Scientific Work & Writing Scientific (and other) Documents

Brief Overview for the Class Project

Tobias Isenberg

Outline

- (scientific) writing: what is this all about
- assignment and tasks
- identifying the problems and issues
- working with scientific literature
- structuring a typical (scientific) document
- your own contributions
- language and form issues
- additional resources

(Scientific) Writing and Presenting

- to inform people about a (research) topic
- communicate complex ideas effectively, NOT to make it sound complex & difficult
- turn complex topic into linear document: maintain a "red ribbon"
- talk about SCIENTIFIC problems/ challenges/ideas/concepts/solutions
- more formal than everyday language

Class Assignment

- chosen special topic
  → project proposal (by January 26)
  → lecture about the topic (February 12 or 19)
  → implementation of some aspect (by March 23)
  → survey paper about topic & implementation (by March 23)

- need to find, read, and work with other papers
- need to organize the topic for a lecture
- need to analyze the area for survey paper
- need to identify a part to implement

Problem Statement – Proposal

- general area of the work? why important?
- state of the art (few references)?
- survey: introduction of assigned paper approaches
- what to do with the topic (for lecture & paper)?
  - compare the papers? using which criteria?
  - examine one specific context?
  - just a description vs. comparison with other work vs. generate own examples vs. own improvement?
- implementation: scope, platform, expected results
- 1–2 pages to get feedback
- ***not wasted work:*** re-use in lecture and paper

Problem Statement – Proposal

Proposal 5th SC@RUG:
Generating Artistic Effects Using Edge and Corner Enhancing Smoothers

Bob Dröge Sander Land

23 November 2007

Traditional smoothing filters used in image processing are useful for removing noise, but often blur sharp edges as well. Edge and corner preserving smoothers (ECPS) solve this problem by smoothing out texture details and removing noise while preserving or enhancing edges. Some of these smoothers can also be used to create artistic effects. Because the small details have been replaced with homogeneous patches, the resulting image has a painting-like appearance.

Many ECPSs are based on a so-called Kuwahara operator: a symmetric, square neighbourhood of a pixel is divided in four square subregions and then the value of the pixel is replaced by the average color of the subregion having the lowest standard deviation. Several extensions exist for the Kuwahara operator, e.g. varying the number of subregions, the shape of the subregions or changing the calculation of the local average.

Papari et al.[1] showed such a filter which was claimed to be better than several other ECPSs. We plan to make a critical comparison between their ECPS and several other ones, based on performance and artistic effects. Furthermore, we will try to improve the user interaction for the best filter. We expect to create an easy-to-use tool for generating artistic images.

[1] G. Papari, N. Petkov and P. Campisi, "Artistic Edge and Corner Enhancing Smoothing," in *IEEE Transactions on image processing*, vol. 16, no. 10, 2007.

Proposal Colloquium "Page ranking"

Presenters:	Simon Dalmolen & Frank Hoving
Field of research:	Computer science
Topic:	Page ranking
The specific focus/research question:	What is page ranking and how does it work in Google PageRank and IBM Clever search?
Expected findings/results:	The models/theories behind Google pagerank and IBM clever search.

PROPOSAL:

Every person on the planet how knows how to use a computer knows Google. But how does it work and for some people even more interesting….Where is my website in Google and why.

This document will explain the known technologies behind page rank. This is a technology calculating the rank of pages on the internet. We'll first explain a few details of internet and behaviour on the internet caused by websites/pages and their contents. The internet and their pages will be described with models and views.

Internet has a structure and is build by linking websites to each other. Almost every website has links to other sites, but is also linked by other pages. The PageRank is for a part based on the in- and outgoing links of pages to other websites/pages. Not only the links contribute to the PageRank.

We will describe some models and algorithms used for the calculations of page ranking. These algorithms are described in different articles and will describe the following parts:

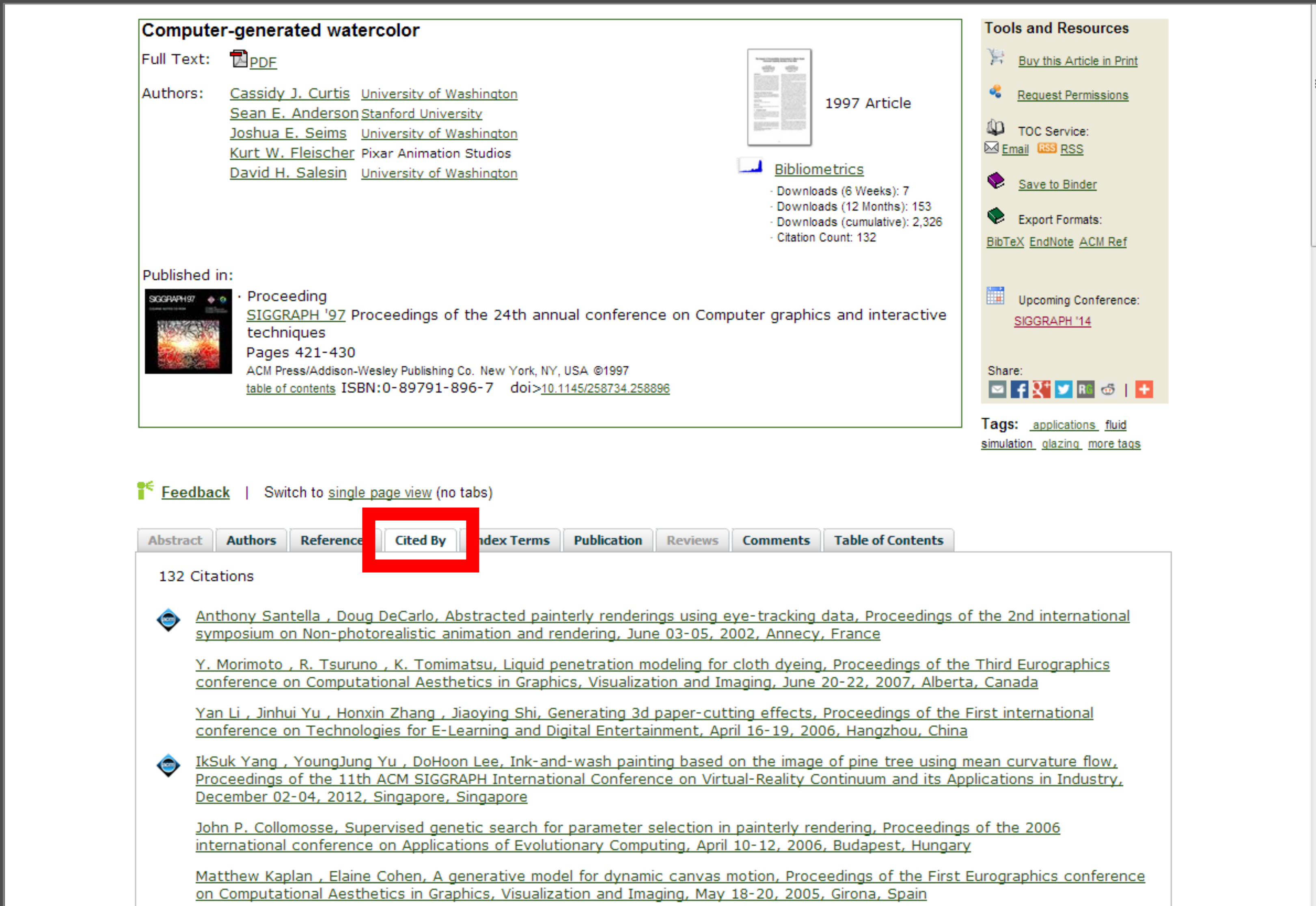
- Markov models
- Clever search
- PageRank

