



Writing a (Computer Science) Paper

Jakob E. Bardram



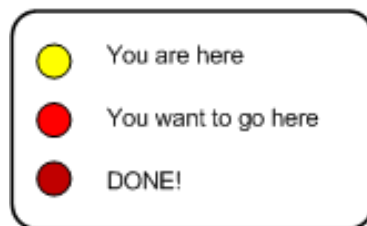
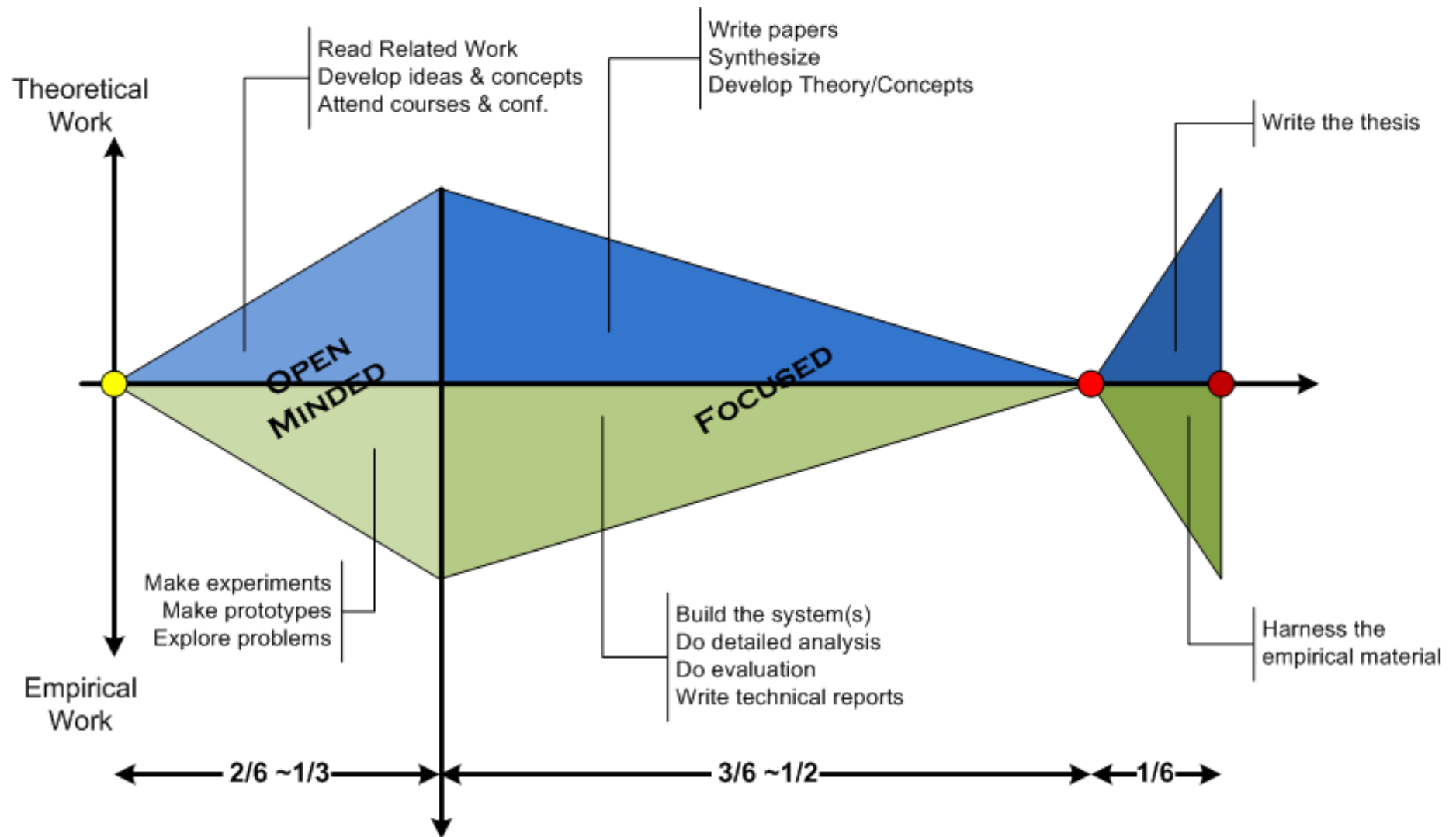
- Why write a paper?
- When to write a paper?
- Types of papers
- How to write a paper?
 - how to write an abstract?
- Where to send it?
- Co-authorship
- Refereeing
- Some practical advice

Why write a paper?

