

Towards Enhanced User Interaction to Qualify Web Resources for Higher-layered Applications



qKAI (qualifying Knowledge Acquisition and Inquiry)
PhD research project at the Leibniz University of Hanover

Faculty of Electrical Engineering and Computer Science
Institute of Systems Engineering
System- and Computer Architecture

Outline

- Introduction
 - Context and subsumption
 - Prerequisites to embed distributed Web resources in knowledge transfer and learning
 - Focusing on assessing information quality (IQ)
- A three-level quality assessment model
- The second level: Enhanced user interaction to qualify resources
- Example: Relevance in tag-based image search
 - Game-based tag rating in folksonomies
 - On the concrete example of Flickr - an Web 2.0 photo sharing community - we will see how game-based rating interoperation as one example of enhanced interaction increases the images relevancy in folksonomies.
- Evaluation of our tag rating example using Flickr.
- Summary and outlook

Introduction: Context and subsumption

- qKAI project
 - The overall aim is to utilize distributed Web resources (especially Open Content) for knowledge transfer and learning.
- We have to provide standard tasks of knowledge engineering:
 - Acquisition, formalization, representation, visualization.
- **We have to determine and enhance the quality of content:**
 - Analyzes and enrichment of meta information is one important aspect regarding information quality.
 - User's opinion and knowledge can be used to annotate, rate and rank content.
 - **The more we know about a resource, the better we can reuse it.**
 - **We deploy information quality concepts as assessment tool.**
- We have to tackle extended interaction and incentive for user's attendance:
 - Deriving new user interaction scenarios based on Open Content.
 - Interoperation as possibility to deduce new knowledge,

Introduction: Quality of Content

- If we want to embed Web content into knowledge transfer and learning, the question about the quality of the data is indispensable.
- Information quality (IQ) can be utilized as a tool to derive personalization and user preferences in web-based information and knowledge systems, because it offers metrics to determine the “*fitness for use*” of autonomous, distributed resources.
- Currently, Web users are claiming for more sophisticated content and less triviality [3] – especially regarding Web 2.0 content.
- To utilize autonomous web resources, qualitative assessment of the broad information load becomes more and more important.
- Statements about the resources information quality (IQ) enhance its “*fitness for use*”.
- ... “*Information quality (iq) is one of the main discriminators of data and data sources on the Web. ... The autonomy of Web data sources renders it necessary and useful to consider their quality when accessing them and integrating their data.*” [1].

Introduction: Assessing information quality (IQ)

- Information quality is often described as “*fitness for use*” in the relevant literature.
- This implies that information quality is to a great extent subjective, because we have to mention multi-dimensional criteria
 - Depending on context, user preferences and tasks.
 - If we talk about information quality, we also talk about user preferences and personalization.
- Subjective dimensions of IQ must be assessed by the help of user interaction
 - User interaction can be basic, direct or indirect feedback.
- There is no absolute quality, but we can compare resources with each other (Open World Assumption) rate, rank and weight them.

A three-level quality assessment model

We adjusted a three-level assessment model to our purpose:

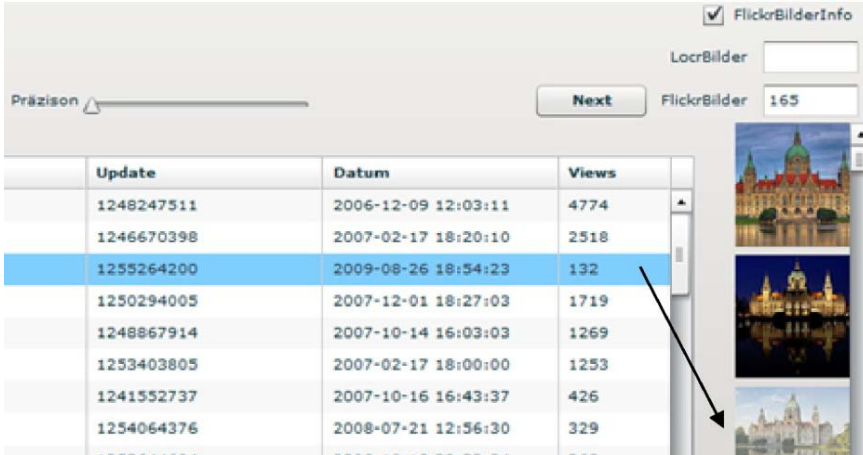
- First level assessment: Meta data analyzes
 - Metadata plays an important role for the determination of IQ-criteria.
 - We have criteria that are directly included in a resource like format, timeliness, authorship, provenance, language, ... e.g. Dublin Core elements.
 - The more meta data we have, the better we get to know the content.
- Second level assessment: User interaction
 - Criteria that can be assessed with the help of user interaction.
 - Questionnaires are often used to get feedback from the user for this purpose.
 - According to C. Bizer this is called **Rating-based assessment**.
- Third level assessment: Intelligent analyzes
 - Employing NLP (Natural Language Processing) might detect some more information hidden inside the resource by entity recognition: NER (Named Entity Recognition), PoS (Part of Speech) Tagging or automated summarization, ...
 - According to relevant literature this called **Content-based assessment**.

