr>
<td>E\TEST\MP\3\myTest (short)01</td>
<td>Trance - Mario Lopez - Always &amp;... Trance</td>
</tr>
</tbody>
</table>

No Model loaded/learned yet.
Indeep: Last Night A Dj Saved My Life

Last night a deejay saved my life
Last night a deejay saved my life, yeah
'Cause I was sitting there bored to death
And in just one breath he said
'Yeah, you got up, you got up, you got down girl?'
You know you drove me crazy, baby
You got me turnin' to another man

Called you on the phone no one's home
Baby, why you leave me all alone
And if it wasn't for the music
I don't know what I'd do, yeah

Last night a deejay saved my life
Last night a deejay saved my life from a broken heart
Last night a deejay saved my life
Last night a deejay saved my life with a song
You know I hopped into my car, didn't get very far, no
Because I had you on my mind, why be so unkind
You got your women all around, all around this town
But I was trapped in love with you and I didn't know what to do
But when I tuned on my radio
I found out all I needed to know
Check it out.
Last night a deejay saved my life
Last night a deejay saved my life from a broken heart
Last night a deejay saved my life
Last night a deejay saved my life with a song
5 KNOWLEDGE BASE: Crowdsourcing using the GooseMe/Web2.0 site
GooseMe: Collecting SEMs in a Web2.0 fashion [public Beta soon]
6 QUANTITATIVE EVALUATION: Goosebumps using Goosecam ©
Quantitative evaluation

Prof. Kaernbach / University of Kiel

- Quantitative methods: Optical recordings of goosebumps
- Goosecam ©
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THE BLUEPRINT

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6 QUANTITATIVE EVALUATION (Goosebumps: Goosecam ©)
Thanks to all the contributors ...