- Science is all about reporting on research
 - A contribution only exists if *and only if* it is documented
- Eating the elephant in smaller pieces
 - focus on a specific contribution
 - rather than telling the whole story
- The main component in your CV
 - and hence for your future (academic) career
- The main source for your peers to get to know you
 - the best way to be famous is form your work
- Work as a way into internships, etc.
- In Denmark – may be the parts making up your thesis

When to write a paper

- When you have something important to share with others
 - a new idea
 - new data
 - an intelligent review of existing work
- Mature results
 - research milestone completed
 - can articulate the results
 - clear problem statement, solution, and contribution



Deliverables:

- related work
- detailed design
- plan
- methods
- hypothesis
- goals
- contributions

- Review paper
 - a survey of a specific area, technology, methods, etc.
 - you need to do this anyway
 - can be published
- Analysis paper
 - workplace study
 - theoretical analysis
 - technical analysis, comparison, or review
- Design paper
 - a new technical design
 - user interface techniques / UI design / Interaction Design
 - software architecture
 - ...

A Review Paper

Table 1. Current location sensing technologies.

Technology	Technique	Physical	Symbolic	Absolute	Relative	LLC	Recognition	Accuracy and precision if available	Scale	Cost	Limitations
GPS	Radio time-of-flight lateration	•		•		✓		1-5 meters (95-99 percent)	24 satellites worldwide	Expensive infrastructure \$100 receivers	Not indoors
Active Badges	Diffuse infrared cellular proximity		•	•			✓	Room size	1 base per room, badge per base per 10 sec	Administration costs, cheap tags and bases	Sunlight and fluorescent light interfere with infrared
Active Bats	Ultrasound time-of-flight lateration	•		•			✓	9 cm (95 percent)	1 base per 10 square meters, 25 computations per room per sec	Administration costs, cheap tags and sensors	Required ceiling sensor grid
MotionStar	Scene analysis, lateration	•		•			✓	1 mm, 1 ms, 0.1° (nearly 100 percent)	Controller per scene, 108 sensors per scene	Controlled scenes, expensive hardware	Control unit tether, precise installation
VHF Omini-directional Ranging	Angulation	•		•		✓		1° radial (≈ 100 percent)	Several transmitters per metropolitan area	Expensive infrastructure, inexpensive aircraft receivers	30-140 nautical miles, line of sight
Cricket	Proximity, lateration		•	◦	◦	✓		4 × 4 ft. regions (≈ 100 percent)	≈ 1 beacon per 16 square ft.	\$10 beacons and receivers	No central management receiver computation
MSR RADAR	802.11 RF scene analysis and triangulation	•		•			✓	3-4.3 m (50 percent)	3 bases per floor	802.11 network installation, ≈ \$100 wireless NICs	Wireless NICs required
PinPoint 3D-ID	RF lateration	•		•			✓	1-3 m	Several bases per building	Infrastructure installation, expensive hardware	Proprietary, 802.11 interference
Avalanche	Radio signal	•			•			Variable,	1 transceiver	≈ \$20	

J. Hightower & G. Borriello. Location Systems for Ubiquitous Computing. *IEEE Computer*, Aug. 2001



- Systems paper
 - describe a system / piece of technology
 - Proff-of-Concept
- Theoretical paper
 - Proves some properties ...
- Evaluation paper
 - Technical evaluation
 - Usability evaluation
 - Pilot study
- Methods paper
 - a new method / methodology for ...
 - new process
- Position Paper
 - a statement / critical message
 - normally not considered a contribution

How to write a paper?

- Find the contribution
- Outline Related Work
- Identify and engage co-authors
- Identify the readers / target outlet
- Ensure validity
- Ensure quality
- Write good English
- Proofread
- Submit
- Revise

A Scientific Contribution I

- Adds to “knowledge”
 - thus it must be a **written** contribution
 - and not only something you did
 - what can others learn from this
- Typically addresses a clear stated problem
 - and explains well, what is new
 - the „delta“ to existing work
- Relevance of a scientific contribution - some metrics
 - relates to the relevance of the problem
 - relates to the #citations
 - relates to the publication
 - the kind (workshop, conference, journal)
 - the ranking of the conference/journal

- What is the “standard” paper in our area?
- HCI
 - needs a user involved somehow – design & evaluation
- Workplace studies
 - needs a non-trivial field study
- Systems papers
 - needs an implementation and some evaluation
 - good: used by others
 - better: used by others to build something
- Theoretical papers
 - a proof of something

The “Introduction”

- Background
 - Motivation – a real issue?
 - What is the research context?
 - What is the state-of-art?
- Hypothesis / Problem
 - What is broken/missing (the “gab”)
 - Thesis or Problem statement
- Goals and methods
 - What are the operational goals of this paper?
 - And how were they achieved?
- Results
 - Contributions
- Paper overview
 - Outline of the rest of the paper

Source: Saul Greenberg's homepage.