IQ assessment by enhanced user interaction

- The problem while assessing IQ with the help of user interaction is:
 - How to motivate users to ongoing interaction like rating, rating or weighting?
- Questionnaires are often used to get feedback from the user for this purpose:
 - But filling out questionnaires is not very motivating, isn't it?
- We need some **rewarding** and **incentive** to participate ...
- Gaming is fun and very popular especially in Web 2.0 contexts.
- We see game-based interaction as a use-case with high design and interaction receivables that is well suited to evaluate enhanced interaction with distributed resources exemplary.

qPOINT: Rewarding any kind of interaction

- We developed an ontology-based, globally interaction rewarding model.
- It offers a game-oriented point and level system documenting (logging) any interaction upon any resource
 - Learning progress, personal knowledge, and interests can be derived.
 - There is a kind of history protocol for every activity of a user with a resource.
 - Every resource that is visualized or just queried by qKAI can be rated and ranked by user interaction or automated metrics like metadata detection.
 - The more a resource is requested, the more statistically data we gain.
- The more we know about a resource, the better we can personalize its usage.



Update	Datum	Views
1248247511	2006-12-09 12:03:11	4774
1246670398	2007-02-17 18:20:10	2518
1255264200	2009-08-26 18:54:23	132
1250294005	2007-12-01 18:27:03	1719
1248867914	2007-10-14 16:03:03	1269
1253403805	2007-02-17 18:00:00	1253
1241552737	2007-10-16 16:43:37	426
1254064376	2008-07-21 12:56:30	329

qPOINT: Interaction tasks and improvable IQ criteria

- Every interaction is rewarded with so called qPOINTS.
- This is based on an interaction catalog with assigned points.
- Every interaction task is based on the conjunction between a resource and a user.
- We have different types of interaction:
 - Edit, create, annotate/add/interlink, rate/rank.
- Additionally gaming joker options can be implemented:
 - Nonsense-Joker, Know-It-All-Joker, Explorer-Joker, Hint-Joker, ...

Interaction	Reward	Improvable iq-criteria
Edit	+50 points	Accuracy, consistency, objectivity, timeliness, believability, reputation, completeness, understandability
Create	+100 points	Completeness, accuracy, verifiability, amount of data
Annotate/ add/interlink	+50 points	Completeness, accuracy, verifiability, amount of data, interpretability, understandability
Rate/rank	+10 points	Relevancy, accuracy, believability, reputation, objectivity, interpretability, understandability, rep. conciseness

Example of enhanced user interaction to qualify Web resources

Example: picture search on the Web

- It is difficult to find relevant pictures to related search terms.
- A Google search for the term „*Jaguar*“ offers the following results:



- How to differentiate between the animal and the car? It is ambiguous ...
- Humans can differentiate, a “*normal*” search agent can not that easy ...
- One solution is the Semantic Web, but not all data is available in RDF – e.g. Flickr images and other Web 2.0 communities.

Tagging and groups in folksonomies

- Tagging is very popular in Online communities these days.
- Everybody can participate in tagging content
- Tags offer a wide range of keywords but are subjective as well and might be confusing sometimes.
- Groups allow pre-selected content and increase the precision and relevance of the recall.
- Our idea to improve search results is a **keyword-oriented group search and ranking.**

animals architecture art asia australia autumn baby band barcelona beach berlin bike bird
birds birthday black blackandwhite blue bw california canada canon car cat
chicago china christmas church city clouds color concert cute dance day de dog
england europe fall family fashion festival film florida flower flowers food
football france friends fun garden geotagged germany girl girls graffiti green
halloween hawaii hiking holiday home house india ireland island italia italy japan july kids la
lake landscape light live london love macro me mexico model mountain mountains museum
music nature new newyork newyorkcity night nikon nyc ocean old paris
park party people photo photography photos portrait red river rock san
sanfrancisco scotland sea seattle show sky snow spain spring street summer
sun sunset taiwan texas thailand tokyo toronto tour travel tree trees trip uk urban
usa vacation washington water wedding white winter yellow york zoo

qRANK: Game-based tag ranking in folksonomies (1)