These algorithms and theories are will be put in comparison to each other. These comparisons will lead to our conclusion of the document about the page ranking on the internet which partly describes why the sites have there ranking in search sites.

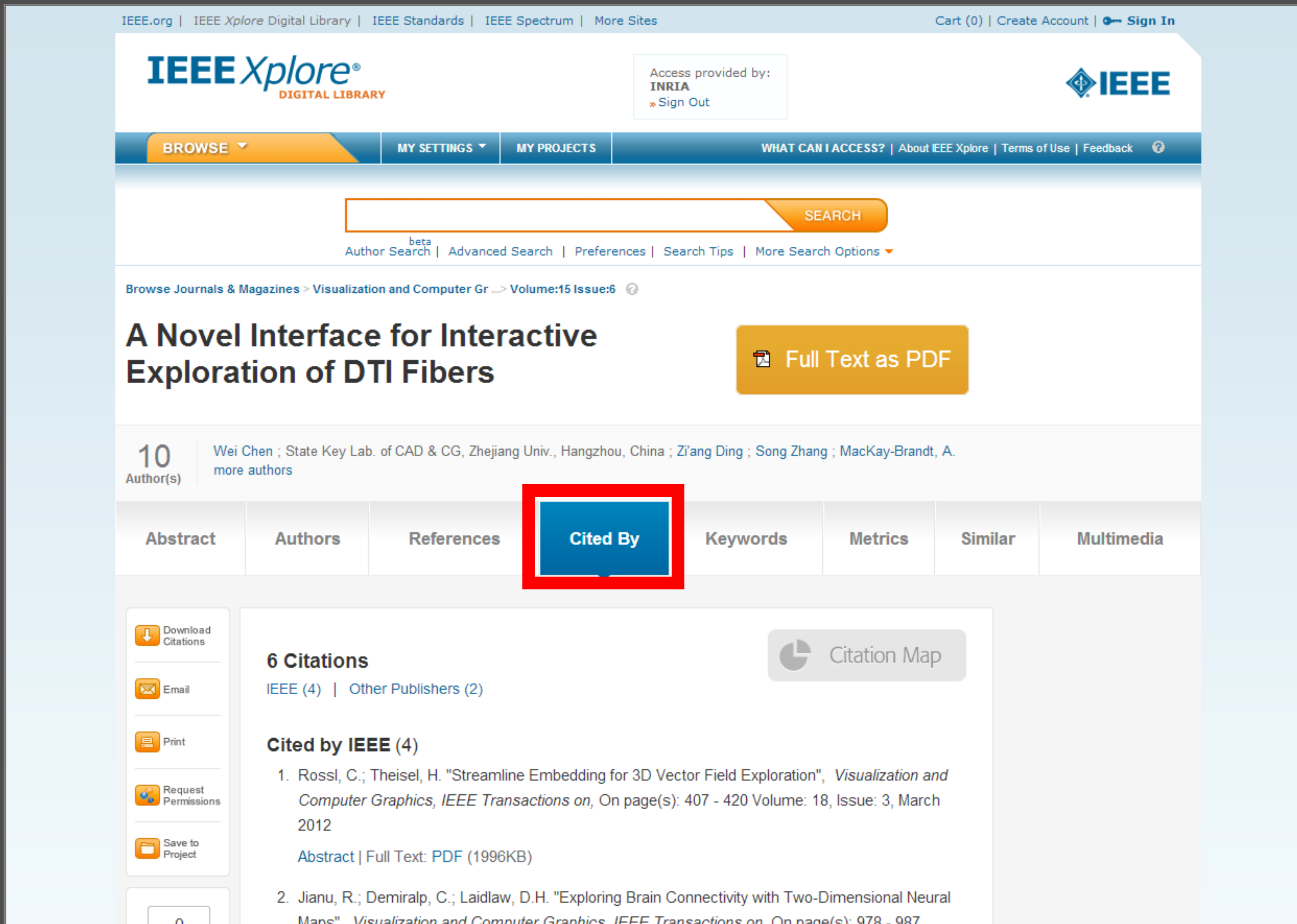
Finding Related Work

- regular search engines: Google & co
- academic search: DBLP, Google Scholar, Mendeley
- digital libraries (DL) of the publishers:
  - ACM Digital Library
  - IEEE Xplore
  - Elsevier's Science Direct
  - SpringerLink
  - Wiley Online Library
- looking at related work cited in a paper
- new papers that cite the older paper (from DLs)

