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Self-organizing Content Sharing at Social Events

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Abstract: *The number of photos and videos, shared by visitors of social events on web platforms, is increasing. However, if visitors are interested in the content of other visitors during the event, they have to wait a few days until content is available. If we enable visitors to connect to each other during the event a complex network evolves. A bio-inspired algorithm is the basis of our work and we investigate improvements of this algorithm by arguing that a small number of predefined tags can be exploited to reduce delivery delays and increase the hit rate.*

Keywords: user generated content; multimedia delivery; bio-inspired algorithm

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1. Introduction

Thousands of visitors follow social events, such as the royal wedding of Prince William and Catherine Middleton. Some of these users share their content produced during the event on YouTube, Flickr, etc., but mostly not immediately. If we connect the visitors' devices and enable the sharing of content immediately, a so called vision of the crowd emerges (del Fabro & Böszörmenyi, 2011). Visitors share with other visitors their most interesting content, thus one can see the event through the eyes of other visitors. However, such a system would result in a number of challenges. A network of visitors at social events can be considered as a complex network. It is full of dynamics, it is non-deterministic regarding user movement and behavior and a global state would be hard to observe. However, there are examples in nature and in computer science, where such complexity can be handled by adaptive and robust systems – see, e.g. gossip protocols that adapt the principles of epidemics. In current systems, e.g., (Kulkarni, Ganguly, Canright, & Deutsch, 2007) the researchers investigate search and transport as two different topics. An interesting point of their work is that the authors show that bio-inspired algorithms fit well the needs of search in dynamic networks. Our work is inspired by the endocrine system of higher mammals. Hormones are released to the blood stream and if reaching corresponding cells certain actions are triggered. The concentration of the hormones is managed by positive and negative feedback (Rushton, 2004). We want to point out that we do not want to create a model of the endocrine system, but we adapt the basic principles as described before to our needs. We have already introduced such an algorithm in (Sobe, Elmenreich, & Böszörmenyi, 2010). Hormones represent demand for content and are spread to the network. At the same time content is attracted by hormones and travels towards a higher hormone concentration. Thus, the algorithm combines search and transport. By exploiting the transport path for replication robustness is increased and the search space reduced (Sobe, Elmenreich, & Böszörmenyi, 2011). However, one important point is still missing. How do we react to emerging production and consumption patterns of users at such events? In this paper we investigate such patterns at social events and improve the algorithm according to that.

2. Content creation at social events

In order to investigate user behavior, we need to rely on existing systems. Therefore, the basis for our evaluations is metadata from Flickr and YouTube on different social events. We want to compare user uploads from two different popular social events (1) the royal wedding of Catherine Middleton and Prince William (2) the inauguration of President Obama.

Search Terms	Royal wedding william kate london	Inauguration obama oath
Date	2011/04/29	2009/01/20
Flickr res./used	7638/5798	1603/1346
YouTube res./used	1000/644	1000/916

Existing analysis such as done in (Cha, Kwak, Rodriguez, Ahn, & Moon, 2007) only focus on the complete content. We want to concentrate on how content is produced at social events, what tags are created and how long it takes until a user uploads the content to the online platforms (see the Table). We filter content that has been produced or uploaded before the actual event. For the YouTube result set one has to note that only 1,000 videos are returned.

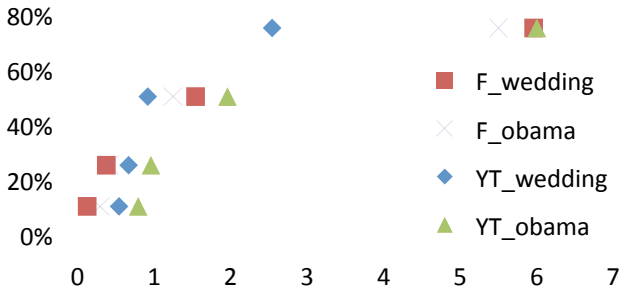

Figure 1 Upload time in days (F: Flickr, YT: YouTube)

