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Novel Interactive Music Search Techniques

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- **A Novel Approach to Hybrid Music Search**
- **GlobalMusic2one**
 - Objectives
 - Architecture
- **Statistical Text Analysis of Music Descriptions in the Web**
- **NIMS**
 - Objectives
 - Architecture
 - Interactivity and Visualization
- **FireMatcher - Find Matching Documents**
- **Conclusion**
 - Summary
 - Future Developments

- **Automatically Computed Content-based music similarities often do not represent the perception of human listeners (semantic gap)**
- **Well-known Web 2.0 services rely on user tagging to categorize music (e.g. Last.fm, iLike)**
 - *Complex statistical analysis on the tags is needed*
 - *Drawback: New content cannot be easily recommended because of missing attributions (cold start problem)*
- **Both approaches can benefit from each other**
- **Idea: Enhance the quality of music search and recommendation by combining these approaches and semantically analyzing textual descriptions on music in the Web**

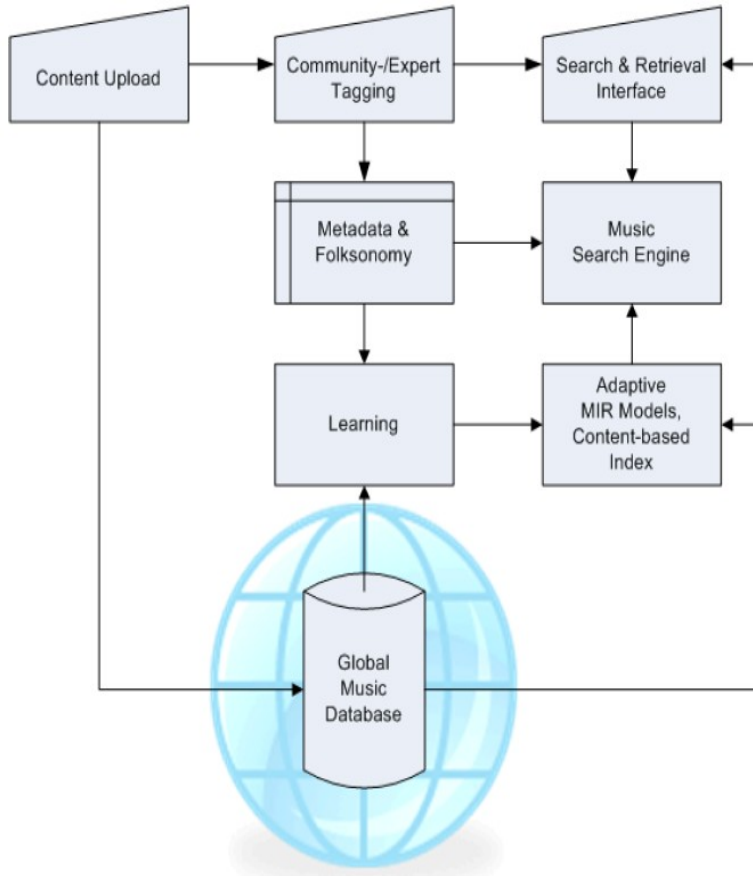
■ GlobalMusic2one

- *Project develops new adaptive methods for hybrid music search and recommendation of global music content*
- *Funded by the German Federal Ministry of Education and Research*
- *Participating members: Bach Technology GmbH, Fraunhofer Institute for Digital Media Technology (IDMT), Piranha Musik & IT AG and 4FriendsOnly.com Internet Technologies AG*

■ Objectives

- *Creation of a software system that users train by adding new musical categories and assigning them example songs*
- *Identify musical qualities (e.g. genre, tempo, mood) by automatic content analyzation (Fraunhofer IDMT)*
- *System should “learn” to recognize relationships of musical categories based on these training sets and musical qualities*
- *Get additional information on music content based on statistical Web document analysis*

Architecture



- **Search & Retrieval Interface**
 - Interactive website and visualization
 - Interactive assignment of musical categories
 - User feedback
- **Adaptive MIR Models, CB-Index**
 - Provides music similarity information based on automatic music classification and community/expert training sets
- **Hybrid Music Search Engine**
 - Combines folksonomy data and content-based music similarities
 - Returns search results and recommendations based on calculated hybrid music similarities
- **GlobalMusic2one Database**
 - Stores user profiles, content-based metadata, semantic categories...

