

Research Questions

1. How can we measure tagging motivation?
2. Does tagging motivation vary on different tagging systems?
3. How do different types of user motivation influence tags and the resulting folksonomies?

Approach

An important aspect of this work is that it focuses on *tag usage* rather than *tag semantics*.

What I did:

- Review of Literature / Identify types of tagging motivation
- Develop measurement methods for the identified motivations
- Application of measures to selected data sets
- Exploring the answers to the research questions

Types of Tagging Motivation

After a review of the current literature (such as [1], [2] and [3]) two important types of users of a tagging system can be identified: “*Categorizer*” and “*Describer*”. Table 1 gives an overview of the different characteristics the two tagging motivation types have.

	<i>Categorizer</i>	<i>Describer</i>
Goal	later browsing	later retrieval
Change of Vocabulary	costly	cheap
Size of Vocabulary	limited	open
Tags	subjective	objective

Table 1 - Categorizer and Describer Characteristics

Categorizers use tags mainly to organize their resources so that they can be found more easily later on. These users establish their own kind of vocabulary for the annotation process based on their personal preferences and behavior. An example is the tag “MacOSX”. A typical categorizer would always stick to the same tag instead of introducing new synonym tags such as “apple” or “mac”. Because of the fact that these tags are normally very close to the mental model of a user, the tags are facilitators for navigation and browsing.

Describers are a second type of the identified users. They utilize tags to support the retrieval process by describing the resources they annotate. Describers can be found in tagging systems such as YouTube where content providers tag their resources so that their submitted videos can be found easier. This way a typical describer tries to describe the resource he annotates as accurate as possible. Therefore tags of describers are often used only once and contain lots of synonyms. In an exemplary tagging vocabulary of such user a lot of tags like “MacOSX”, “apple” and “mac” can be found. In addition, the vocabulary of a describer is larger than that of a categorizer who has his own stable vocabulary. Because the content of the tags is very close to the content of the annotated resources, these tags support the process of searching.

This research focuses on the usage of tags rather than examining the semantics of used tags. Therefore not the content of tags are examined but their use.

Data Sets

For the experiments, complete personomies of the following data sets were collected and investigated:

- *ESP Game* - Picture Annotation Game
- *Flickr* - Photo Sharing System
- *Del.icio.us* - Social Bookmarking System
- *Bibsonomy* - Social Publication and Bookmark Sharing System

To construct points of reference two extreme data sets were selected. The idea is that the other data sets lie between the identified extremes.

The data set of the ESP game was used to establish the notion of a “perfect describer” because players of this game need to find the most descriptive keywords for pictures.

Due to the fact that a picture is typically only stored in one photo set a data set of Flickr photo sets was used to mimic personomies of “perfect categorizers”.

Data Set	U	T	R	R _{u min}	$\frac{ T }{ R }$
ESP Game	82	27.872	86.669	1.000	0,3216
Flickr Sets	173	6.286	245.282	500	0,0256
Flickr Tags	74	37.889	160.717	1.000	0,2357
Del.icio.us	445	112.173	585.580	1.000	0,1916
Bibsonomy Publications	26	11.006	23.696	500	0,4645
Bibsonomy Bookmarks	84	29.176	93.309	500	0,3127

Table 2 - Characteristics of the Data Sets

Measures

RQ 1: How can we measure tagging motivation?

- Tag Ratio - Ratio between tags and resources (Growth of Tag Vocabulary)

$$\text{tagRatio} = \frac{|T|}{|R|} \quad (1)$$

- “Orphaned” Tags - Proportion of tags which annotate only a small amount of resources

$$D_n = \frac{|T_n|}{|T|}, T_n = \{t \mid |R(t)| \leq n\}, n = \lceil \frac{|R(t_{max})|}{100} \rceil \quad (2)$$

- Tag Entropy - reflects the effectiveness of the encoding process of tagging

$$H(R|T) = - \sum_{r \in R} \sum_{t \in T} p(r, t) \log_2(p(r, t)), C_n = \frac{H(R|T) - H_{opt}(R|T)}{H_{opt}(R|T)} \quad (3)$$

Figure 1 depicts the growth of the vocabularies across four systems.

