User Intentions in Visual Information Retrieval & Multimedia Information Systems

Mathias Lux

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User Intentions in Multimedia

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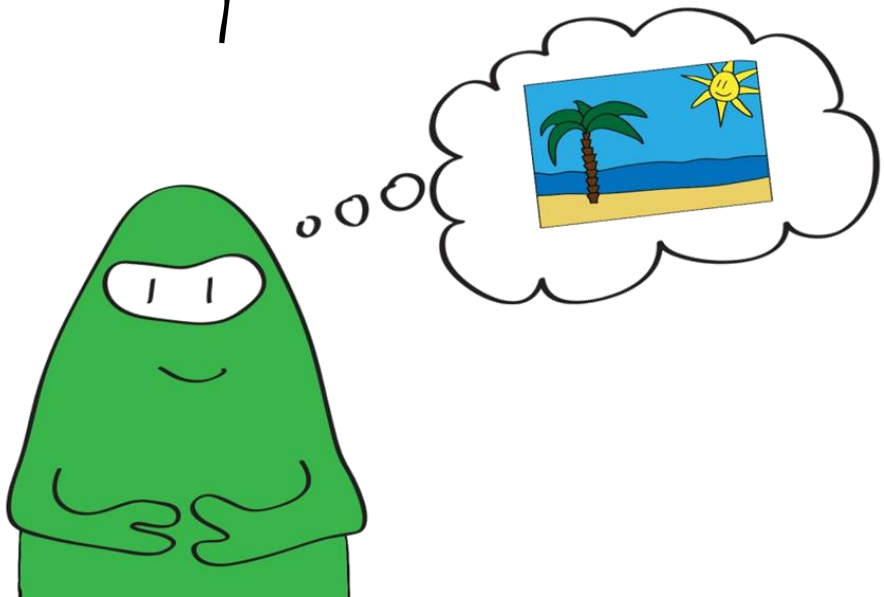
Query By Example

- User has particular information need
- Need reflected by example image
- Query is expressed visually



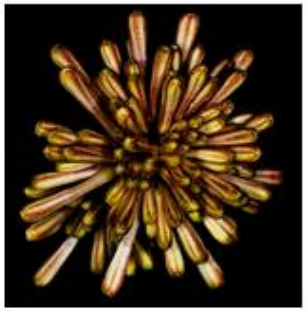
We all know that ...

- Some features work better than others
- Features have different characteristics
- Some features work out well for some domains, while others don't