■ Basic Idea

- *The World Wide Web contains a lot of freely accessible and descriptive information on music content (lyrics, discographies...)*
- *This knowledge from diverse sources presents a valuable and up-to-date resource to gather dynamically changing music trends and to obtain relationships between musical entities*
- *Music search engines most often only accept textual queries, the importance of this knowledge is therefore further underpinned when it comes to presenting appropriate search results*
- *Usage of statistical text analysis to gain this knowledge*

■ What to Expect from this Approach?

- *Automatically gather textual metadata on music*
- *Obtain semantic relationships between musical entities*
- *Sensibly complements methods for community-based and content-based music similarity analysis*

■ NIMS

- *First showcase project for this approach*
- *Was funded by the German Federal Ministry of Economics and Technology (2007-2008)*
- *Developed by 4FO AG in collaboration with the NLP (Natural Language Processing) department at the University of Leipzig*
- *Website: <http://www.potatosystem.com/nims>*

■ Objectives

- *Develop novel interactive multimedia search techniques based on text mining and statistical text analysis*
- *Collect musical metadata and transfer them to a music text corpus*
- *Calculate their significance and semantic relationships between them based on co-occurrence analysis*
- *Visualize them as a graph on an interactive website*
- *Embed matching commercial advertisements*

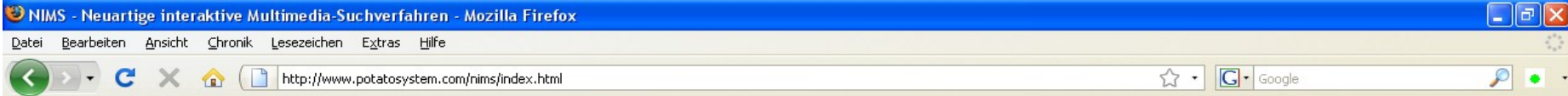
■ Interactive Website

- *Consists of a query input field, the interactive map, search history and commercial advertisements*

■ Interactive Map

- *Provides users a convenient way to navigate and zoom inside the graph of musical entities (here artist similarities)*
- *Well-known Google Maps API used for graph visualization*
 - *Widely accepted interface*
 - *Ajax support*
 - *“Custom-Maps“ allow to visualize third-party datasets*
- *Graph grows while the user explores it*
 - *Close nodes suggest high similarity*
 - *Graph calculated using a modified version of the Fruchterman-Reingold algorithm*
 - *Area around requested node is recalculated only*
- *Gimmick: Youtube videos of selected artists*

Visualization



NIMS - Neuartige interaktive Multimedia-Suchverfahren - (Beta)