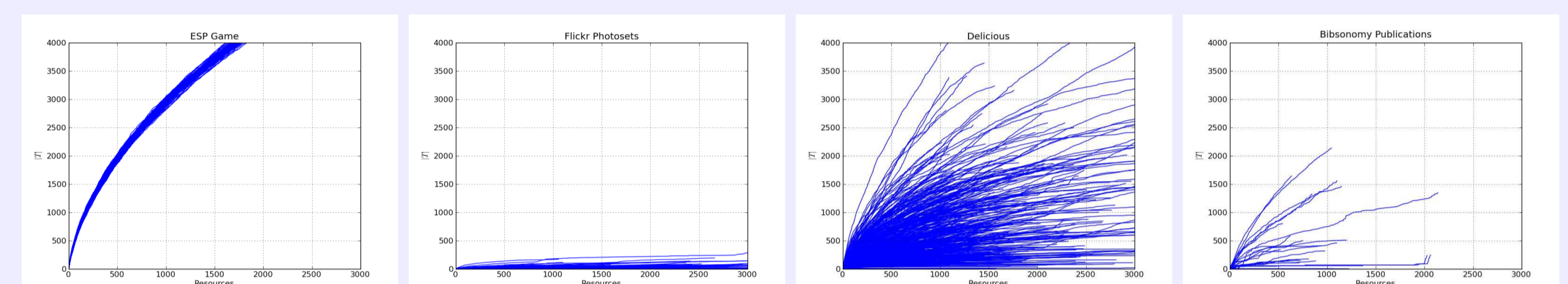


Figure 1 - Growth of Tagging Vocabulary

Figure 2 shows the characteristics of the orphaned tags (equation 2) across the four data sets.

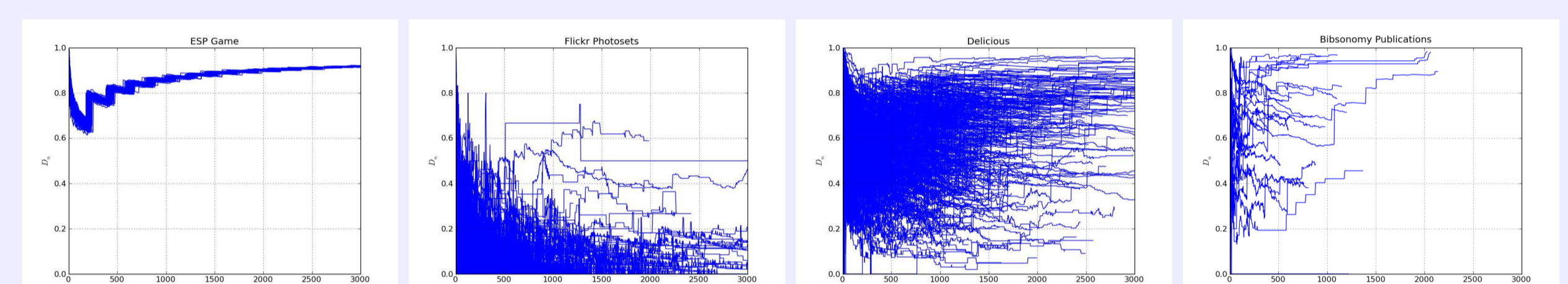


Figure 2 - Orphaned Tag Ratio D_n

Figure 3 shows the characteristics of the conditional tag entropy (equation 3) across the four data sets.