The results in Figure 1 show the need for a live application, because only 25 % of the content is uploaded within the same day. For the rest, a visitor has to wait up to 300 days. YouTube videos are faster uploaded than Flickr images. We further analyze the different tags used for the content (**Fehler! Verweisquelle konnte nicht gefunden werden.**). Most content can be reached by the use of a small number of tags. We argue that some common tags might be predefined before the event and that a delivery algorithm can exploit this knowledge. E.g., if a user searches for “president” then it is likely that those images and videos tagged with “Obama” would also fit. The same applies for the combination of the tags “oath”, “president” and “Obama”. Even a hierarchy of tags can be exploited. E.g., if one requests “kiss” it is likely that a more general tag like “wedding” might also fit. However, if a too general term is used then all of the content might be returned.

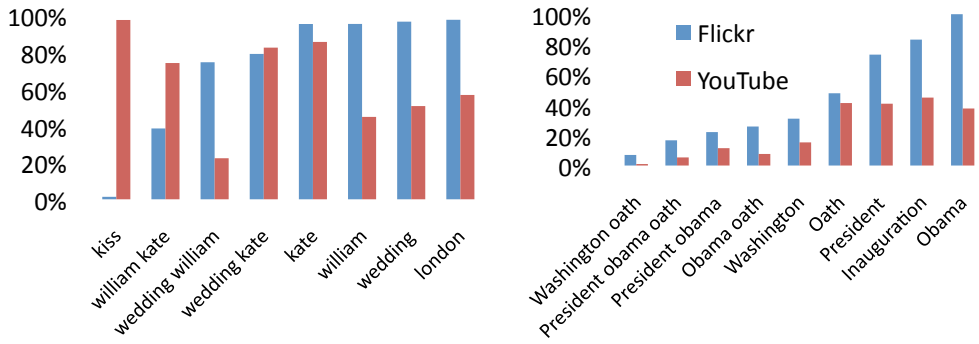

Figure 2 Tags wedding, inauguration

3. Hormone-based delivery

The basic idea is that content is attracted by corresponding hormones and for this a hormone path is needed from requester to content holder. To reach this, the requester creates hormones for the demanded file and forwards them. The hormones lead to actions when arriving on a node. If the corresponding content is available the node returns the content to the neighbor with the highest hormone concentration, otherwise it forwards hormones to its neighbors. The hormone forwarding mechanism is QoS-aware, i.e., the concentration forwarded to a neighbor is depending on its provided QoS (RTT, link availability, etc.). In previous work, we defined that one hormone type is created per file. If new content is added to the system, it takes some time until sufficient replicas are created to lead to low delays. It takes around 100 seconds until a critical number of replicas are created. During this time the delay is in the order of a few seconds. We thus want to reduce this startup delay by defining hierarchies of hormone types. We want to forward not only content that matches the requested tag, but also content that matches the tag one level higher, e.g., request for “Obama” also attracts content tagged with “President”. We assume that tag hierarchies are predefined.

4. Conclusion

The basis of our work is a bio-inspired algorithm that adapts the principles of the endocrine system of higher mammals. We showed that a dynamic network that could be built at a social event can take advantage of self-organizing delivery; however, if new content arrives it takes some time until sufficient replicas are created. To motivate our work we perform a short empirical study of user-generated content to show that pre-defined tags might help to efficiently and effectively distribute content during a social event.

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She received her Ph.D in January 2012 from Klagenfurt University. In her Ph.D. thesis she investigated delivery for non-sequential media access. For this she introduced a formalism to describe non-sequential media access and developed a bio-inspired algorithm to deliver non-sequential media and combined her findings to a middleware. Her current research focuses on bio-inspired algorithms for complex multimedia networks.

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He received his Ph.D. in January 2012 from Klagenfurt University. In his Ph.D. thesis he investigated three interrelated topics in the context of non-sequential multimedia usage, including video scene detection, summarization of real-life events with community-contributed content, and video browsing. His current research focuses on social media retrieval.