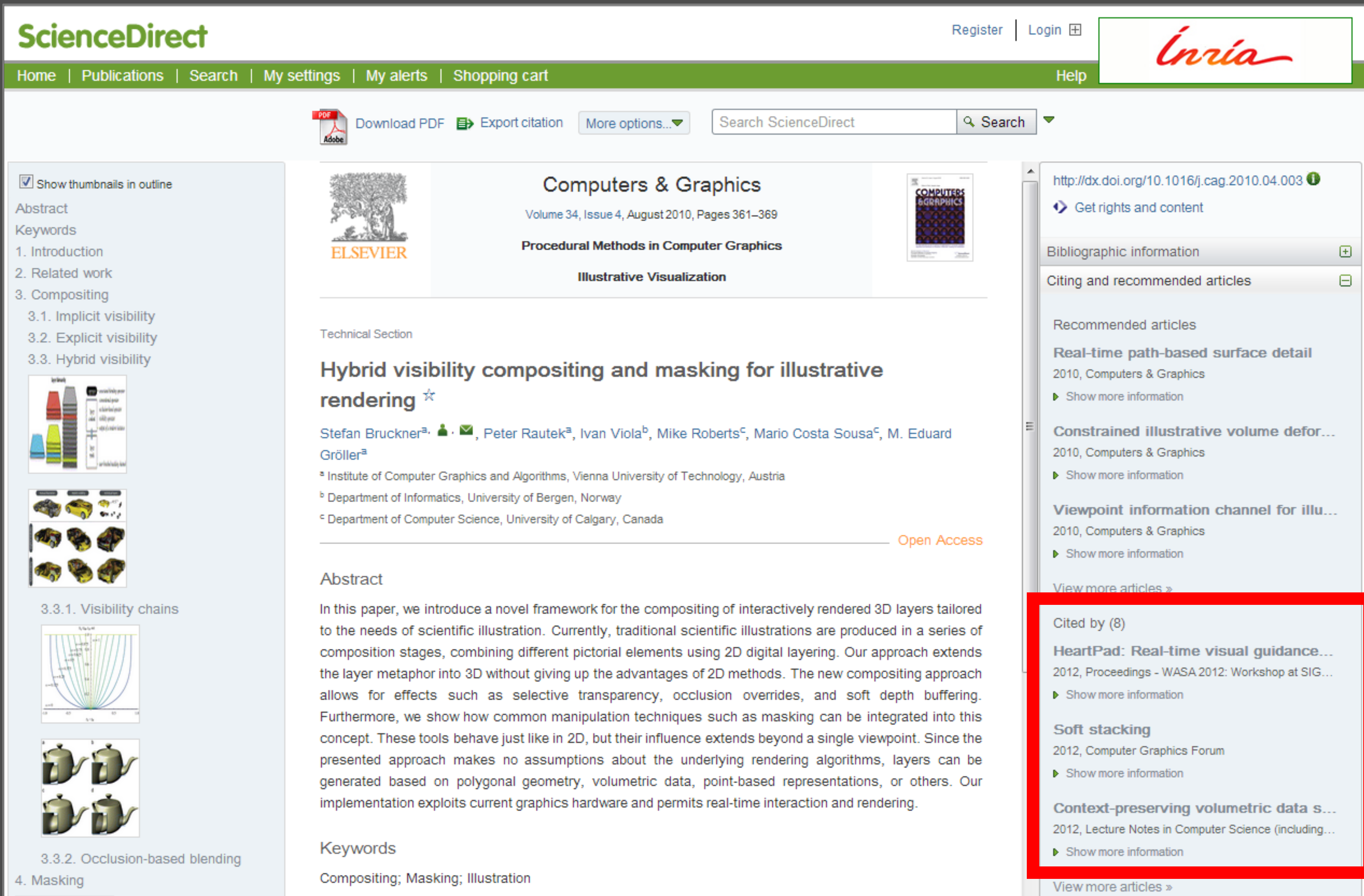
Finding Related Work: ACM DL



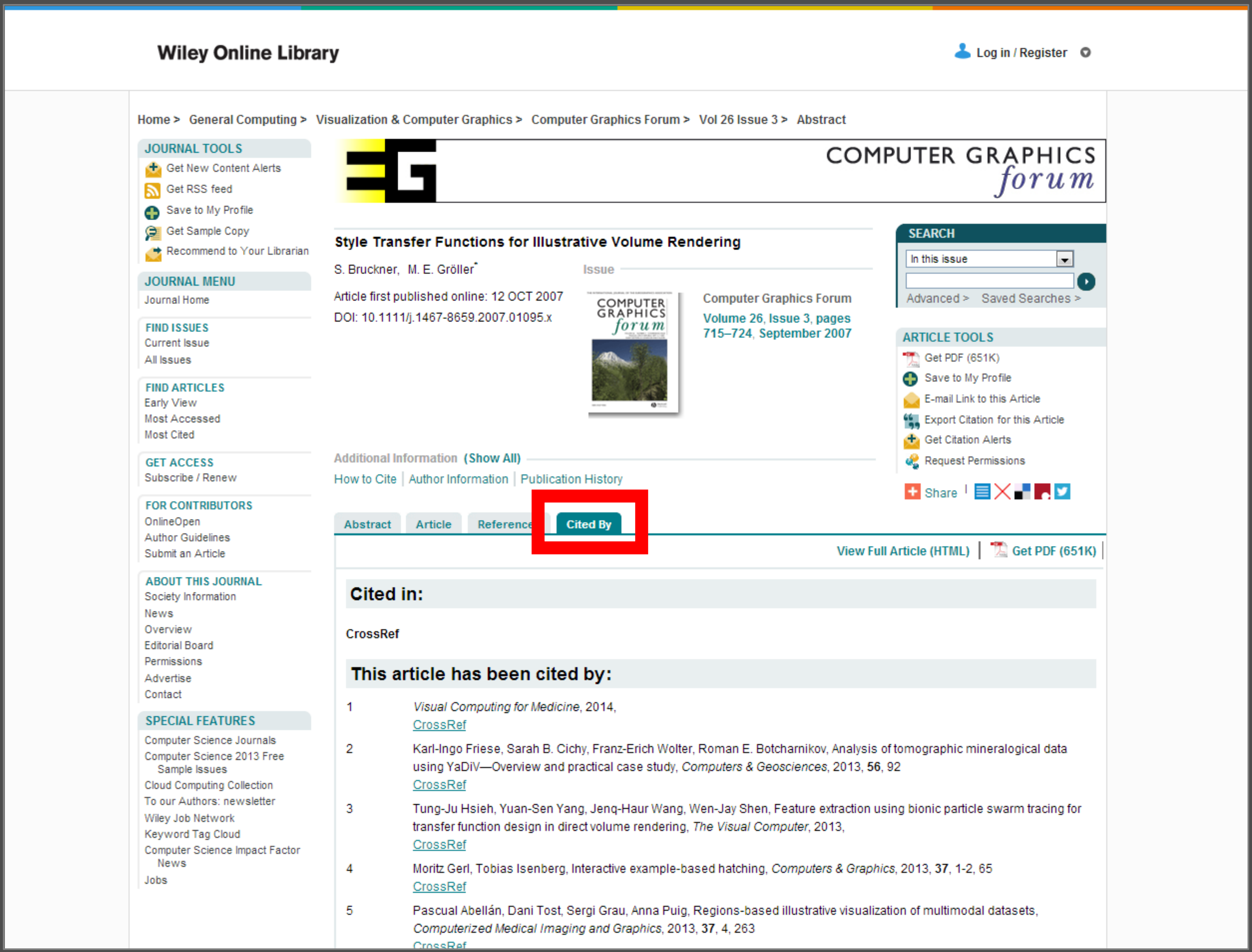
Finding Related Work: IEEE Xplore



Finding Related Work: Elsevier's DL



Finding Related Work: Wiley Online



Finding Related Work

- DOI: digital object identifier
  - to uniquely identify an online repository (of a paper)
  - example: **10.1038/nphys1170**
  - find the respective online resource:
    http://dx.doi.org/10.1038/nphys1170
  - typically leads to the publisher's DL

- finding paper PDFs
  - publisher's DL (using university subscriptions)
  - google for paper title (with and without quotes)

Working with Scientific Literature

- important questions to understand:
  - what is the general area of the work?
  - why is it important?
  - what is the state of the art (before the new parts)?
  - why do we need something different?
  - why is this new/cool/better/different/more elegant/more efficient/etc.?
  - what are the problems/issues/challenges?
  - how were they solved/addressed
  - what is the employed methodology?

Scientific Document Structure

- typical structure:
  1. Introduction
  2. Related Work
  3. Concept
  4. Realization/ Implementation
  5. Application Example and/or Evaluation
  6. Summary/Conclusion & Future Work

CONTENTS

Scientific Document Structure

- typical structure:
  1. Introduction
  2. Related Work
  3. Concept
  4. Realization/ Implementation
  5. Application Example and/or Evaluation
  6. Summary/Conclusion & Future Work

- survey structure, e.g.:
  1. Introduction
  2. Related Work
  3. Specific Problem
     1. Approach 1
     2. Approach 2
     3. Approach 3
  4. Analysis/Comparison
  5. Own Experiences (Implementation)
  6. Summary/Conclusion & Future Work