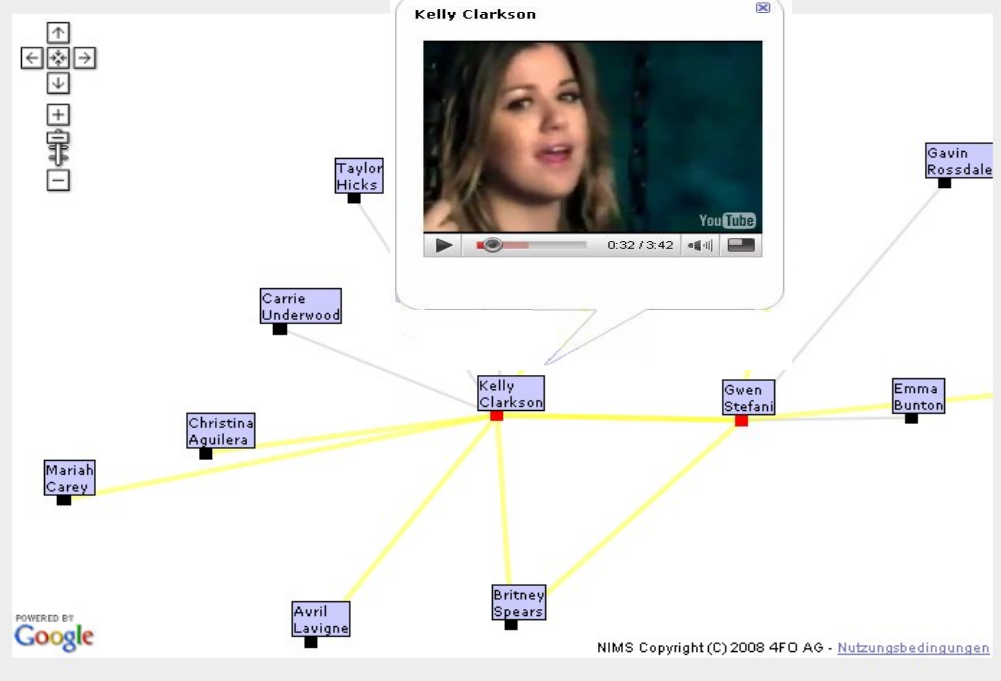
Musikempfehlungen zu Kelly Clarkson



- Never Again**
Kelly Clarkson
Nur EUR 7,99
Top-Preis EUR 6,76
- Over the Hump**
the Kelly Family
Top-Preis EUR 2,28
- Maximum Kelly Clarkson**
Kelly Clarkson
Nur EUR 25,99
Top-Preis EUR 6,84
- All I Ever Wanted**
Kelly Clarkson
Jetztvorbestellen!
Nur EUR 14,95
- All I Ever Wanted Deluxe Edition**
Kelly Clarkson
Nur EUR 17,95
Top-Preis EUR 12,99

Information

Bitte gib Deinen Lieblingskünstler ein:



Bisherige Sucheingaben:

Gwen Stefani Kelly Clarkson

Musikempfehlungen zu Kelly Clarkson



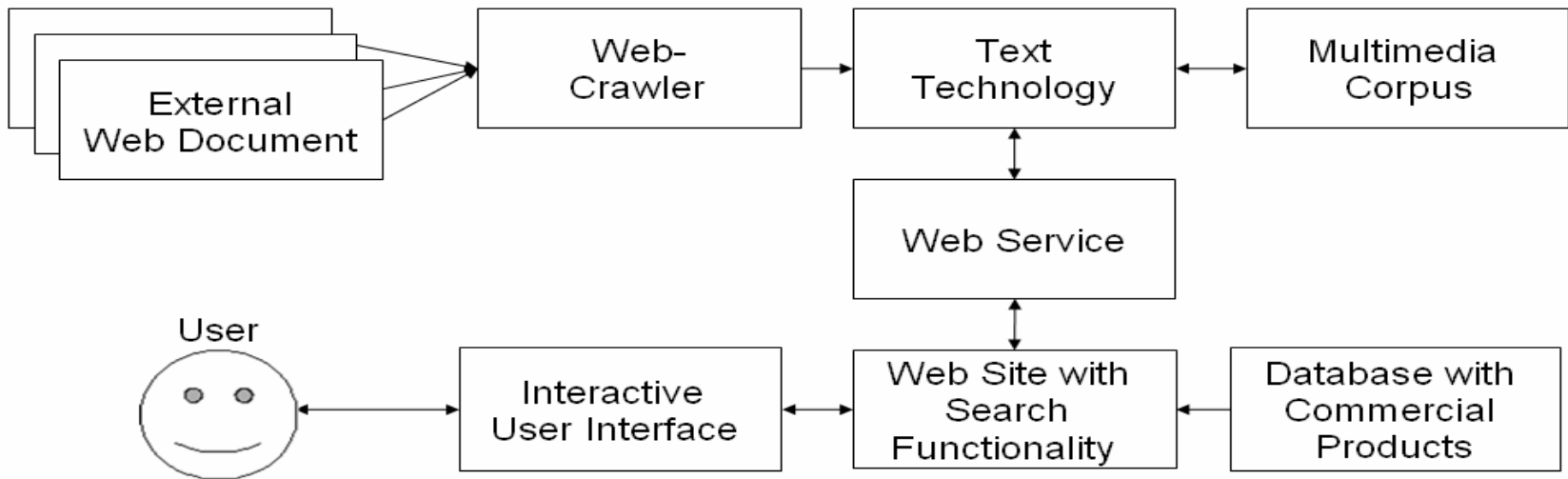
- Double Up**
R. Kelly
Nur EUR 6,90
Top-Preis EUR 3,81
- My Life Would Suck Without You**
Kelly Clarkson
Nur EUR 3,46
Top-Preis EUR 1,51
- Pickin on Kelly Clarkson**
Pickin on Kelly Cl...
Nur EUR 29,99
Top-Preis EUR 12,90
- Breakaway**
Kelly Clarkson
Nur EUR 9,97
Top-Preis EUR 6,00
- Tribute to Kelly Clarkson**
Various
Nur EUR 19,99
Top-Preis EUR 3,12