PHOG & Flowers

100% match

Search OH, JH, EH, CH, JCD, CL, PHOG

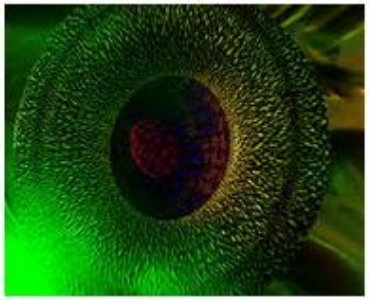


28% match

Search OH, JH, EH, CH, JCD, CL, PHOG

26% match

Search OH, JH, EH, CH, JCD, CL, PHOG



24% match

Search OH, JH, EH, CH, JCD, CL, PHOG

24% match

Search OH, JH, EH, CH, JCD, CL, PHOG

22% match

Search OH, JH, EH, CH, JCD, CL, PHOG

18% match

Search OH, JH, EH, CH, JCD, CL, PHOG

17% match

Search OH, JH, EH, CH, JCD, CL, PHOG

16% match

Search OH, JH, EH, CH, JCD, CL, PHOG

16% match

Search OH, JH, EH, CH, JCD, CL, PHOG

ColorLayout & Sunsets

100% match

Search OH, JH, EH, CH, JCD, CL, PHOG

34% match

Search OH, JH, EH, CH, JCD, CL, PHOG

28% match

Search OH, JH, EH, CH, JCD, CL, PHOG

28% match

Search OH, JH, EH, CH, JCD, CL, PHOG

24% match

Search OH, JH, EH, CH, JCD, CL, PHOG

20% match

Search OH, JH, EH, CH, JCD, CL, PHOG

20% match

Search OH, JH, EH, CH, JCD, CL, PHOG

20% match

Search OH, JH, EH, CH, JCD, CL, PHOG

18% match

Search OH, JH, EH, CH, JCD, CL, PHOG

18% match

Search OH, JH, EH, CH, JCD, CL, PHOG

EdgeHistogram & Portraits

100% match

Search OH, JH, EH, CH, JCD, CL, PHOG

47% match

Search OH, JH, EH, CH, JCD, CL, PHOG

43% match

Search OH, JH, EH, CH, JCD, CL, PHOG

41% match

Search OH, JH, EH, CH, JCD, CL, PHOG

37% match

Search OH, JH, EH, CH, JCD, CL, PHOG

36% match

Search OH, JH, EH, CH, JCD, CL, PHOG

35% match

Search OH, JH, EH, CH, JCD, CL, PHOG

33% match

Search OH, JH, EH, CH, JCD, CL, PHOG

31% match

Search OH, JH, EH, CH, JCD, CL, PHOG

31% match

Search OH, JH, EH, CH, JCD, CL, PHOG

JCD & Portraits

100% match

Search OH, JH, EH, CH, JCD, CL, PHOG

55% match

Search OH, JH, EH, CH, JCD, CL, PHOG

47% match

Search OH, JH, EH, CH, JCD, CL, PHOG

46% match

Search OH, JH, EH, CH, JCD, CL, PHOG

38% match

Search OH, JH, EH, CH, JCD, CL, PHOG

36% match

Search OH, JH, EH, CH, JCD, CL, PHOG

35% match

Search OH, JH, EH, CH, JCD, CL, PHOG

33% match

Search OH, JH, EH, CH, JCD, CL, PHOG

30% match

Search OH, JH, EH, CH, JCD, CL, PHOG

29% match

Search OH, JH, EH, CH, JCD, CL, PHOG

ColorLayout & Landscapes

100% match

Search OH, JH, EH, CH, JCD, CL, PHOG

43% match

Search OH, JH, EH, CH, JCD, CL, PHOG

35% match

Search OH, JH, EH, CH, JCD, CL, PHOG

30% match

Search OH, JH, EH, CH, JCD, CL, PHOG

25% match

Search OH, JH, EH, CH, JCD, CL, PHOG

24% match

Search OH, JH, EH, CH, JCD, CL, PHOG

23% match

Search OH, JH, EH, CH, JCD, CL, PHOG

23% match

Search OH, JH, EH, CH, JCD, CL, PHOG

23% match

Search OH, JH, EH, CH, JCD, CL, PHOG

21% match

Search OH, JH, EH, CH, JCD, CL, PHOG

PHOG & Birds on the water

100% match

Search OH, JH, EH, CH, JCD, CL, PHOG

29% match

Search OH, JH, EH, CH, JCD, CL, PHOG

26% match

Search OH, JH, EH, CH, JCD, CL, PHOG

25% match

Search OH, JH, EH, CH, JCD, CL, PHOG

24% match

Search OH, JH, EH, CH, JCD, CL, PHOG

21% match

Search OH, JH, EH, CH, JCD, CL, PHOG

20% match

Search OH, JH, EH, CH, JCD, CL, PHOG

19% match

Search OH, JH, EH, CH, JCD, CL, PHOG

18% match

Search OH, JH, EH, CH, JCD, CL, PHOG

17% match

Search OH, JH, EH, CH, JCD, CL, PHOG

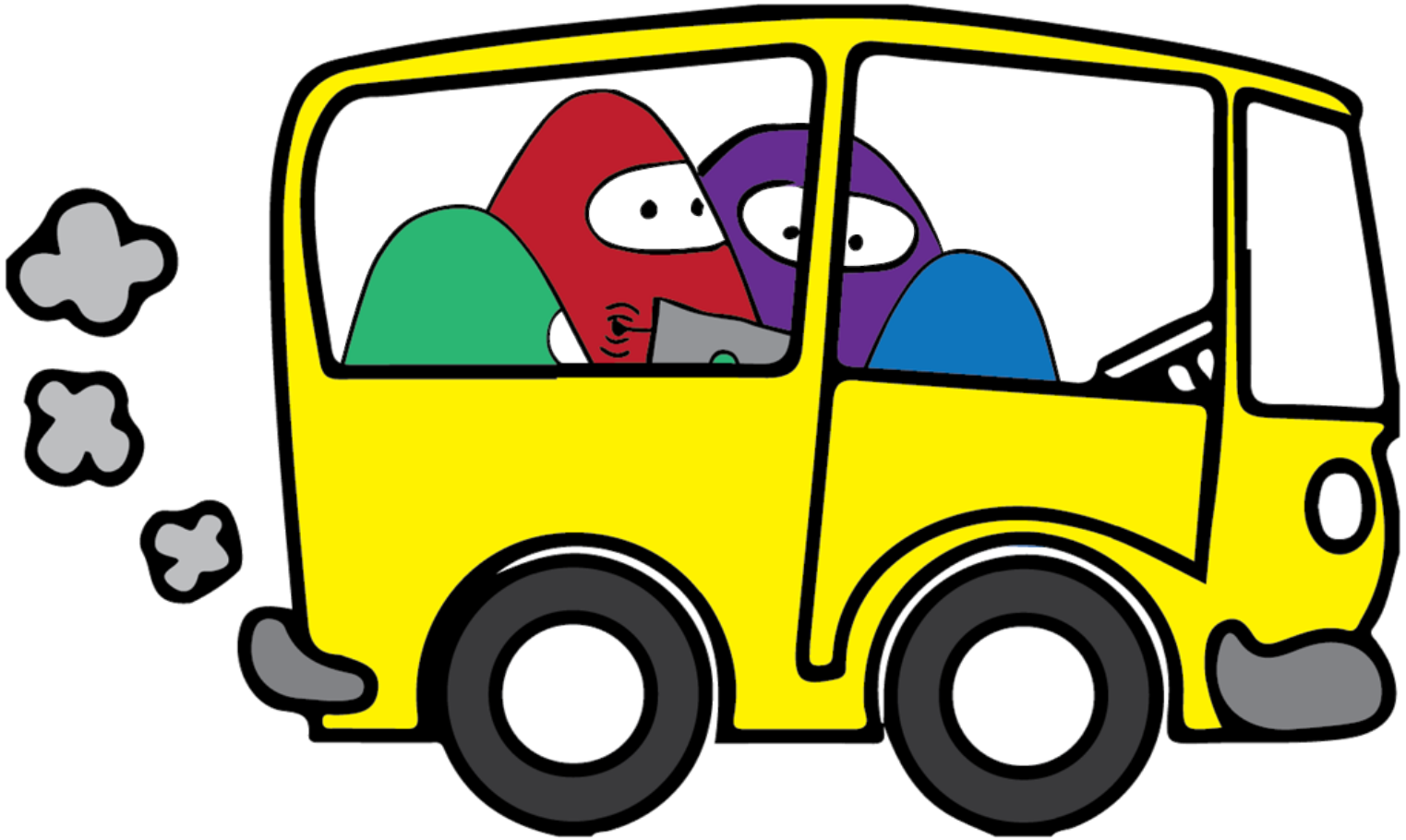
GLOBAL FEATURES
FOR SALE: 2 FOR 1

Which one is right?

- How to determine the right feature?
- What are the necessary characteristics?
- How do I define visual similarity within the domain?
- What is visual similarity for the user?

Why is there a different ranking?

Users in Context



Definition: Context

"Context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves."

Ref. G. Abowd et al., "Towards a better understanding of context and context-awareness. In Handheld and Ubiquitous Computing, vol. 1707 LNCS, 1999.

Definition: Intention

noun

(1) thing intended; an aim or plan

(2) *Medicine* the healing process of a wound

(3) (**intentions**) *Logic* conceptions formed by directing the mind towards an object

Context vs. Intention?

Context is any information that can be used to characterize the situation of an entity. An entity is a person, [...]

noun

(1) thing intended; an aim or plan

[...]

A User's Intention is

- part of a user's context
- of manageable size (verb & frame)
- related to the information need in search

Examples

- I want to download a new background for my mobile.
- I want to share the first laugh of my daughter.
- I want to see what a Lancia Lyra looks like.

