Research Methods in computer science
Spring 2019

Lecture 7

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February 6, 2019

Agenda

HW2 Live Grading

Paper Review

Assignment

Which papers are more important?

Conference

Journal

Magazine

What makes a paper more important than others?

Types of Papers (purpose)

Research Paper

Survey Paper

Tutorial

Technical Report

- E.g., NIST, Other Orgs

White Paper

Vision Paper

Challenge Paper

Citation Format

There is no standard citation format
    Different communities
        APA, Chicago, ………………
    Different conferences/journals
        ACM, IEEE, ……….

Learn how to use tools
    BibTex
    Online Services (e.g., Mendeley)
        Demo: Google Scholar, IEEE, ACM
    Word

Citation

Clean! Clean! Clean!
(esp. for websites, links, datasheets)

Consistency! Consistency! Consistency!

Examples

ALIZAI, M. H., WIRTZ, H., KIRCHEN, B., VAEGS, T., GNAWALI, O., AND WEHRLE, K. 2011. TinyWifi: Making Network Protocol Evaluation Portable Across Multiple Phy-Link Layers . In WiNTECH '11 Proceedings of the Sixth ACM International Workshop on Wireless Network Testbeds, Experimental Evaluation and Characterization.

^6th

BHATTI, S., CARLSON, J., DAI, H., DENG, J., ROSE, J., SHETH, A., SHUCKER, B., GRUENWALD, C., TORGERSON, A., AND HAN, R. 2005. MANTIS OS: An Embedded Multithreaded Operating System for Wireless Micro Sensor Platforms. *Mobile Networks and Applications 10*, 4 (Aug.), 563–579.

BROUWERS, N., LANGENDOEN, K., AND CORKE, P. 2009. Darjeeling, a Feature-rich VM for the Resource Poor. In *SenSys '09, Proceedings of the 7th ACM Conference on Embedded Networked Sensor Systems.* ACM, New York, NY, USA, 169–182.

BURRI, N., VON RICKENBACH, P., AND WATTENHOFER, R. 2007. Dozer: ultra-low power data gathering in sensor networks. In *IPSN '07, Proceedings of the 6th international conference on Information processing in sensor networks (2007-00-00).* ACM, 450–459.

CHALLEN, G. W., WATERMAN, J., AND WELSH, M. 2010. IDEA: Integrated Distributed Energy Awareness for Wireless Sensor Networks. In *MobiSys '10, Proceedings of the 8th international conference on Mobile systems, applications, and services.* ACM, New York, NY, USA, 35–48.

CHEN, Y., GNAWALI, O., KAZANDJIEVA, M., LEVIS, P., AND REGEHR, J. 2009. Surviving Sensor Network Software Faults. In *SOSP '09, Proceedings of 22nd ACM Symposium on Operating Systems Principles.*

CHIPARA, O., LU, C., BAILEY, T. C., AND ROMAN, G.-C. 2010. Reliable Clinical Monitoring Using Wireless Sensor Networks: Experiences in a Step-down Hospital Unit. In *SenSys '10, Proceedings of the 8th ACM Conference on Embedded Networked Sensor Systems.* ACM, New York, NY, USA, 155–168.

CONTIKICOLLECT. 2010. Contiki Collect Memo. http://comments.gmane.org/gmane.os.contiki.devel/5790.
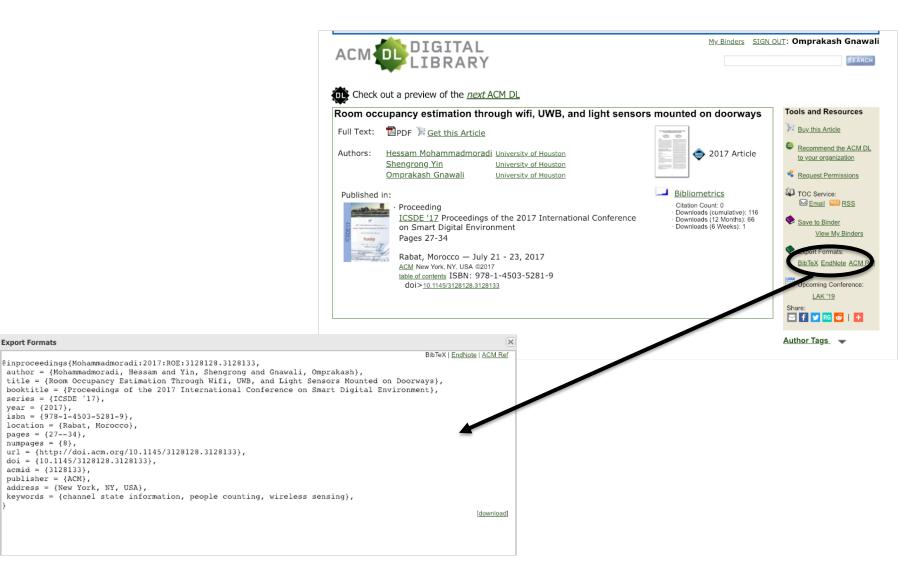
Citations

Can take a long time to format citations.