- Main body
 - Section organization reflects how your argument unfolds
 - Each section should have a main point
 - Each paragraph should have a main point
- Summary/Conclusions
 - Tell them what you've told them
 - some people only read abstract, intro and conclusions
 - Relate back to general area
 - Introduce future work

How to make the “Abstract”

- 1st model ~ systems kind of papers
 - Background
 - However, gap
 - What we did ~ innovation
 - Contributions
 - What it means
- 2nd model ~ study/medical kind of papers
 - Background & Purpose
 - Methods
 - Results
 - Conclusions

Support for Activity-Based Computing Operations

Jakob E. Bardram, Jonathan Bunick
Centre for Pervasive Health
Aabogade 34, 8200 Århus
{bardram,jbp,mads}@cph.ku.dk

ABSTRACT

Research has shown that computers are notoriously bad at supporting the management of parallel activities and interruptions, and that mobility increases the severity and scope of these problems. This paper presents *activity-based computing* (ABC) which supplements the prevalent data- and application-oriented computing paradigm with technologies for handling multiple, parallel and mobile work activities. We present the design and implementation of ABC support embedded in the Windows XP operating system. This includes replacing the Windows Taskbar with an Activity Bar, support for handling Windows applications, a zoomable user interface, and support for moving activities across different computers. We report an evaluation of this Windows XP ABC system which is based on a multi-method approach, where perceived ease-of-use and usefulness was evaluated together with rich interview material. This evaluation showed that users found the ABC XP extension easy to use and likely to be useful in their own work.

Background & Gap

What we did ~ Innovation

Contributions

Method

Results

ABSTRACT

The role of computers in the modern office has divided our activities between virtual interactions in the realm of the computer and physical interactions with real objects within the traditional office infrastructure. This paper extends previous work that has attempted to bridge this gap, to connect physical objects with virtual representations or computational functionality, via various types of tags. We discuss a variety of scenarios we have implemented using a novel combination of inexpensive, unobtrusive and easy to use RFID tags, tag readers, portable computers and wireless networking. This novel combination demonstrates the utility of invisibly, seamlessly and portably linking physical objects to networked electronic services and actions that are naturally associated with their form.

Papers

CHI 99 15-20 MAY 1999

Bridging Physical and Virtual Worlds with Electronic Tags

Roy Want, Kenneth P. Fishkin, Anuj Gujar, Beverly L. Harrison



Exercise

Try to write an abstract for a paper describing the invention of the paper clip

- Workshops
 - Good for practice
 - Good for networking
 - Not archival,
 - Limited peer-review
- Conferences
 - BEWARE! Quality varies a lot
 - ACM, IEEE Conferences (Springer)
 - Archival
 - Peer-reviewed
- Journals
 - Look for top-rated journals (ACM, IEEE, Elsevier, ...)
 - Publish in the green-listed journals (Danish)
- National publication ...

THE AUTHOR LIST: GIVING CREDIT WHERE CREDIT IS DUE

The first author
Senior grad student on the project. Made the figures.

The third author
First year student who actually did the experiments, performed the analysis and wrote the whole paper. Thinks being third author is "fair".

The second-to-last author
Ambitious assistant professor or post-doc who instigated the paper.

Michaels, C., Lee, E. F., Sap, P. S., Nichols, S. T., Oliveira, L., Smith, B. S.

The second author
Grad student in the lab that has nothing to do with this project, but was included because he/she hung around the group meetings (usually for the food).

The middle authors
Author names nobody really reads. Reserved for undergrads and technical staff.

The last author
The head honcho. Hasn't even read the paper but, hey, he got the funding, and his famous name will get the paper accepted.

JORGE CHAM © 2005

www.phdcomics.com

Co-authorship – Simple Rules

- All authors should have contributed
 - to the research
 - to the paper
- Always try to put your professors name on
 - forces him/her to work with you
 - if “only” advising, put the name last
- Make sure to invite everybody who at some point made a contribution
 - initial ideas
 - coding
 - evaluation

Refereeing

- Just overhead?
 - your professor hand you all his papers...
- Refereeing is excellent practice for
 - developing critical appraisal skills
 - understanding how good (and bad) papers are written
- Fairness
 - all your papers will be refereed
 - expected duty of all researchers/academics
- Other upsides
 - enhance reputation
 - expedites processing of your own papers
 - get on editorial board or program committee
 - 'previews' to the state of the art

Source: Saul Greenberg's presentation on refereeing, "HowToReferee.ppt" from his homepage.