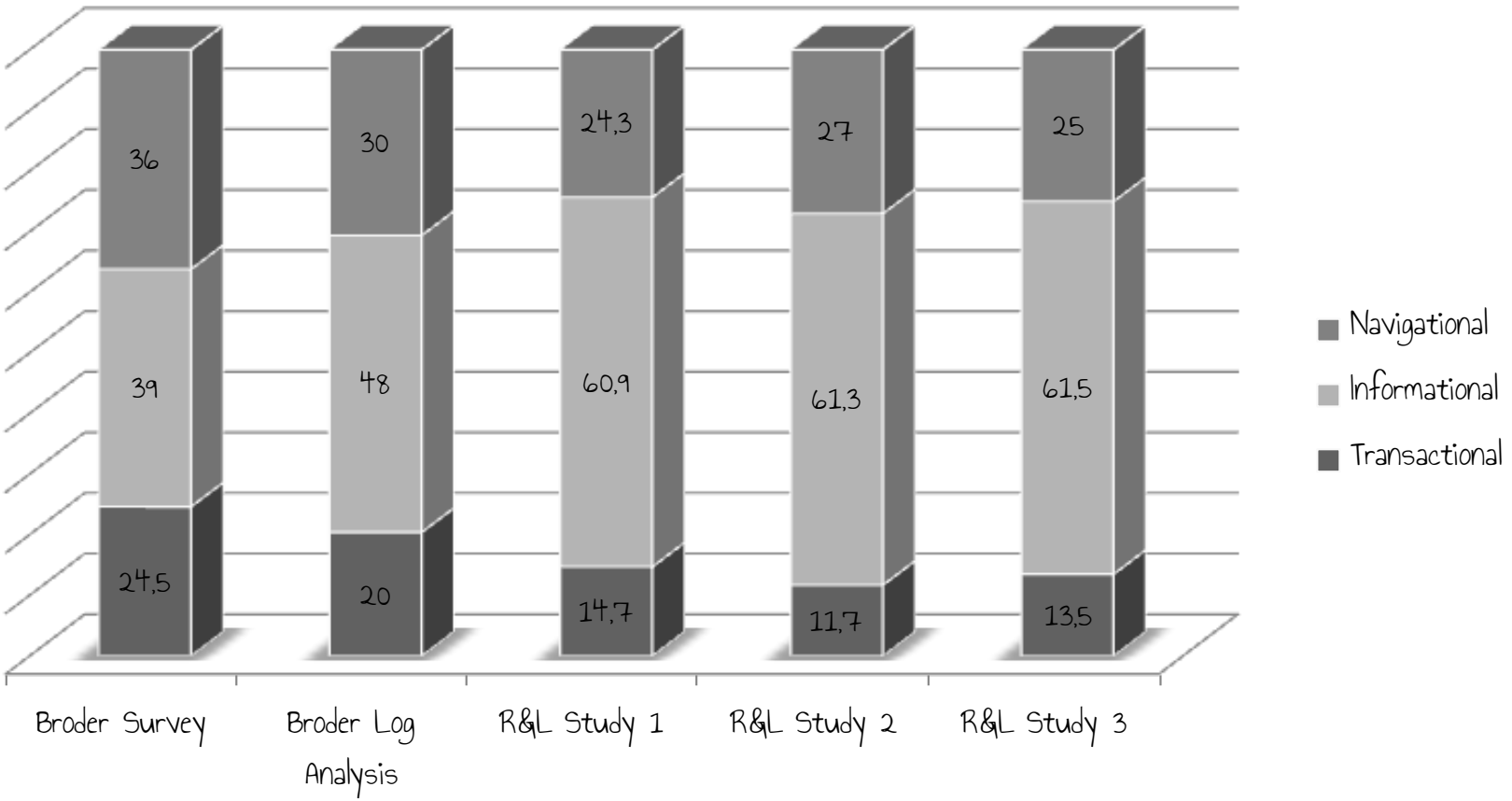
User Intentions in the Web

Underlying goals of web searches

- Informational
  - to learn / know something
- Navigational
  - to go to a specific place (on the web)
- Transactional
  - to go somewhere to ultimately buy sth.