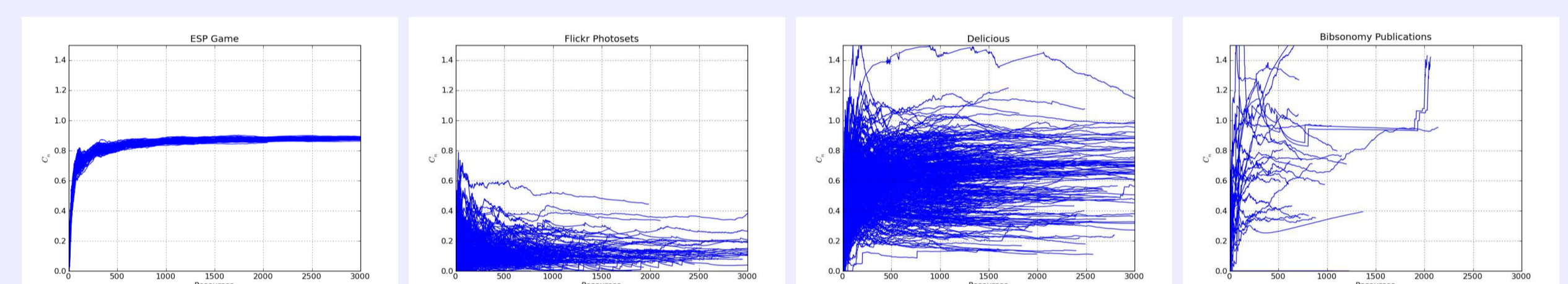


Figure 3 - Conditional Entropy C_n

Preliminary Results

This section shows selected results of the calculations made on the data sets.

RQ 2: Does tagging motivation vary across different tagging systems?

RQ 3: How do different types of user motivation influence tags and the resulting folksonomies?