Structure: Introduction

- topic introduction:
  what & why important/relevant?
- the specific issue in this context
- small overview of your achievements
- maybe show an example result (image?)
- overview of rest of document

Structure: Related Work

- why to talk about related work?
- what have other people done in the context of your work and what can you learn from it?
- not only report, but evaluate: what is good/ bad, similar/different, suitable/unsuitable, relevant/irrelevant for your work, *WHY?*
- show examples (images/illustrations!)

Side Note: Illustrations

2 Graftals

Graftals, as they are introduced by Alvy Ray Smith [4], are originally defined as parallel graph grammar languages. They are no different than L-systems [5], but specifically used to describe tree and plant models. Graftals are similar to fractals, in the sense that they are self-similar (the whole has the same shape as one or more of the parts). However, graftals are less restrictive than fractals. The L-systems, introduced by Lindenmayer [5], are similar to conventional grammars, but they differ in two aspects. Firstly, all grammar rules are applied simultaneously. Secondly, there is no distinction between terminal and non-terminal symbols, so the production rules can be applied infinitely often. An example is the L-system with the alphabet $\{0, 1, [,]\}$, the production rules $\{0 \rightarrow 1[0]1[0]0, 1 \rightarrow 11, [\rightarrow [,] \rightarrow]\}$ and the axiom (starting symbol) 0. For this grammar, the first three steps are:

1. 0
2. 1[0]1[0]0
3. 11[1[0]1[0]0]11[1[0]1[0]0]1[0]1[0]0

If such a grammar is translated to a graphical presentation, rather complex structures can emerge, as shown in Figure 2.