Ref. Broder: A Taxonomy of Web Search. SIGIR Forum, 2002

User Intentions in the Web



Ref. Rose & Levinson: Understanding user goals in web search, WWW 2004

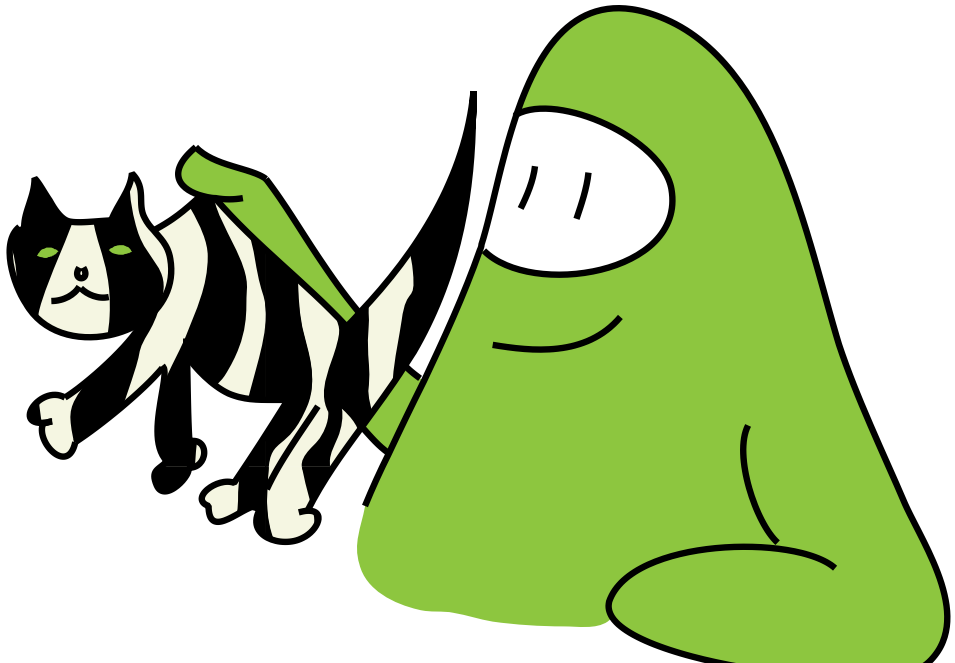
User Intentions n Multimedia

- Search
- Production
- Sharing
- Archiving

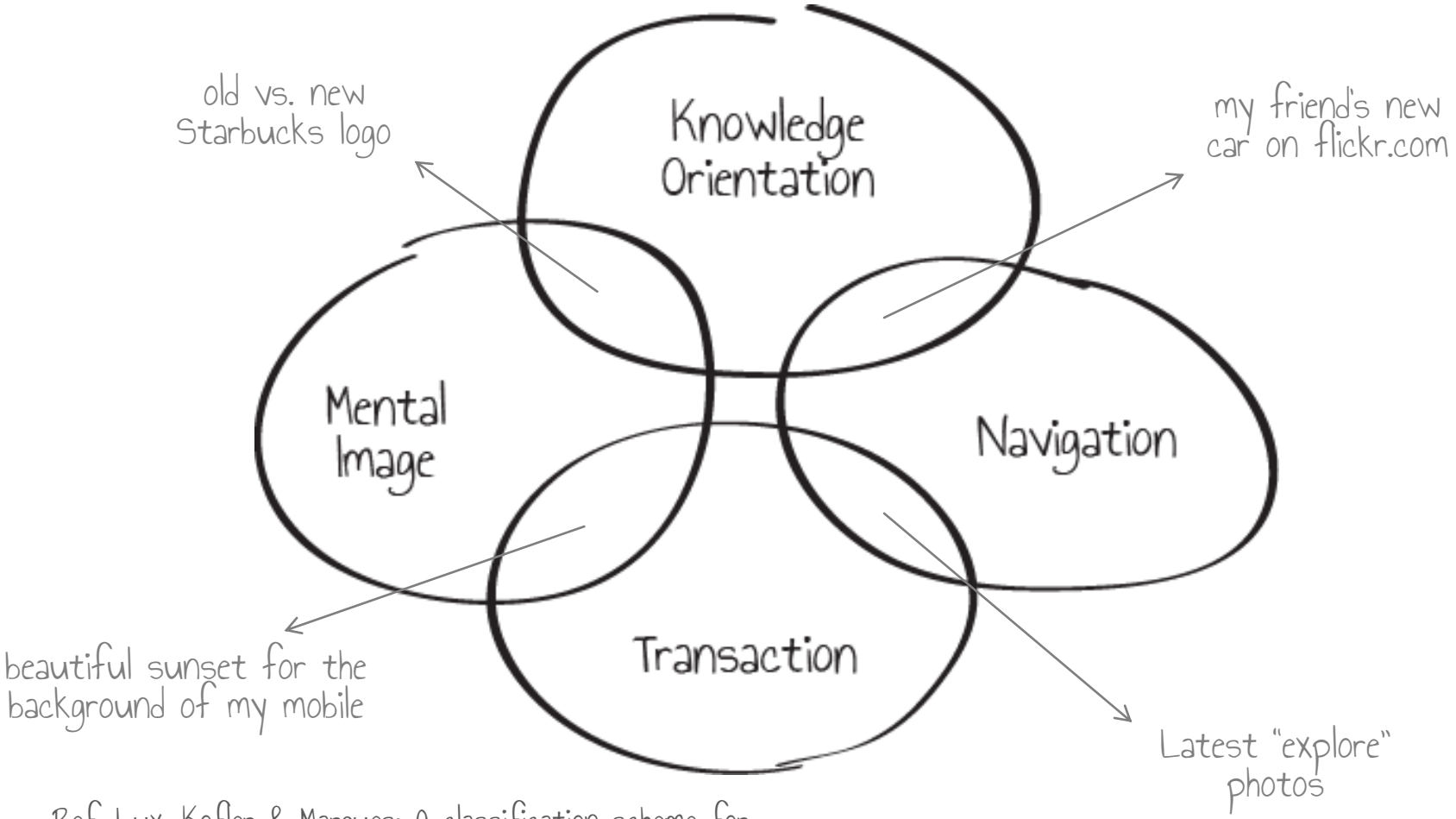
- Image
- Video
- Audio
- Multiple modalities

Hand-picked Examples

Right now there is no all-in-one publication on user intentions in multimedia ...



User Intentions in Image Search



Ref. Lux, Kofler & Marques: A classification scheme for user intentions in image search, CHI 2010

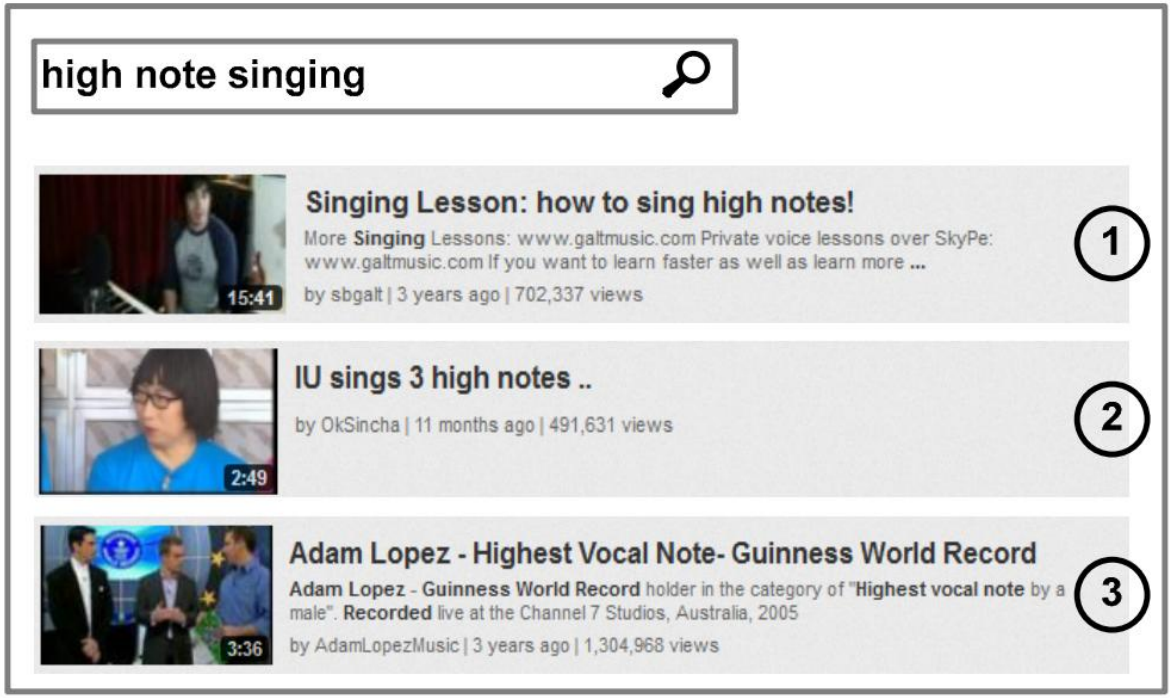
Do queries help with the search intention?

User information need vs. query formulation in video search.

- How to support users with video indexing and search methods?
- Search goal failure is (partially) predictable
  - Based on keywords and
  - Based on natural language

Ref. Kofler, Larson & Hanjalic: To Seek, Perchance to Fail: Expressions of User Needs in Internet Video Search, ECIR 2011

Asking for the "why?" behind the "what?"



Learn to sing ...

Hear others singing ...