- We developed a tag ranking game called qRANK to rate and rank Web resources.
- qRANK queries available Web services (almost RESTful) and embeds returned content in a predefined gaming setting.
- We added some algorithms to enhance the precision (relevance) of the search results like e.g. interestingness rating or precision formulas for folksonomies.
- Additionally, every gaming interaction is logged and ranks played content enabling the users' **collective intelligence** by and by.
- Results are stored in qKAI but are still semantically interlinked with the provenance source not to lose the resources' context and for updating.
- Techniques used are semantically Linked Data (annotation, interlinking), server-side Java, Adobe Flex/Flash and a MySQL database – to be flexible in representation.

qRANK: Screenshot and gaming targets

Find the three most relevant tags of the pictures

coбaka sweet hund

sleeping nature

cane love

retriever

بيلكل ا

toy cat

grass blue

puppies sand

chien dog

man Statistics

Total Score : 0

Round/MAXRound: 1 / 5

cx2

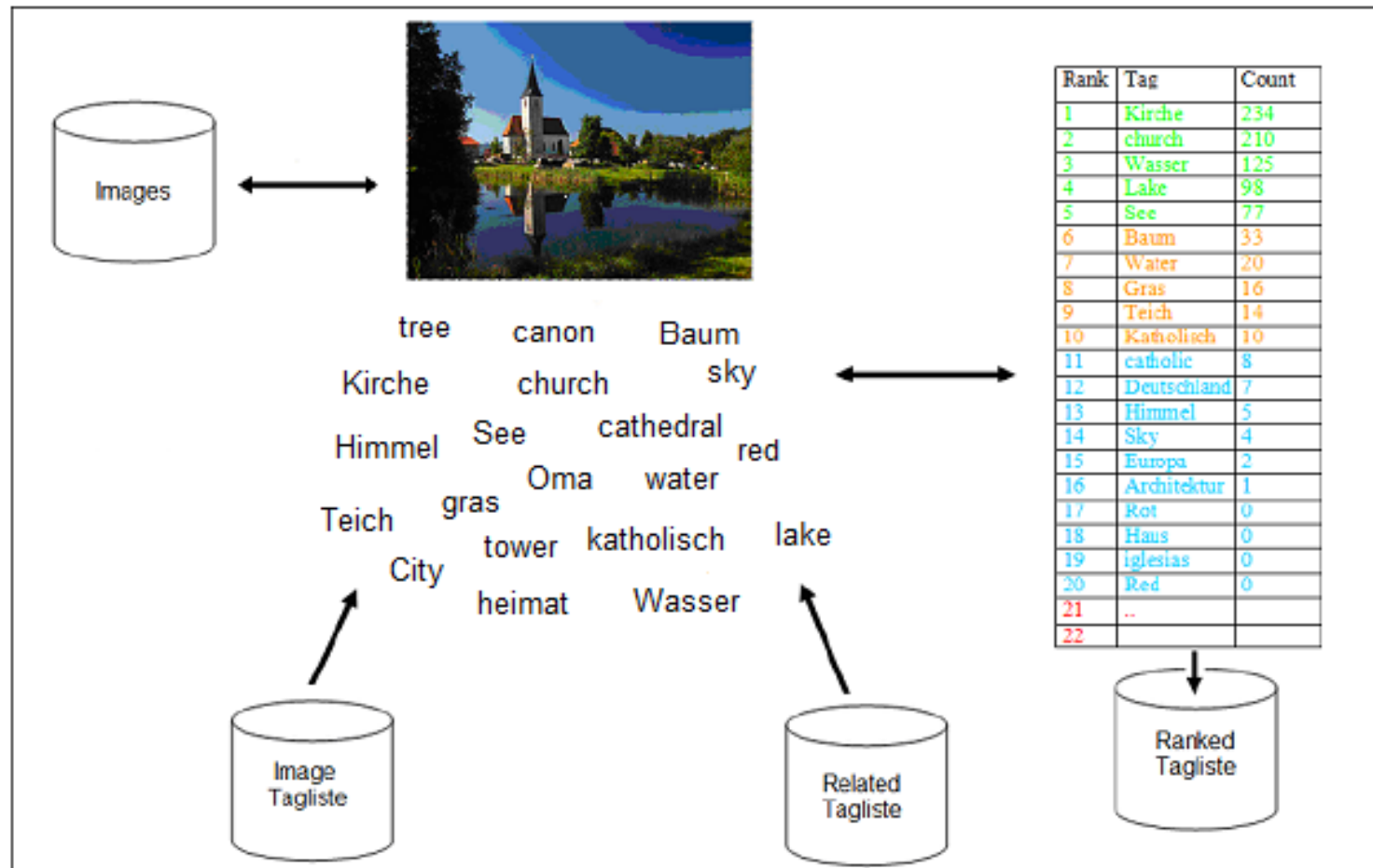
Level/MaxLevel: 1 / 10

Score/Target: 0 / 5

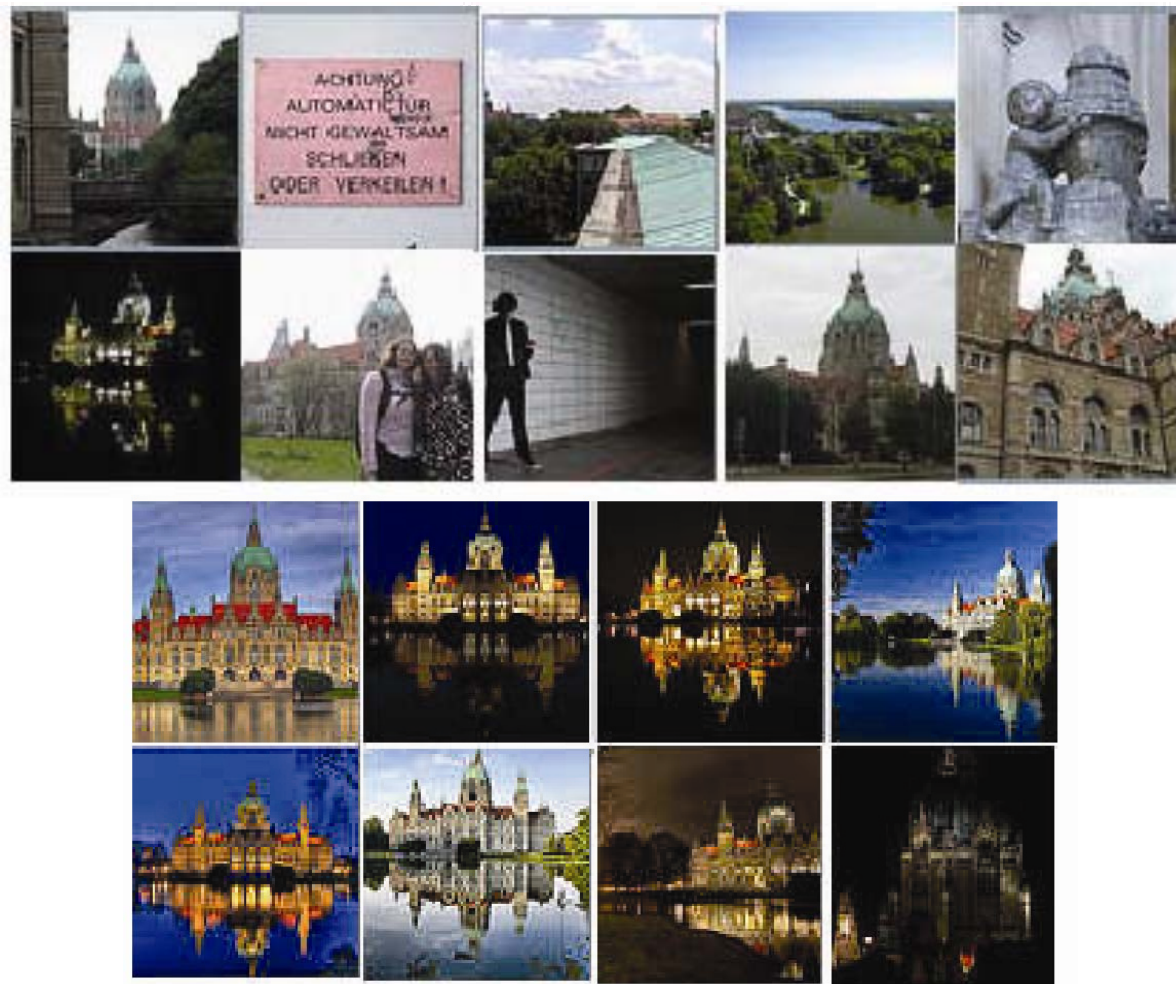
Pass

Game Instructions

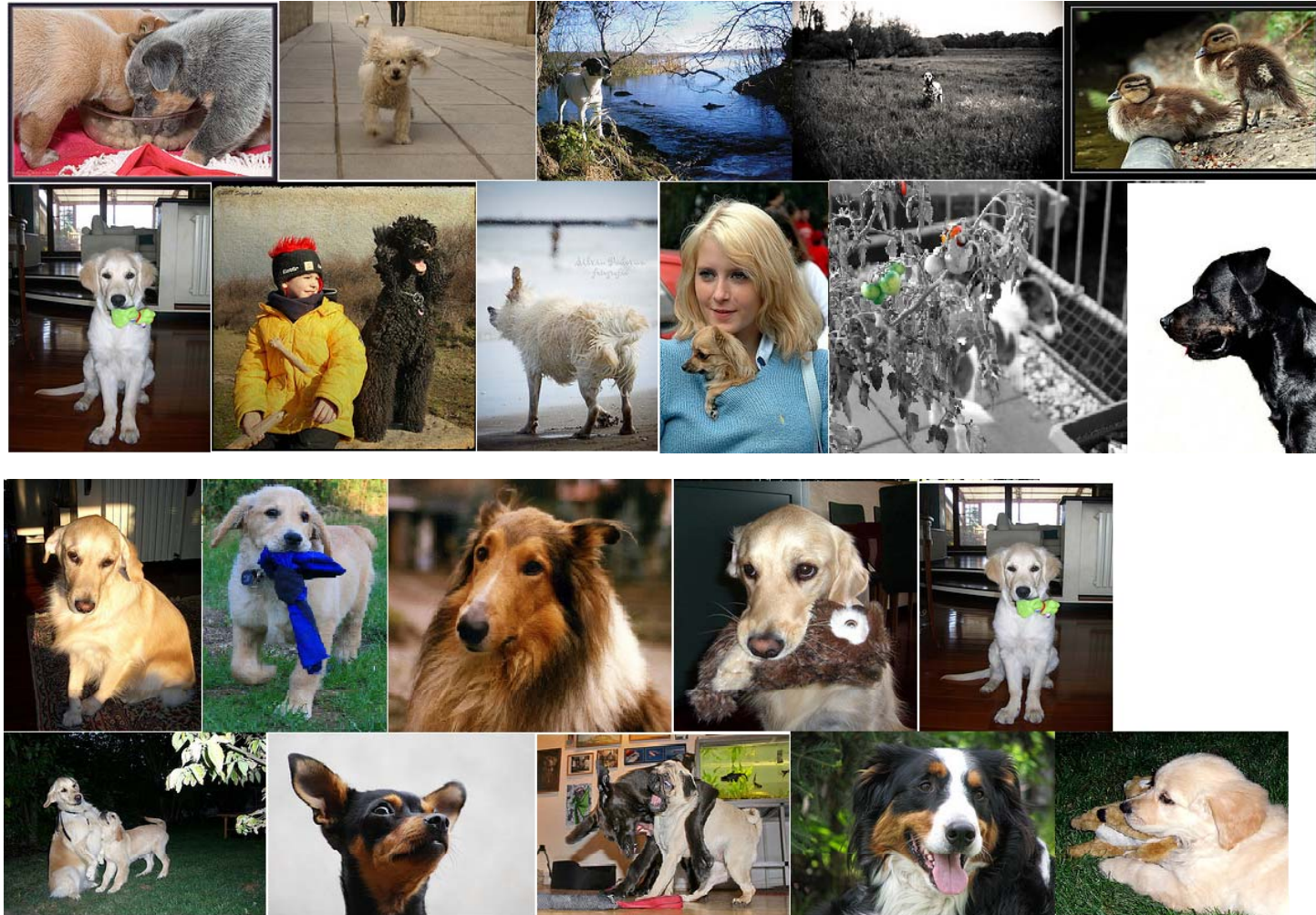
qRANK: Image tag list, related tag list and ranked tag list



Evaluation: Flickr search for the terms „*rathaus*“ and „*hannover*“



Evaluation: Flickr search for the term „dog“



Conclusion

- All over, information quality enhancement is getting more and more important – especially regarding the flood of autonomous Web resources without responding authorship.
- We presented exemplary the role of information quality in web-based information and knowledge transfer with smart interaction.
- We adapted an existing assessment model to our purpose in qKAI and showed some examples for enhanced, rating-based interaction that is suitable to qualify Open Content stepwise in an incentive way.
- Incentive for user participation and interaction is implemented in qKAI as game-oriented, ontology-based and global rewarding model for any kind of interaction.
- Information quality can be utilized as a tool to derive personalization and user preferences in web-based information and knowledge systems, because it offers a.o. metrics to determine the fitness for use of autonomous, distributed resources.
- The evaluation of our game-based assessing approach for Flickr images showed promising results and the contents' quality increased obviously.
- Single tasks are reusable and combinable in different scenarios (implemented as atomic Web services).



Thank you very much for your attention!