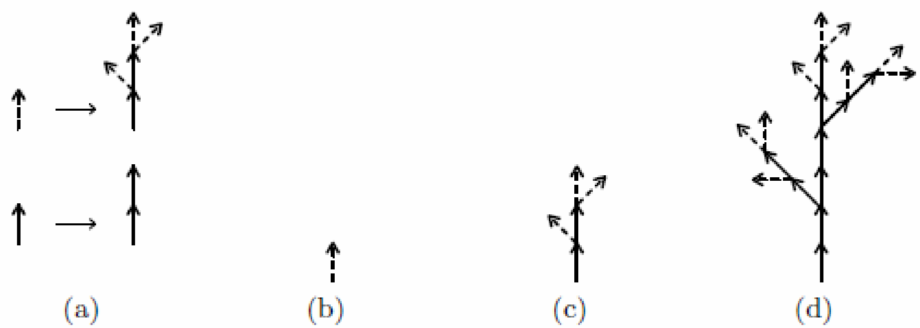


Fig. 2. Production rules (a), axiom (b) and the results after one (c) and two steps (d). Example taken from [4].

Joël van Neerbos and Watze Winsemius

Side Note: Illustrations

One example is Pixar's recent movie Ratatouille, in which a rat plays the part of the hero and therefore needs to win the audiences' hearts, despite the fact that rats are usually portrayed negatively in our society. In one of their articles, Konishi and Venturini describe the steps they have taken to give animated rats appeal [Kon07].

Figure 2: Complex vs. simple silhouette of a rat [Kon07]

Jaap Bresser and Nico de Poel

Side Note: References

- *Cool Computer Science*.
- John Smith. *Cool Computer Science*.
- John Smith. *Cool Computer Science*. 2007.
- John Smith. *Cool Computer Science*. In *Important Conference Proceedings*. 2007.
- John Smith. *Cool Computer Science*. In *Important Conference Proceedings*. ACM Press. 2007.
- John Smith. *Cool Computer Science*. In *Important Conference Proceedings,* pages 103–112. ACM Press, New York. 2007.
- John Smith. *Cool Computer Science*. Important Computer Journal 17(4): 32–41, April 2007.

- **DON'T TRUST** the DLs for completeness and correctness!

Structure: Concept

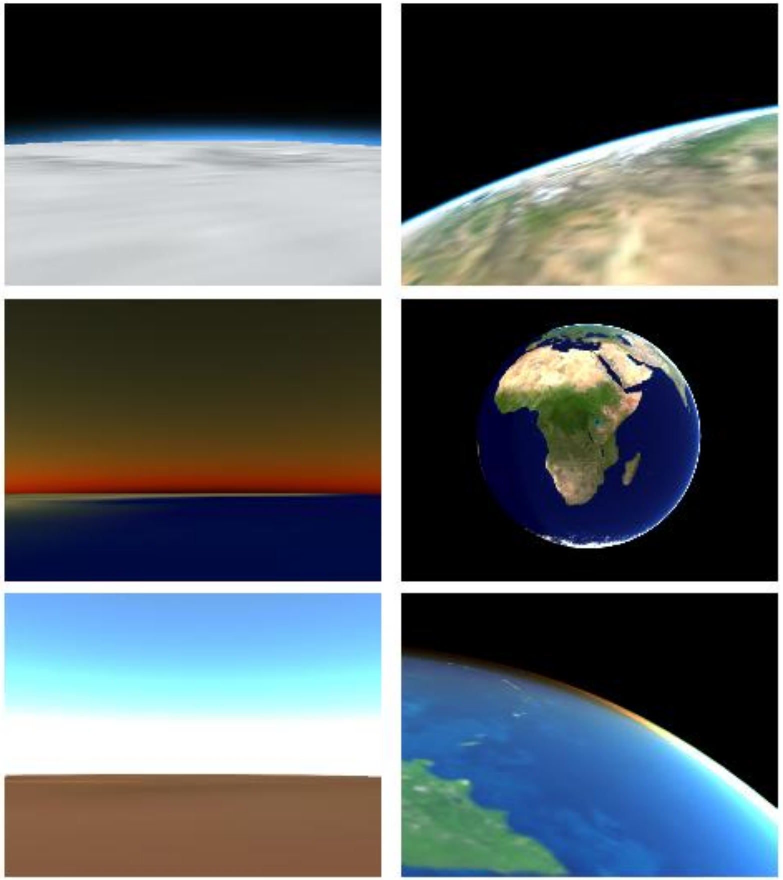
- develop own ideas
- first independent of realization
- concentrate on ***scientific & research issues***: what are the problems & how to solve them?
- how different from other techniques, what is better/new/innovative?
- illustrate!
- summarize

Structure: Realization & Evaluation

- conceptual problems & solutions
  (not this or that bug of a library you used)
- selected implementation issues
- illustrate appropriately (e.g., class diagrams not too interesting for graphics)
- evidence that your approach works & solves the posed problem
- application example
- e.g., performance data, study result, etc.

Structure: Realization & Evaluation

frame rates. Our proof of concept application produced a framerate that was always in the 20-30 frames per second area. These rates were archieved on an NVIDIA GeForce 7800 GS graphics card using settings matching the conditions of the earth. The atmosphere was rendered in 32 layers. Some screen captures of our implementation are supplied below.