Ref. Hanjalic, Kofler & Larson: Intent and its Discontents: The User at the Wheel of the Online Video Search Engine, ACM MM 2012

Asking for the "why?" behind the "what?"

- Information
  - news, commercial, advertisement, documentary, science, commentary, education, learning, ...
- Experience
  - tutorial, how-to, advise, help, training
- Affect
  - books, podcast, music, comedy, series, art, movie, action, gaming, film, episode, entertainment, ...

Ref. Hanjalic, Kofler & Larson: Intent and its Discontents: The User at the Wheel of the Online Video Search Engine, ACM MM 2012

Helping with clever UIs?

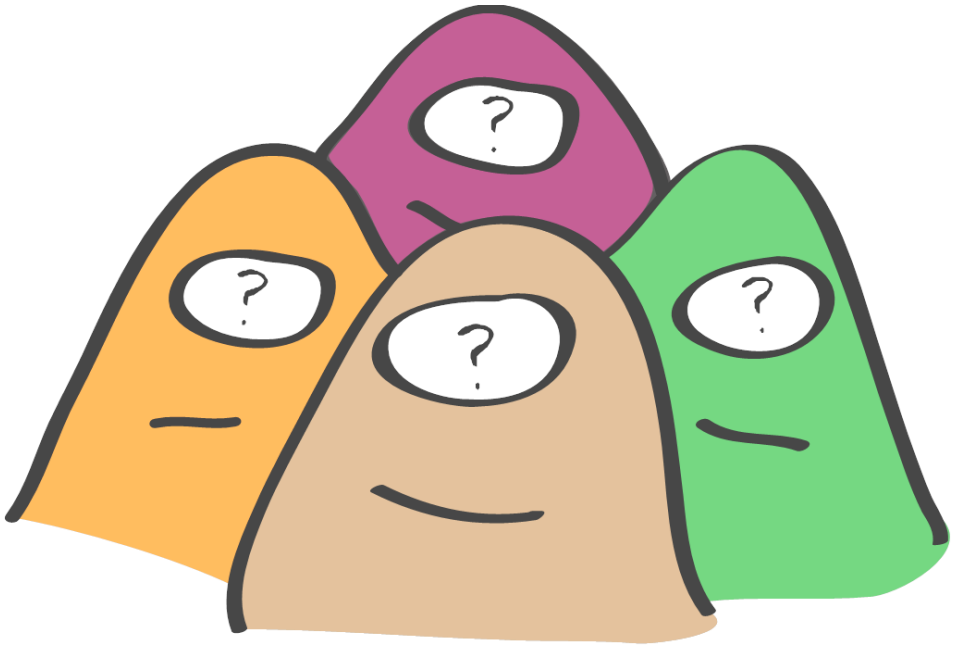
Search ...

I want to ...

Ref. Lagger, Lux & Marques: An Adaptive Video Retrieval System Based On Recent Studies On User Intentions While Watching Videos Online. ACM CIE, online.

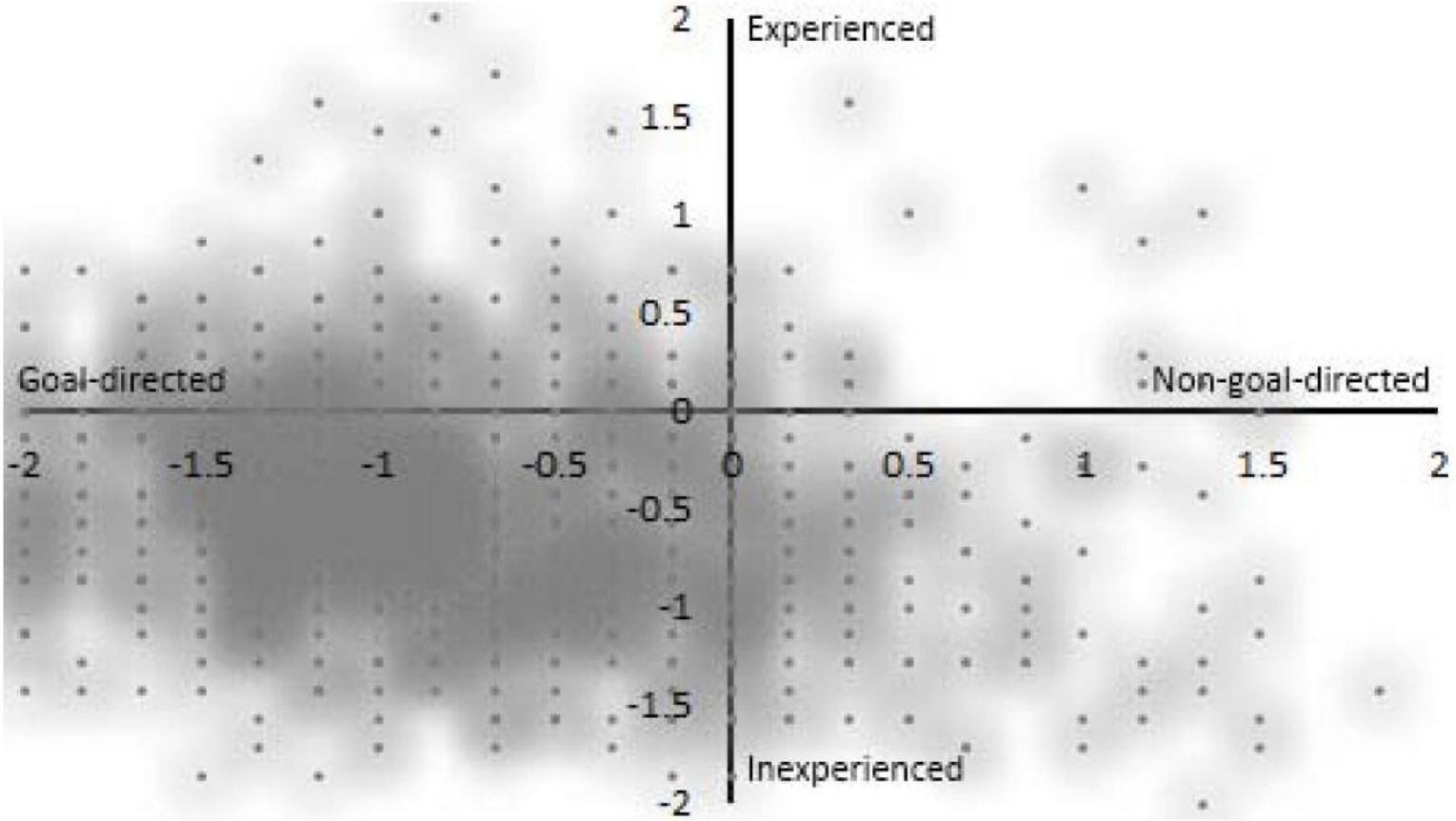
Who are the users in a Video Search System?