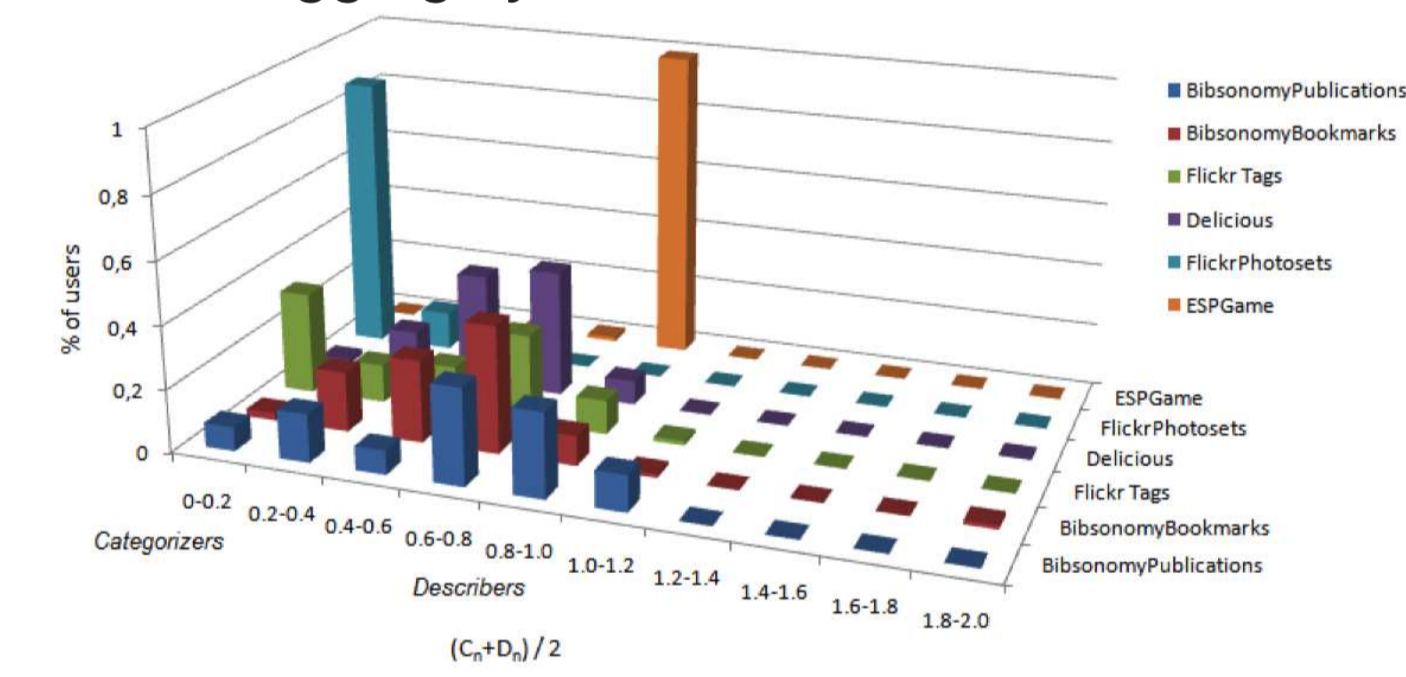


Figure 4 - Vast Diversity of the Tagging Systems

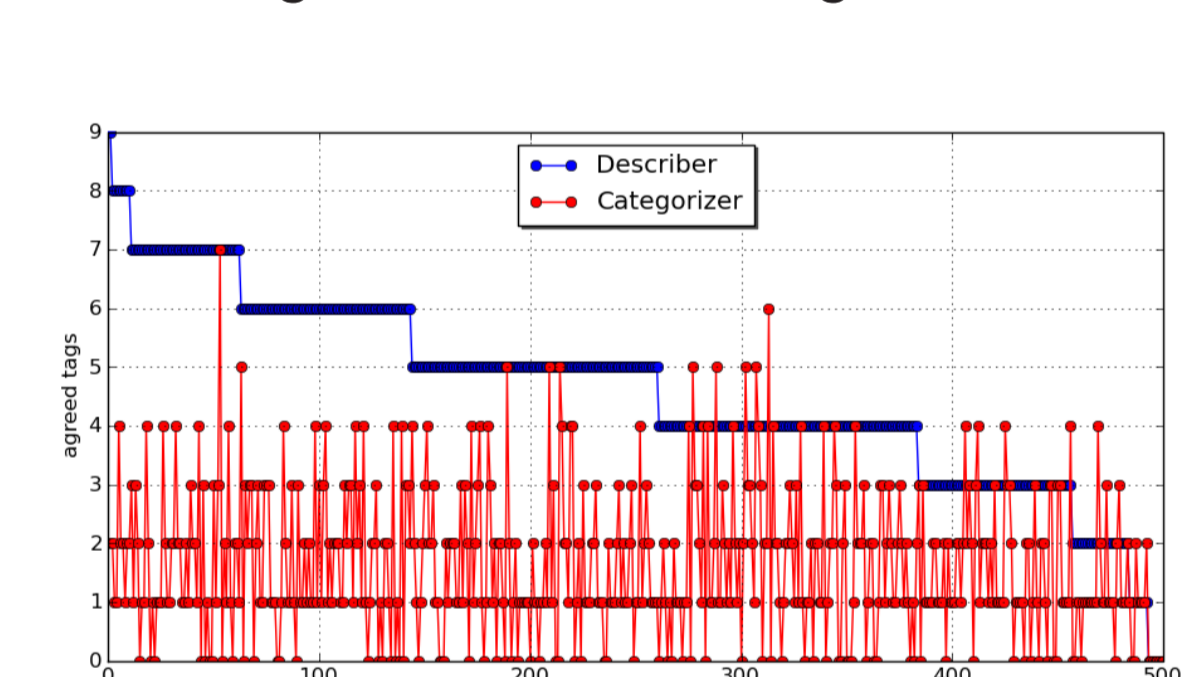


Figure 5 - Tag Agreement Comparison for $|U_i| > 3$

Observations: Vast diversity of tagging motivation in different tagging systems (see figure 4) and differences in tag agreement (figure 5)

Implications

- **Tag Recommendation:** Based on the two types of motivation different recommendation methods are needed
 - Categorizers need recommender based on their personal vocabulary.
 - Describers need recommender that capture content of the resources.
- **User Interfaces:** Different user interfaces aid different motivation types (e.g. tag clouds for categorizer)
- Knowledge Acquisition and Ontology Learning from Folksonomies
- Describers seem to introduce more descriptive tags to a folksonomy than categorizer.

Outlook

- Introduce a formalized model describing how likely a given personomy represents the history of a categorizer or a describer.
- Identify other types of tagging motivation and find other measurements.
- **Question:** Does tagging motivation influence the performance of recommendation systems?

[1] S. Golder and B. Huberman. Usage patterns of collaborative tagging systems. Journal for Information Science, (32)2:198–208, Sage Publications, Inc., Thousand Oaks, CA, USA, 2006.

[2] M. Heckner and M. Heilemann and C. Wolff. Personal Information Management vs. Resource Sharing: Towards a Model of Information Behaviour in Social Tagging Systems, In *International AAAI Conference on Weblogs and Social Media (ICWSM)*.

[3] C. Ye and O. Nov. Motivational, Structural and Tenure Factors that Impact Online Community Photo Sharing. AAAI 2009, 2009.