Emil Loer and Thomas ten Cate

Your Own Contribution/Implementation

- try out their techniques, produce own examples (online or downloadable demos)
- implement parts, try out variations
- evaluate performances
- analyze in a specific context not looked at by the original authors

Your Own Contributions

by Sander Land and Bob Dröge

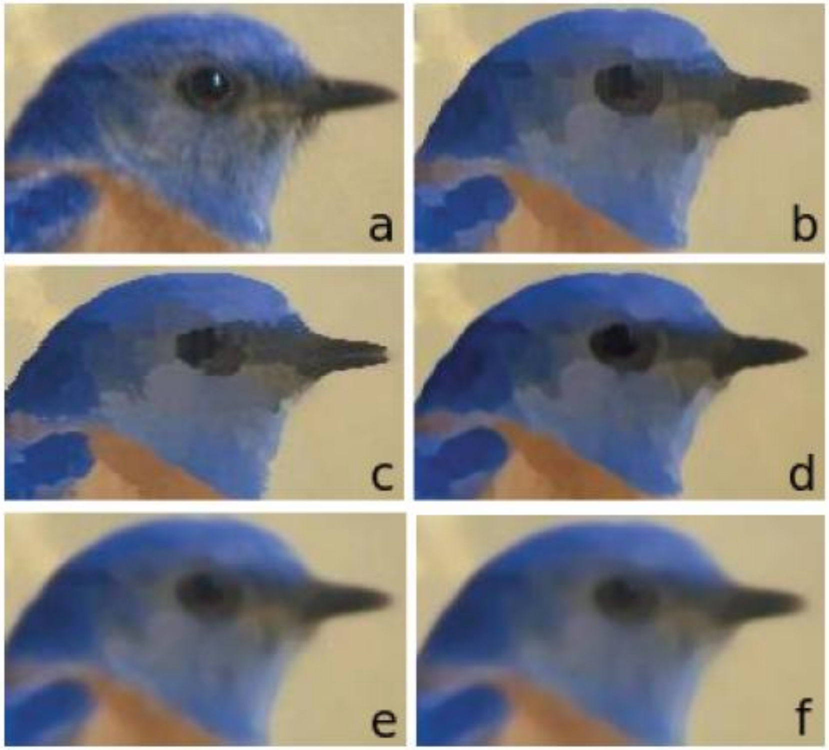


Fig. 2. Some of the best artistic effect results: a) Original, b) Kuwahara weighted ($s = 5$, $q = 8$), c) Kuwahara ($s = 7$), d) Papari-Petkov-Campisi ($\sigma = 3$, $N = 8$, $q = 6$), e) Median ($r = 4$, $N = 5$), f) Rudin-Osher-Fatemi ($\lambda = 64$, $N = 32$)

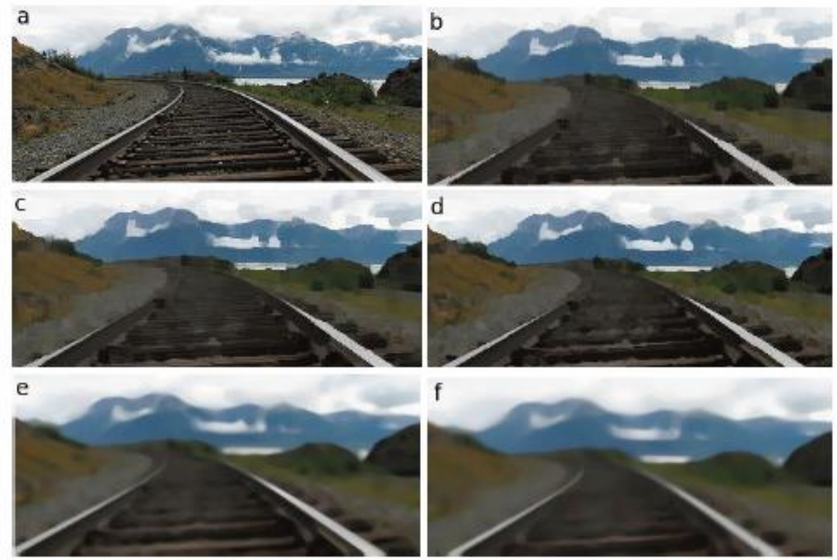


Fig. 3. Some of the best artistic effect results: a) Original, b) Kuwahara weighted ($s = 5$, $q = 8$), c) Kuwahara ($s = 5$), d) Papari-Petkov-Campisi ($\sigma = 2$, $N = 12$, $q = 12$), e) Median ($r = 4$, $N = 7$), f) Rudin-Osher-Fatemi ($\lambda = 64$, $N = 64$)

Structure: Summary/Conclusion

- difference between summary and conclusion
  - what have you done (summary)
  - what have you achieved (conclusion)

- looking back at your initial problem statement (introduction), did you solve it?
- points of strength, contributions?
- points of criticism, weaknesses?
- what essential things have you learned?

Structure: Future Work

- could be part of conclusion section
- what would you do if you would have more time to work on the project?
- interesting possibility to extend it
- illustrations?

WHAT – WHY – HOW

- usually we write: ***why–how–what***
- in technical writing better: ***what–why–how***
  - ***what:*** clear statement of what you do
  - ***why:*** why approach/technique is important
  - ***how:*** how is the approach/technique realized
- used in most parts of document at different levels: paragraph, subsection, section, etc.

Plagiarism

- copying other people's work without reference – NOT acceptable
- cite ideas, text, and illustrations
- mark literally quoted text as such
- is it ok to …
  - use other people's ideas? – yes, reference!
  - use text from other documents? – yes, quote & reference!
  - use text from other sources without quotes – no!
  - use other people's images (Web)? – if allowed, reference!
  - hand in another paper as my work? – no!