- Study on users of
  - YouTube
  - BBC iPlayer
  - Uitzending Gemist



Ref. Kemman, Kleppe& Beunders: Who are the users of a video search system? Classifying a heterogeneous group with a profile matrix, WIAMIS 2012

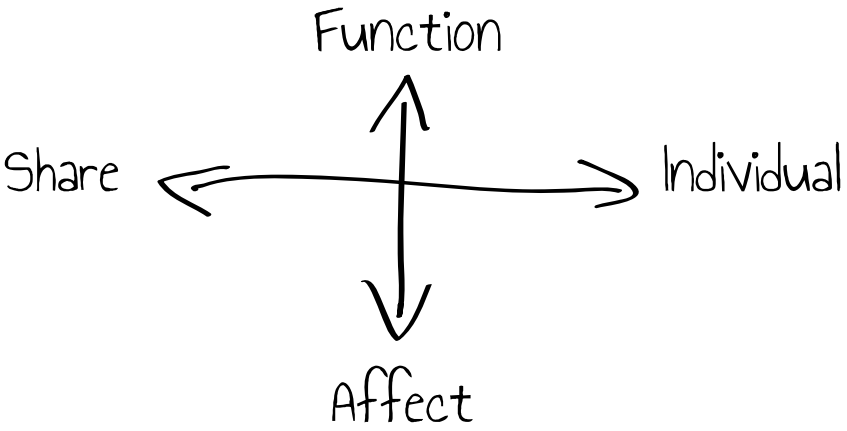
Who are the users in a Video Search System?



Ref. Kemman, Kleppe & Beunders: Who are the users of a video search system? Classifying a heterogeneous group with a profile matrix, WIAMIS 2012

Why do People make Videos?

- Study on four main goals:
  - Affection, Function, Sharing & Preservation.



	Sharing	Affection	Function
Preservation	-0,59	-0,78	-0,36
	-0,05	-0,26	-0,36
	0,39	0,84	0,55
Sharing		-0,50	-0,93
		0,25	-0,07
		0,46	0,21
Affection			-0,43
			-0,21
			0,47

Ref. Lux & Huber: Why did you record this video?
WIAMIS 2012

Finding User Intentions & Goals is a hard task ....

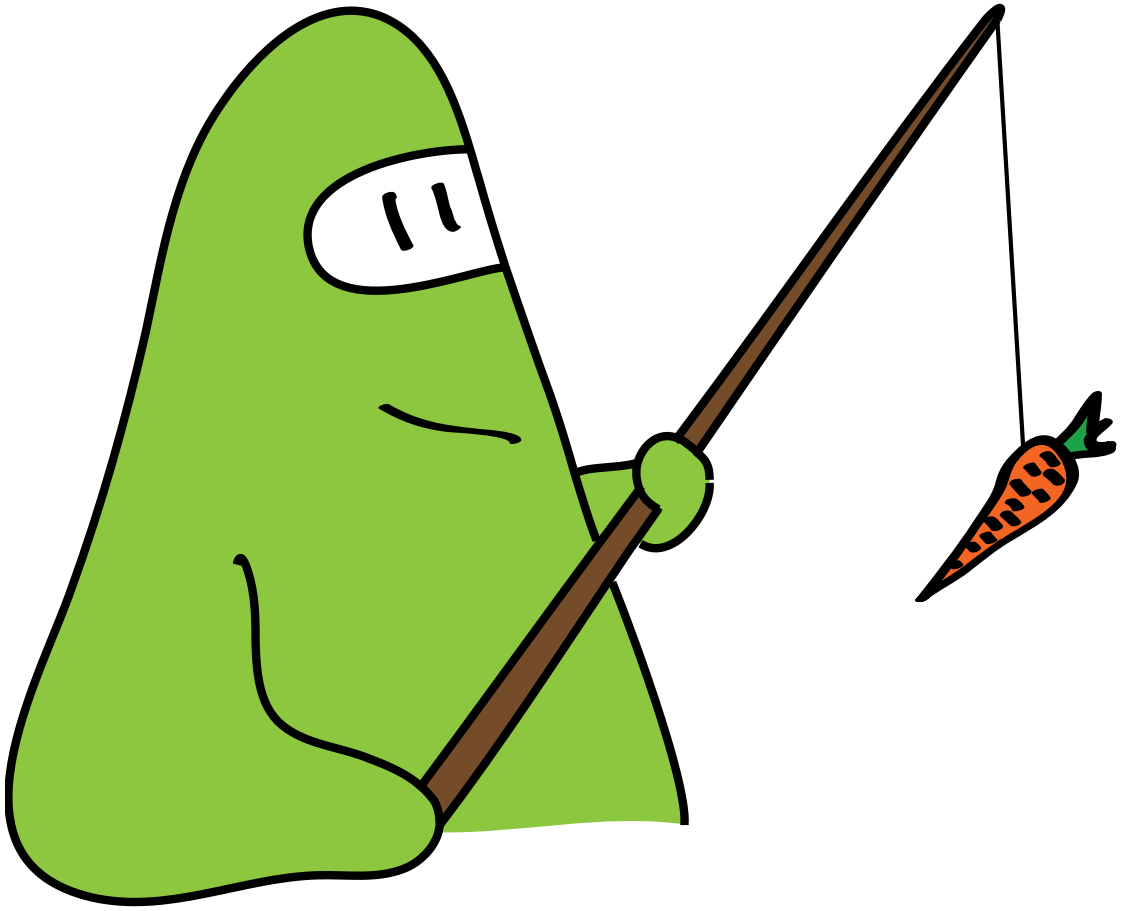
Demand Media - The AnSwer Factory

- Demand mined from search queries
- Requests for content put on auction
- Contractors create content
- Crowd does quality control

