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Warnke, Martin; Wedemeyer, Carmen

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Documenting Artistic Networks: Anna Oppermann's Ensembles are Complex Networks!

Martin Warnke, Carmen Wedemeyer, Department of Cultural Sciences, Leuphana University of Lüneburg, Lüneburg, D-21335, Germany) E-mail: <{warnke, wedemeyer}@leuphana.de>.

Abstract
Anna Oppermann's Ensembles are scale-free networks. This explains their robustness and legitimates the art critic's metaphors.

The late Anna Oppermann (1940-1993), participant of the documenta 6 and 8 and of the Venice (1980) and Sydney (1984) biennials invented an artistic practice of ever re-representing objects recursively: depicting depicted pictures. Her Ensembles vary in size, from a few to tens of thousands of objects. Her artistic form could grow almost limitless, not exhibiting any typical scale. She created offspring ensembles by layering them, and art critics and historians found varying metaphors for them as *mirror cabinets* or *jungles*.

Documentation

We have developed a software system to document this kind of artwork and generalized it to become an everyday medium for image scientists (http://www.hyperimage.eu), inspired by Aby Warburg's *Memnosyne Atlas* [1]. With our technology everyone can inves-tigate her image networks thoroughly in every detail.

An excerpt of the Ensemble "Öl auf Leinwand" (since 1992) (Fig. 1) that can be visited at the URL given, consisting of approximately 100 objects, shows her recursive strategy of representation. A mouse click on any of the depicted objects leads to its full view, again showing other pictures, until the very beginning is reached.

Our system allows for marking up parts of images with visual hyperlinks to other images or parts thereof, creating a network of visual association links. In the case of Anna Oppermann's Ensembles, the nodes are the depictions of an image done by the artist; the links are image association links from that depiction to the depicted image itself that becomes the central object of investigation filling the screen after the jump.

Heterogeneous Scale

The Ensembles we investigated show a heterogeneous scaling behavior not known to the artist. Plotting the number of images against the number of outgoing association links reveals a tailed frequency distribution, as found in many other more or less scale-free complex networks [2]. Projected into a linear coordinate system, the distribution reveals a long tail with a large number of images carrying only a single link and a small number of images with an unexpectedly high number of links. Plotting the same data in a log-log coordinate system reveals a so-called fat tail that is character-istic for many real world complex networks without a widespread average number of links.

The number of links in general is most likely underestimated, since we only know about the ones we have actually seen. Thus the heterogeneity found here is a lower bound for what is actually true in the artwork.

The well known properties of Anna Oppermann's Ensembles, their ability to grow from small initial states to very large installations of tens of thousands of pieces, their robustness against removal and addition of parts remind us very much of the discussion of growth and robustness of scale free networks, yielding a first hint to a statistical underpinning of these phenomena that still has to be investigated further.

Conclusion

We have uncovered a growing complex network being the result of a famous artist's work process, and we have introduced a software system that enables everyone to build or document image networks by linking image details to one another as Aby Warburg did with paper in his Mnemosyne atlas. In our opinion the case of Anna Oppermann's "Öl auf Leinwand" ensemble reveals that the biologic metaphors used by art critics in the past have a deep legitimation. In fact Oppermann's artistic work shows the qualitative characteristics of an ever-growing jungle. Using the presented hyperimage system, it is now possible to give exact metrics for the different ensembles she made, possibly revealing insights into the development of her artistic practice.

References and Notes

* This paper was presented as a contributed talk at Arts | Humanities | Complex Networks – a Leonardo satellite symposium at NetSci2010. See <http://artshumanities.netsci2010.net>

1. Aby Warburg: *Der Bilderatlas Mnemosyne*, Band 1: Gesammelte Schriften. Berlin: Akademie-Verlag, 2000.

2. See for e.g. Newman 2005: *Power laws, Pareto distributions and Zipf's law*. arXiv:cond-mat/0412004v3, <http://arxiv.org/abs/cond-mat/0412004v3>