The Piled Higher & Deeper
Paper Review Worksheet

Stuck reviewing papers for your advisor? Just add up the points using this helpful grade sheet to determine your recommendation.

No reading necessary!

Paper title uses witty pun, colon or begins with "On..." (+10 pt)	
Paper has pretty graphics and/or 3D plots (+10 pt)	
Paper has lots of equations (+10 pt) (add +5 if they look like gibberish to you)	
Author is a labmate (+10 pt)	
Author is on your thesis committee (+60 pt)	
Paper is on same topic as your thesis (-30 pt)	
Paper cites your work (+20 pt)	
Paper scooped your results (-1000 pt)	
TOTAL	

Points	Recommendation
< 0	Recommend, but write scathing review that'll take them months to rebuff.
0-120	Recommend, but insist your work be cited more prominently.
>120	Recommended and deserving of an award

A Template for Reviewing

- Meta information
 - paper title, author (if not ann.), manuscript id, ...
- The review
 - brief summary (2-3 lines)
 - “If you can’t, there is probably something wrong with the paper” [ACM CHI FAQ]
 - Contribution
 - what is new? is it significant? (novelty/contribution)
 - would it stimulate further work? (impact)
 - how relevant is it to the community? (relevance)
 - Quality of the *research*
 - how sound is the work?
 - how appropriate/reliable are the methods used?
 - how reasonable are the interpretations?
 - how does it relate to existing work?
 - can an experienced practitioner in the field duplicate the results?
 - Quality of the *writing*
 - outline, language, spelling, grammar, figures, ...
 - Recommend acceptance / rejection

ADDRESSING REVIEWER COMMENTS

BAD REVIEWS ON YOUR PAPER? FOLLOW THESE GUIDELINES AND YOU MAY YET GET IT PAST THE EDITOR:

Reviewer comment:

"The method/device/paradigm the authors propose is clearly wrong."

How NOT to respond:

✗ "Yes, we know. We thought we could still get a paper out of it. Sorry."

Correct response:

✓ "The reviewer raises an interesting concern. However, as the focus of this work is exploratory and not performance-based, validation was not found to be of critical importance to the contribution of the paper."

Reviewer comment:

"The authors fail to reference the work of Smith et al., who solved the same problem 20 years ago."

How NOT to respond:

✗ "Huh. We didn't think anybody had read that. Actually, their solution is better than ours."

Correct response:

✓ "The reviewer raises an interesting concern. However, our work is based on completely different first principles (we use different variable names), and has a much more attractive graphical user interface."

Reviewer comment:

"This paper is poorly written and scientifically unsound. I do not recommend it for publication."

How NOT to respond:

✗ "You #&@*% reviewer! I know who you are! I'm gonna get you when it's my turn to review!"

Correct response:

✓ "The reviewer raises an interesting concern. However, we feel the reviewer did not fully comprehend the scope of the work, and misjudged the results based on incorrect assumptions."

www.phdcomics.com

JORGE CHAM © 2005

Practical Advice

Some final practical advice

- Copycat
 - find a very good* paper and literally copy it word by word, sentence by sentence, section by section
 - *: good in terms of writing – not contribution
- Learn from others
 - write together with others – e.g. your supervisor
 - read and review other's papers
- Learn to write English
 - take classes
 - spend time on writing – it is time consuming
 - build your (scientific) vocabulary
 - pick up phrases and words from others
- (Try to split a paper in two)*

- Saul Greenberg's homepage
 - <http://pages.cpsc.ucalgary.ca/~saul>
- "So long, and thanks for the Ph.D.!"
 - a.k.a "Everything I wanted to know about C.S. graduate school at the beginning but didn't learn until later."
 - Ronald T. Azuma, UNC, 1997, 2003
- <http://www.phdcomics.com/>
- ... and a lot of other resources!

Oh no, your paper exceeds the maximum number of pages allowed! What do you do??

TIPS AND TRICKS

FOR KEEPING YOUR PAPER WITHIN THE PAGE LIMIT

Shrink font size to limits of human perception

If a minimum font sized is imposed, use a font that is 0.2pt smaller. They won't notice, will they?

Take out excessive details of your methodology

Let's face it, nobody really cares (and if they do, why help your competition?)

Border size Rule-of-thumb:

If there is paper exposed, it can be filled (Nature, and other journals, abhors a vacuous submission). If limit exists, apply 0.2pt rule.

Use Max. Abbrev. in Ref. Sec.

Spelling out the journal names will only make it easy for people to look up your competitors' papers.

Rewrite entire paper to make it more concise and easier to understand

Yeah right. Prodigious verbiage establishes your superior intelligence. Also, who has the time?