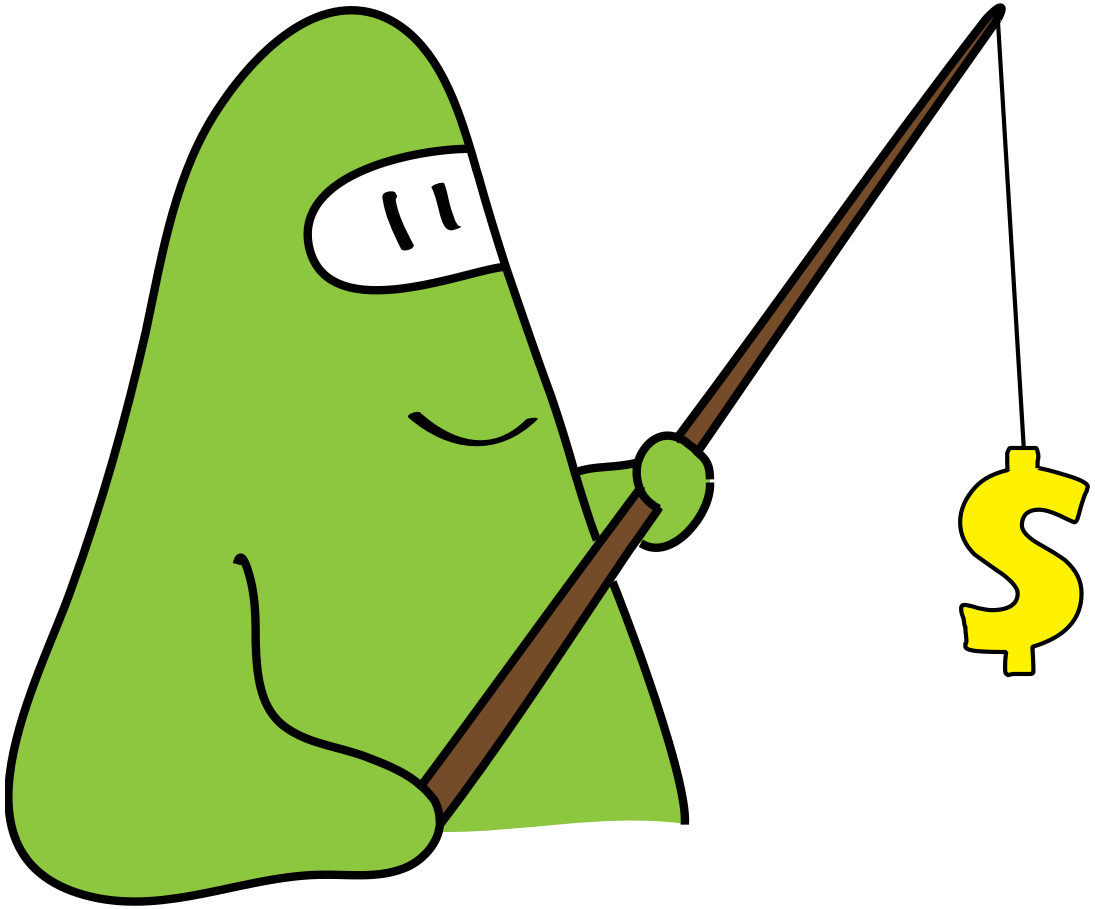
see i.e. eHow.com

The Answer Factory: Demand Media and the Fast, Disposable, and Profitable as Hell Media Model, http://www.wired.com/magazine/2009/10/ff_demandmedia/

Human Computation



Human Computation



Human Computation

- Is crowd-sourcing of any help here?
  - cp. ACM MM & work of Kofler, Larson & Hanjalic

Crowd-Sourcing

- It's hard to judge intentions of others
  - That makes it error prone

"a reminder of the beautiful Island were [sic] my father came from"

- ✓ Recall situation
- ✓ Preserve good feelings
- ✓ Publish online
- ✓ Show to family & friends
- ○ Support task of mine
- ○ Preserve bad feeling

"a reminder of the beautiful Island were [sic] my father came from"

- ✓ Recall situation
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- ○ Support task of mine
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		turkers				
Recall situation	2	2	0	1	0	2
Preserve good feeling	2	-2	1	0	0	1
Publish online	2	0	0	0	1	2
Show to family & friends	2	1	2	1	1	0
Support task of mine	0	-2	1	1	1	-2
Preserve bad feeling	-2	0	-2	0	-2	-2

Crowd-Sourcing

- Turkers disagreed with original publishers.
- But pretests had better inter-rater agreements.

	Intentions	Other
turkers	0,147	0,232
pretests	0,571	0,510

Ref. Lux, Taschwer & Marques: A Closer Look at Photographers' Intentions: a Test Dataset, CrowdMM WS at ACM MM 2012

Human Computation

- How about motivating people, i.e. with fun & rewarding experience?