Fig. 1: The hyperimage user interface. Image association links are marked up with frames in the source image. (© Martin Warnke)
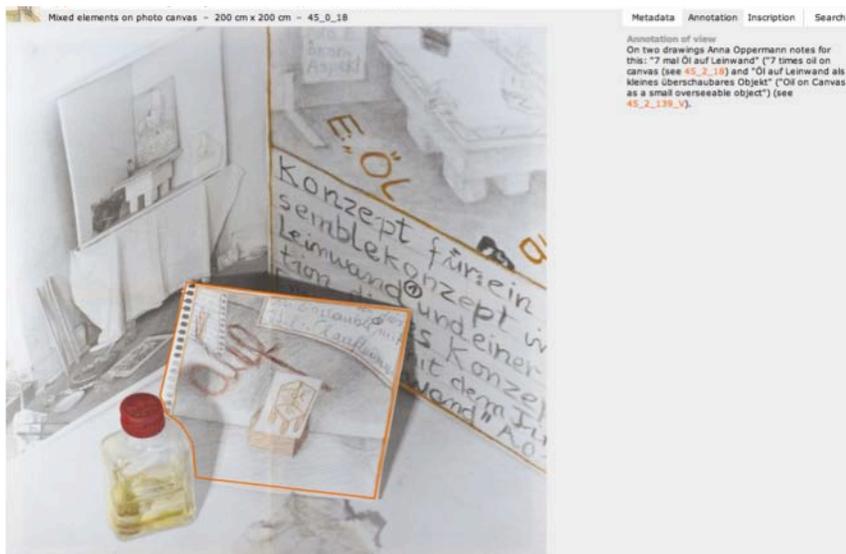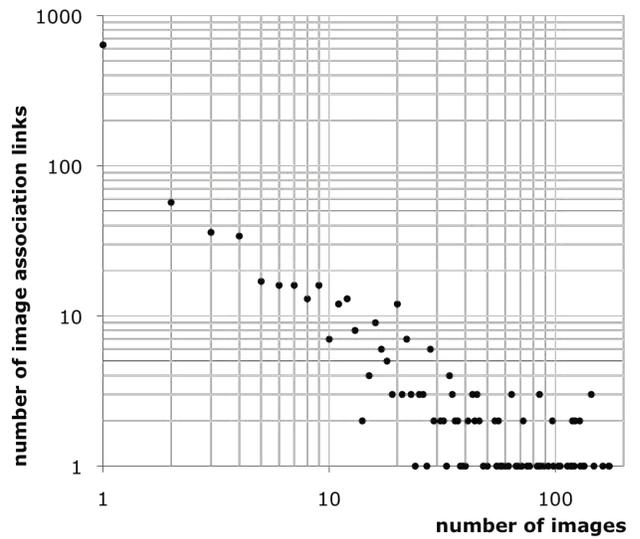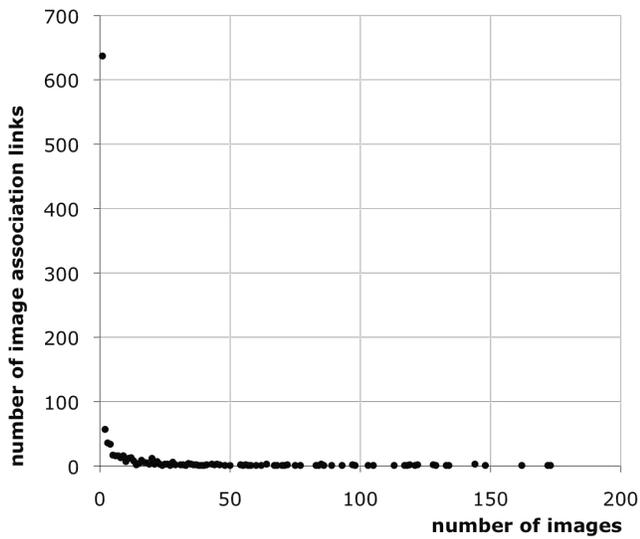
Fig. 2: Linear plot of the number of images in "Öl auf Leinwand" that have a certain number of links. (© Martin Warnke)
Fig. 3: Log-log plot of the same data revealing the heterogeneous scaling behavior. (© Martin Warnke)

Fig. 4: Anna Oppermann: "Öl auf Leinwand" (since 1992). 500 x 383 x 400 cm. Hamburger Kunsthalle. http://www.uni-lueneburg.de/hyperimage/HI_Kunsthalle (© Martin Warnke)