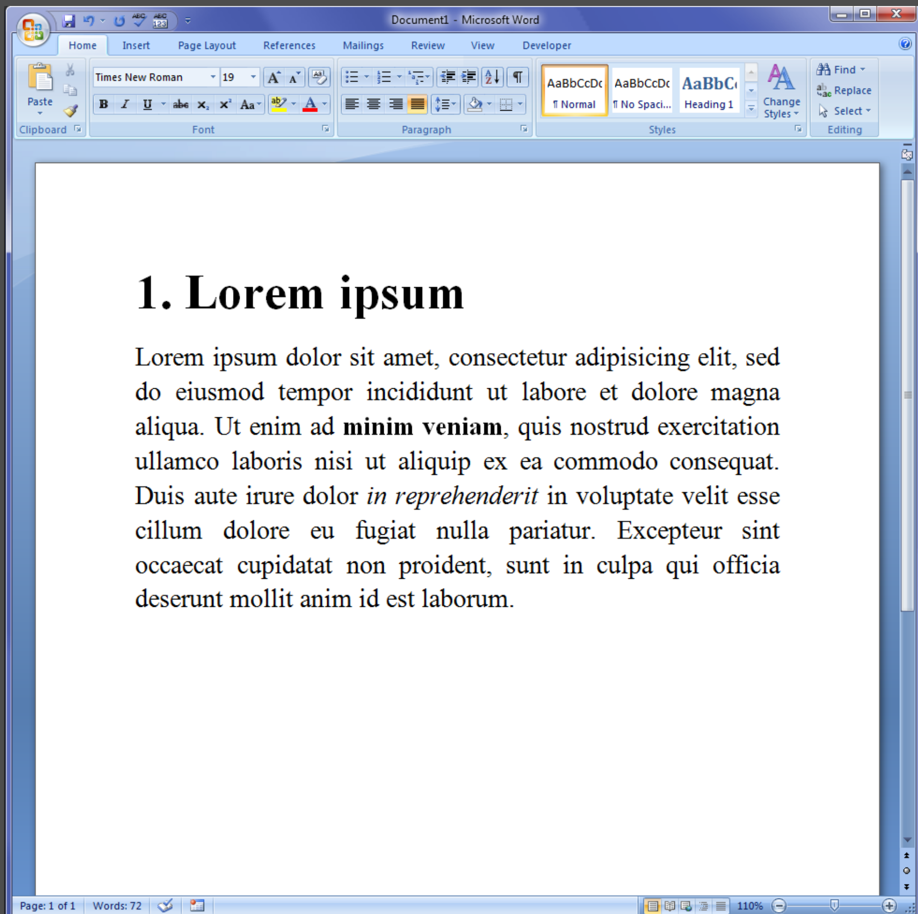
Language & Form Issues

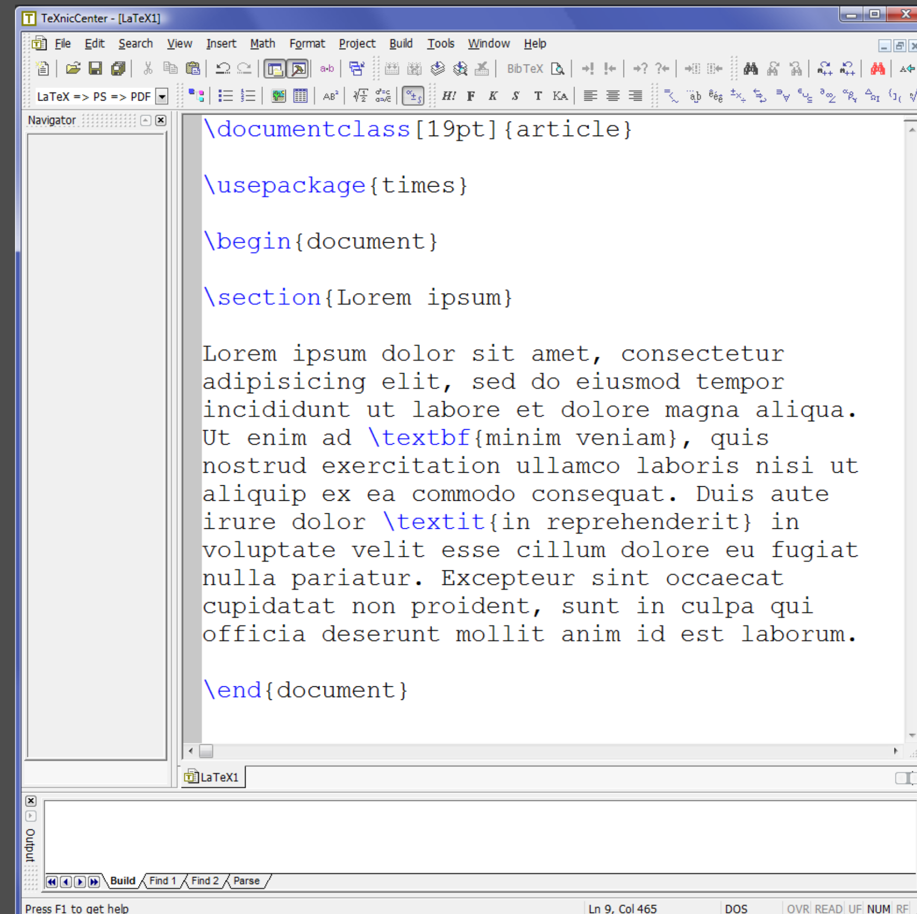
- concise language, easy to understand
- avoid overly long sentences
- reader does not understand: YOUR fault!
- be consistent in everything (e.g., I vs. we)
- avoid abbreviations: don't, ain't, can't, it's (some are ok: e.g., i.e., etc., et al.)
- do not use future tense (I will talk about)

Language & Form Issues

- no sectioning without text
  (3. Concept – 3.1 First Concept – text)
- reference all figures & tables in main text
- references as names capitalized:
  Figure 3.1, Table 3.2, Section 3.3
- gender-neutral writing (the user – he?)
- spell-check, grammar-check, proof-read
- let someone else proof-read: spelling and understanding

Typesetting





Typesetting

- consistency and completeness
  - all parts there (page numbers, title, table of contents, text, list of references, lists of tables and figures, appendix; as appropriate)?
  - references in the document up to date?
  - make use of reference databases (e.g., bibTeX or similar)
  - following the prescribed document style?
  - etc.