Games with ~~a~~ additional Purpose

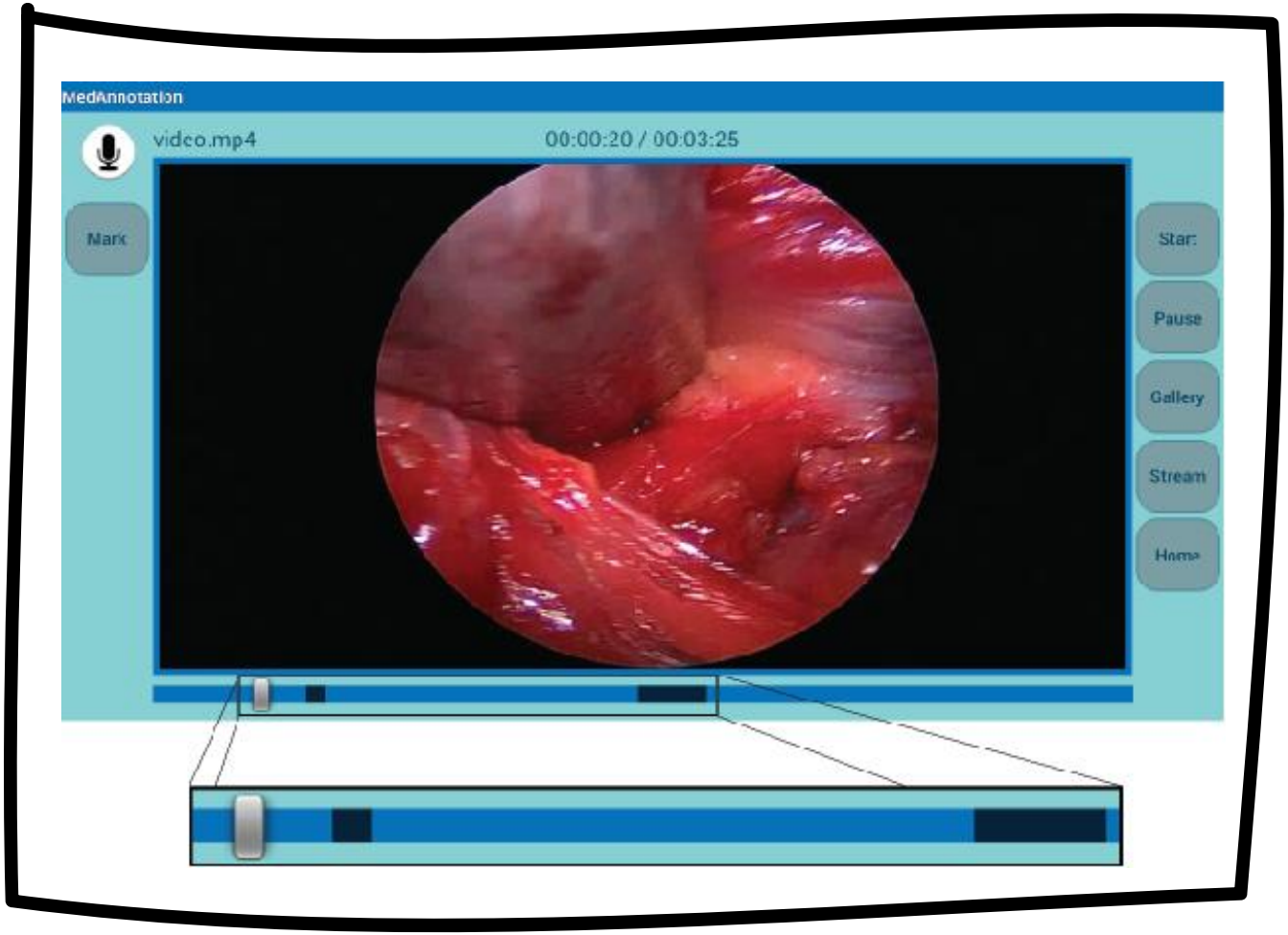
Games with ~~a~~ additional Purpose

- Tag a Tune
- Popvideo
- Matchin
- Flip It
- Verbosity

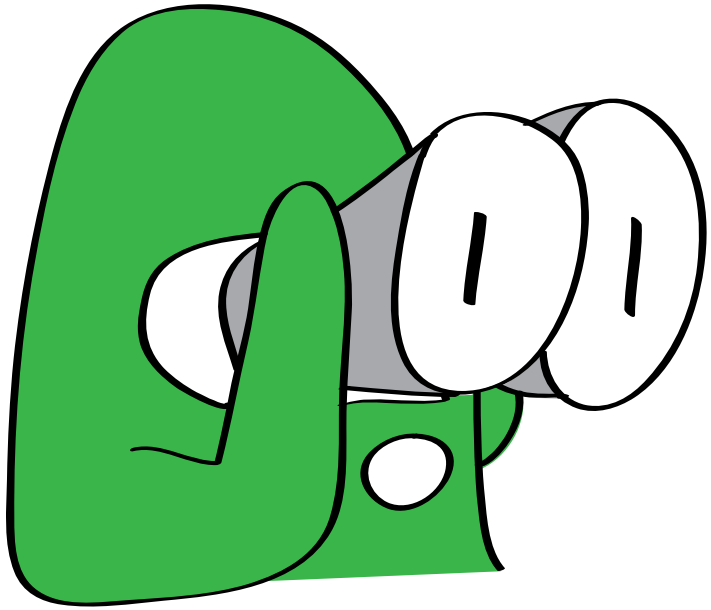
Games with ~~a~~ additional Purpose

- How to go beyond annotation?
  - classical applications are focused on annotation
- How to infer user intentions?
  - proves to be hard to "guess" intentions of others
  - even "own" intentions may not be explicit
- How to leverage user intentions?
  - finding which intentions can be leveraged and which goals can be supported

Leveraging Educational Needs ...



Where did we go?



- CBIR & QBE
- User Intentions
  - Search
  - Production
  - Sharing
- Games with additional Purpose

what is left?

- Lots of loose ends & open grounds for research ...

... let me propose four different PhD theses ...

Open PhD Theses I

- General Model for User Intentions & Goals in Multimedia.
  - Is there a unified model?
  - What are the class cardinalities?
  - How to map production, archiving, search and sharing intentions?

Open PhD Theses II

- GWAP, HC & UIs for determining & inferring & utilizing User Intentions & Goals
  - Which UI elements, game mechanics and HC mechanics help in this scenario?
  - What are appropriate design patterns and scenarios?
  - What is an appropriate research methodology and how to (easily) evaluate?

Open PhD Theses III

- Bringing Context to the Query in Multimedia Information Systems.
  - How to utilize Intentions & Goals within search and indexing methodology?
  - Building MMIS around a model for user intentions.

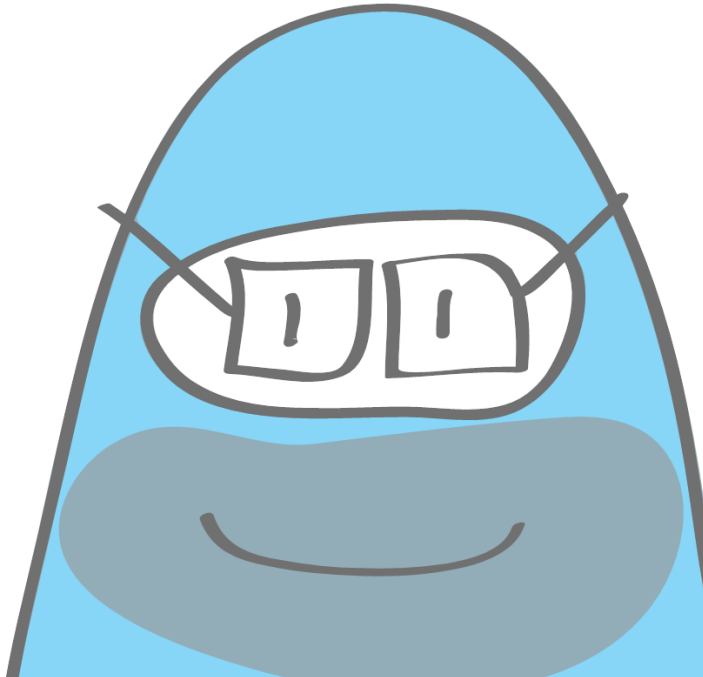
Open PhD Theses IV

- Adaptable Applications
  - How to adapt an application to users' intentions?
  - Which elements & process to display, etc.?

Thanks for listening ...

- Mathias Lux
- Klagenfurt University, AT
- mlux@itec.uni-klu.ac.at

Lucene Image Retrieval

LIRE

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