Is it worth it?

Citations – Google Scholar

Citations – ACM DL

Citations - IEEE

Towards Embedded Visible Light Communication Robust to Dynamic Ambient Light

2 Author(s)   Shengrong Yin ; Omprakash Gnawali   View All Authors

1 Paper Citation	169 Full Text Views

Download Citations

Abstract

Document Sections

I. Introduction

II. Related Work

III. System Overview

IV. Evaluation

V. Conclusions

Authors

Figures

References

Citations

Keywords

Abstract:
The presence of ambient light is a key challenge for reliable and robust low cost embedded visible light communication system. The photodetector used by these systems can perform poorly when subjected to bright ambient light or fluctuating ambient light. To solve this problem, we present an ambient light cancellation mechanism for low cost embedded LED to photodiode communication systems that utilizes a digital potentiometer to adaptively nullify the ambient light to provide an always ZERO output no matter what the ambient light intensity is. The proposed technique allows the receiver to correctly receive the light transmitted by the transmitter without any interference from the ambient light. We provide a detailed description of the modulation and demodulation schemes as well as ambient light cancellation mechanism, and their evaluations. The results show our proposed system can provide a reliable and robust visible light communication with extremely low symbol error rate (almost 0) and an acceptable data rate up to 3kbps given an operating distance of 50 centimeters.

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author={S. Yin and O. Gnawali},
booktitle={2016 IEEE Global Communications Conference (GLOBECOM)},
title={Towards Embedded Visible Light Communication Robust to Dynamic Ambient Light},
year={2016},
volume={},
number={},
pages={1-6},
keywords={demodulation;free-space optical communication;interference suppression;light emitting diodes;optical modulation;photodetectors;photodiodes;dynamic ambient light fluctuation;robust low-cost embedded visible light communication system reliability;photodetector;photodiode communication system;low-cost embedded LED;digital potentiometer;modulation scheme;demodulation scheme;ambient light cancellation mechanism;distance 50 cm;Receivers;Photodiodes;Robustness;Modulation;Prototypes},
doi={10.1109/GLOCOM.2016.7842344},
ISSN={},
month={Dec},}

References - 1

[36] D. Chen, X. Cao, F. Wen, and J. Sun, "Blessing of dimensionality: High-dimensional feature and its efficient compression for face verification," in *Proc. IEEE Conf. CVPR*, Jun. 2013, pp. 3025–3032.

[37] Z. Cui, W. Li, D. Xu, S. Shan, and X. Chen, "Fusing robust face region descriptors via multiple metric learning for face recognition in the wild," in *Proc. IEEE CVPR*, Jun. 2013, pp. 3554–3561.

[38] H. Larochelle, D. Erhan, A. Courville, J. Bergstra, and Y. Bengio, "An empirical evaluation of deep architectures on problems with many factors of variation," in *Proc. 24th ICML*, 2007, pp. 473–480.

[39] M. Varma and A. Zisserman, "A statistical approach to material classification using image patch exemplars," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 31, no. 11, pp. 2032–2047, Nov. 2009.

[40] A. Krizhevsky, "Learning multiple layers of features from tiny images," 2009.

[41] R.-E. Fan, K.-W. Chang, C.-J. Hsieh, X.-R. Wang, and C.-J. Lin, "LIBLINEAR: A library for large linear classification," *J. Mach. Learn. Res.*, vol. 9, pp. 1871–1874, Jul. 2008.

[42] D. Ciresan, U. Meier, and J. Schmidhuber, "Multi-column deep neural networks for image classification," in *Proc. IEEE Conf. CVPR*, Jun. 2012, pp. 3642–3649.

[43] K. Sohn, G. Zhou, C. Lee, and H. Lee, "Learning and selecting features jointly with point-wise gated Boltzmann machines," in *Proc. 30th ICML*, 2013, pp. 217–225.

[44] K. Yu, Y. Lin, and J. Lafferty, "Learning image representations from the pixel level via hierarchical sparse coding," in *Proc. IEEE Conf. CVPR*, Jun. 2011, pp. 1713–1720.