Typesetting

Global Illumination for Fun and Profit

Roy G. Biv, Ed Grimley, *Member, IEEE*, and Martha Stewart

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Index Terms—Radiosity, global illumination, constant time.

1 Introduction

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2 Exposition

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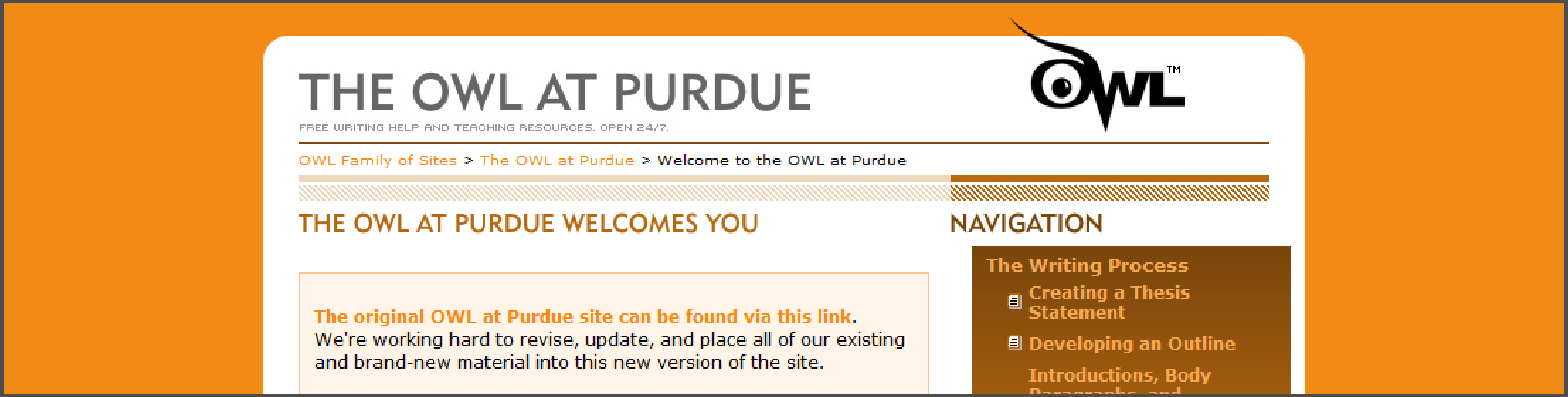
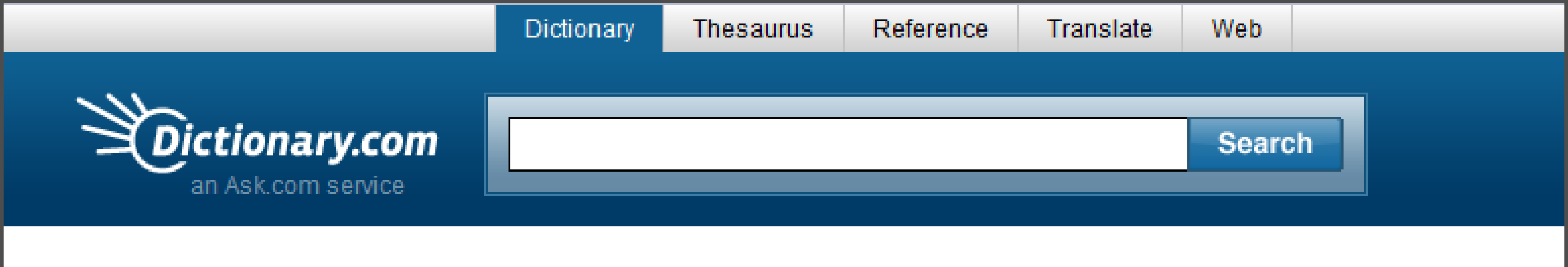
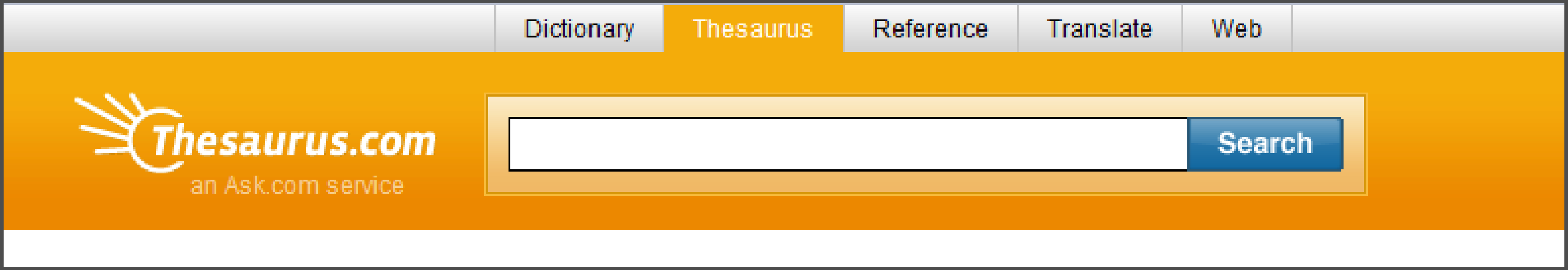
Manuscript received 31 March 2008; accepted 1 August 2008; posted online 19 October 2008; mailed on 13 October 2008.
For information on obtaining reprints of this article, please send e-mailto:tvcg@computer.org.

Additional Resources







Additional Resources: Links

- http://owl.english.purdue.edu/
- http://dictionary.reference.com/
- http://thesaurus.reference.com/
- http://tobias.isenberg.cc/Teaching/ThesisGuidelines