Information

Fertig

NIMS Copyright (C) 2008 4FO AG - Nutzungsbedingungen

Architecture



- **Webcrawler gathers freely accessible music descriptions in the Web**
 - **Also filters out unsolicited content as advertisements**
 - **Identifies relevant documents on music using a stopword list**
- **Text Technology (software Medusa) determines significant occurrences and significant co-occurrences of music entities**
 - **MusicBrainz Database used to further enhance the detection rate**
- **Components for statistical text analysis and graphical user interface interconnected by a Webservice**

■ Webservice

- *Provides a subset of previously calculated term frequencies and co-occurrences for an incoming query*
- *Returns them in form of XML formatted data*

■ Example query: Udo Lindenberg

- *Results descendingly ordered according to the query's distance*

```
<nims_service>
<cooccurrences search="Udo Lindenberg" search-freq="304" search-freq-class="7.27">
<coocc term="Peter Maffay" label="ARTIST" dist="19.44" freq="335" freq-class="7.13"/>
<coocc term="Herbert Grönemeyer" label="ARTIST" dist="40.17" freq="299" freq-class="7.29"/>
<coocc term="Inga Rumpf" label="ARTIST" dist="52.29" freq="48" freq-class="9.93"/>
<coocc term="BAP" label="ARTIST" dist="54.16" freq="200" freq-class="7.87"/>
<coocc term="Ton Steine Scherben" label="ARTIST" dist="73.98" freq="158" freq-class="8.21"/>
<coocc term="Frumpy" label="ARTIST" dist="76.78" freq="47" freq-class="9.96"/>
<coocc term="Nena" label="ARTIST" dist="81.97" freq="310" freq-class="7.24"/>
<coocc term="Truck Stop" label="ARTIST" dist="101.1" freq="54" freq-class="9.76"/>
<coocc term="Peter Herbolzheimer" label="ARTIST" dist="106.42" freq="74" freq-class="9.31"/>
<coocc term="Nina" label="ARTIST" dist="123.8" freq="2631" freq-class="4.09"/>
<coocc term="Bruce Springsteen" label="ARTIST" dist="131.87" freq="314" freq-class="7.22"/>
</cooccurrences>
</nims_service>
```

■ FireMatcher – Find Matching Documents

- *New Firefox Extension to search for similar documents*
- *Based on the text technology of NIMS*
- *Principle: User selects local documents or documents from the WWW, FireMatcher analyzes them and presents topically matching documents from the WWW*
- *Support filetypes: TXT, HTML, PDF, DOC and PPT*
- *Supported OSs: Windows and Linux*

■ Usage

- *Drag & Drop local documents or texts / links from webpages to the FireMatcher icon in the navigation bar*
- *OR: Click on the FireMatcher icon and select a local document*
- *OR: Analyze selected text on webpages (click in context menu)*