[45] S. Belongie, J. Malik, and J. Puzicha, "Shape matching and object recognition using shape contexts," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 24, no. 4, pp. 509–522, Apr. 2002.

References - 2

[1] N. H. Motlagh, M. Bagaa, and T. Taleb, "UAV-based IOT platform: A crowd surveillance use case," *IEEE Communications Magazine*, vol. 55, no. 2, pp. 128–134, 2017.

[2] L. Gupta, R. Jain, and G. Vaszkun, "Survey of important issues in UAV communication networks," *IEEE Communications Surveys & Tutorials*, vol. 18, no. 2, pp. 1123–1152, 2016.

[3] (2017, April) Homeland security in united states. [Online]. Available: https://en.wikipedia.org/wiki/Homeland_security

[4] C. C. Haddal and J. Gertler, "Homeland security: Unmanned aerial vehicles and border surveillance." DTIC Document, 2010.

[5] Y. Zou, J. Zhu, X. Wang, and L. Hanzo, "A survey on wireless security: Technical challenges, recent advances, and future trends," *Proceedings of the IEEE*, vol. 104, no. 9, pp. 1727–1765, 2016.

[6] R. K. Sharma and D. B. Rawat, "Advances on security threats and countermeasures for cognitive radio networks: A survey," *IEEE Communications Surveys & Tutorials*, vol. 17, no. 2, pp. 1023–1043, 2015.

[7] A. Mukherjee, S. A. A. Fakoorian, J. Huang, and A. L. Swindlehurst, "Principles of physical layer security in multiuser wireless networks: A survey," *IEEE Communications Surveys & Tutorials*, vol. 16, no. 3, pp. 1550–1573, 2014.

[8] J. Xu, K. Li, L. Duan, and R. Zhang, "Proactive eavesdropping via jamming over HARQ-based communications," in *IEEE Global Communications Conference (GLOBECOM)*, 2017.

[9] M. Bloch, J. Barros, M. R. Rodrigues, and S. W. McLaughlin, "Wireless information-theoretic security," *IEEE Transactions on Information Theory*, vol. 54, no. 6, pp. 2515–2534, 2008.

Usefulness of Learning How to Review

Look at your paper as a reviewer

Answer potential reviewer questions

Reviewer psychology

Review a few to get a feel for it

Critique

Critique is a method of disciplined, systematic analysis of a written or oral discourse. Critique is commonly understood as fault finding and negative judgment, but it can also involve merit recognition, and in the philosophical tradition it also means a methodical practice of doubt. – (Wikipedia)

Coping with Criticism

Keep it professional

Don't take it personally

Understand it

Respond at the right time

Challenge as appropriate

Do unto others as you would have them do to you. – (lots of places)

A Paper Review

"While the exercise is useful, the paper does not have any new concepts or implementation caveats that I think are worth publishing. All of the design description seems straightforward integration of existing systems. The evaluation is also very weak."

--- excerpt from a review received by the instructor

A Paper Review

"Despite the limited practical applicability, I find the paper interesting for the sheer courage to try something out of the ordinary and to properly explore its limits."

-- excerpt from a review received by the instructor

How to Review a Paper?

- Form and Content

- Parts of a paper
  - What do you expect in each paper?

How to Review a Paper? - Considerations

Novelty

Importance

Generality

Rigor

Insights

Typical Template

Summary

Strengths

Weaknesses

Detailed Comments

Justification for these sections?

We looked at a few examples of paper reviews.

We also looked at paper review software.

I almost never print out papers for review; I prefer to work with the electronic version. I always read the paper sequentially, from start to finish, making comments on the PDF as I go along. I look for specific indicators of research quality, asking myself questions such as: **Are the background literature and study rationale clearly articulated? Do the hypotheses follow logically from previous work? Are the methods robust and well controlled? Are the reported analyses appropriate? (I usually pay close attention to the use—and misuse—of frequentist statistics.)** Is the presentation of results clear and accessible? **To what extent does the Discussion place the findings in a wider context and achieve a balance between interpretation and useful speculation versus tedious waffling?**

I subconsciously follow a checklist. First, is it well written? That usually becomes apparent by the Methods section. (Then, throughout, if what I am reading is only partly comprehensible, I do not spend a lot of energy trying to make sense of it, but in my review I will relay the ambiguities to the author.) I should also have a good idea of the hypothesis and context within the first few pages, and it matters whether the hypothesis makes sense or is interesting. Then I read the Methods section very carefully. I do not focus so much on the statistics—a quality journal should have professional statistics review for any accepted manuscript—**but I consider all the other logistics of study design where it's easy to hide a fatal flaw**. Mostly I am concerned with credibility: Could this methodology have answered their question? Then I look at how convincing the results are and how careful the description is. Sloppiness anywhere makes me worry. **The parts of the Discussion I focus on most are context and whether the authors make claims that overreach the data. This is done all the time, to varying degrees. I want statements of fact, not opinion or speculation, backed up by data.**
- *[Michael Callaham](), emergency care physician and researcher at the University of California, San Francisco*

Most journals don't have special instructions, so I just read the paper, usually starting with the Abstract, looking at the figures, and then reading the paper in a linear fashion. I read the digital version with an open word processing file, keeping a list of "major items" and "minor items" and making notes as I go. There are a few aspects that I make sure to address, though I cover a lot more ground as well. First, I consider how the question being addressed fits into the current status of our knowledge. Second, **I ponder how well the work that was conducted actually addresses the central question posed in the paper. (In my field, authors are under pressure to broadly sell their work, and it's my job as a reviewer to address the validity of such claims.)** Third, I make sure that the design of the methods and analyses are appropriate.
- McGlynn

First, I read a printed version to get an overall impression. What is the paper about? How is it structured? I also pay attention to the schemes and figures; if they are well designed and organized, then in most cases the entire paper has also been carefully thought out.

When diving in deeper, first I try to assess whether all the important papers are cited in the references, as that also often correlates with the quality of the manuscript itself. Then, right in the Introduction, you can often recognize whether the authors considered the full context of their topic. After that, I check whether all the experiments and data make sense, paying particular attention to whether the authors carefully designed and performed the experiments and whether they analyzed and interpreted the results in a comprehensible way**. It is also very important that the authors guide you through the whole article and explain every table, every figure, and every scheme.**

As I go along, I use a highlighter and other pens, so the manuscript is usually colorful after I read it. Besides that, I make notes on an extra sheet.
- *[Melanie Kim Müller](), doctoral candidate in organic chemistry at the Technical University of Kaiserslautern in Germany*

I first familiarize myself with the manuscript and read relevant snippets of the literature to make sure that the manuscript is coherent with the larger scientific domain. Then I scrutinize it section by section, noting if there are any missing links in the story and if certain points are **under- or overrepresented**. **I also scout for inconsistencies in the portrayal of facts and observations**, assess whether the exact technical specifications of the study materials and equipment are described, consider the adequacy of the sample size and the quality of the figures, and assess whether the findings in the main manuscript are aptly supplemented by the supplementary section and whether the authors have followed the journal's submission guidelines.
- *[Chaitanya Giri](), postdoctoral research fellow at the Earth-Life Science Institute in Tokyo*

I spend a fair amount of time looking at the figures. In addition to considering their overall quality, sometimes figures raise questions about the methods used to collect or analyze the data, or they fail to support a finding reported in the paper and warrant further clarification. I also want to know whether the authors' conclusions are adequately supported by the results. Conclusions that are overstated or out of sync with the findings will adversely impact my review and recommendations.

- [Dana Boatman-Reich](), professor of neurology and otolaryngology at Johns Hopkins University School of Medicine in Baltimore, Maryland

I generally read on the computer and start with the Abstract to get an initial impression. Then I read the paper as a whole, thoroughly and from beginning to end, taking notes as I read. For me, the first question is this: Is the research sound? And secondly, how can it be improved? Basically, I am looking to see if the research question is well motivated; if the data are sound; if the analyses are technically correct; and, **most importantly, if the findings support the claims made in the paper.**
- Walsh

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- Walsh

The main aspects I consider are the novelty of the article and its impact on the field. I always ask myself what makes this paper relevant and what new advance or contribution the paper represents. Then I follow a routine that will help me evaluate this. First, I check the authors' publication records in PubMed to get a feel for their expertise in the field. I also consider whether the article contains a good Introduction and description of the state of the art, as that indirectly shows whether the authors have a good knowledge of the field. Second, I pay attention to the results and whether they have been compared with other similar published studies. Third, **I consider whether the results or the proposed methodology have some potential broader applicability or relevance, because in my opinion this is important. Finally, I evaluate whether the methodology used is appropriate. If the authors have presented a new tool or software, I will test it in detail.**
*- **Fátima Al-Shahrour**, head of the Translational Bioinformatics Unit in the clinical research program at the Spanish National Cancer Research Centre in Madrid*

HW3 – Related Work

Pick 10 "important" papers related to your research

Write two sentences about each work:
      Main contributions
      Main weakness

Pick one paper and improve the related work section of that paper.

Heilmeier