■ Download Beta Version

- <http://www.firematcher.com/>

■ FireMatcher – Demonstration

- [http://en.wikipedia.org/wiki/All_I_Ever_Wanted_\(album\)](http://en.wikipedia.org/wiki/All_I_Ever_Wanted_(album))



Select important terms from your document as a query (?):

Quick Search always On Off

Albums Chart **Billboard Hot** **Louis Biancaniello** **Ryan Tedder** **Kelly Clarkson**

Edition Bonus [Hide additional terms](#)

Sam Watters New Zealand Producer Length Writer Producer Ever album March

Clarkson Biancaniello link Billboard Chart Gone songs

Albums Chart Billboard Hot Louis Biancaniello Ryan Tedder Kelly Clarkson

Google™

Custom Search

Ads by Google

[Album Kelly Clarkson](#)

www.ebay.de Günstige CD-Angebote von A-Z finden Sie bei eBay supergünstig zum Kauf

Results 1 - 10 for **Albums Chart Billboard Hot Louis Biancaniello Ryan Tedder Kelly Clarkson**. (0.18 seconds)

[All I Ever Wanted \(album\) - Wikipedia, the free encyclopedia](#)

Clarkson worked with producer and OneRepublic front man, **Ryan Tedder**. ... "All I Ever Wanted", Sam Watters, **Louis Biancaniello**, Dameon Aranda, L. **Biancaniello**, S. Watters, 3:59 South African **Albums Chart**, 3. Austrian **Albums Chart**, 4 ... "**Kelly Clarkson** Breaks Record For **Hot 100** Jump". **Billboard**. ... [en.wikipedia.org/wiki/All_I_Ever_Wanted_\(album\)](http://en.wikipedia.org/wiki/All_I_Ever_Wanted_(album))

Google™

Custom Search

[Kelly Clarkson - All I Ever Wanted Album Review](#)

Label RCA Producer **Kelly Clarkson**, **Ryan Tedder**, Howard Benson, Max Martin, Lukasz Gottwald, Dre & Vidal, Sam Watters, **Louis Biancaniello** ... **Billboard Hot 100 Chart**: Black Eyed Peas - I Got A Feeling UK Singles **Chart**. ... www.musicloversgroup.com/kelly-clarkson-all-i-ever-wanted-album-review/

[Kelly Clarkson.All I Ever Wanted\[2009\]\[Deluxe Edition\]MP3@320kb ...](#)

18 Mar 2009 ... **Album** information **Clarkson** worked with producer and OneRepublic front ... that the single went from #97 to #1 on the **Billboard Hot 100**, ... "If I Can't Have You" **Kelly**

■ Summary

- ***Introduced GlobalMusic2one: Create new adaptive methods for hybrid music search and recommendation of global music content***
- ***New approach: Enhance music recommendations by gathering musical metadata from the WWW and determine their relationships by applying statistical text analysis***
 - ***Can complement methods for community-based and content-based music similarity analysis***
- ***NIMS is first showcase project for this approach***
 - ***Architecture outlined***
 - ***Visualization discussed***
- ***FireMatcher***
 - ***Further field of application for the text technology***
 - ***Finds similar documents in the Web***
 - ***Live demo***

- **Future Developments** (focus on text technology)
 - *Integrate the approach of NIMS in GlobalMusic2one*
 - *Evaluation of methods for the statistical analysis of textual annotations of musical entities provided by users*
 - *Challenge: Semantically interconnect mostly sparse data from users (only a few tags might be available) and find similar tags, content and users*
 - *Solutions:*
 - *Interpret tags of users as co-occurrences; similar tags have high significance co-occurrence value; find these tags with spreading activation approach (last year's FXResearcher)*
 - *Identify user communities with a similar taste by applying clustering algorithms (e.g. Flake's algorithm)*
 - *Further application scenarios:*
 - *Calculate expanded or associated queries*
 - *Suggest tags for not yet annotated content*

Thank you for your attention!



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Questions?