Research Methods
in computer science
Fall 2023

Lecture 8

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February 13, 2023

Agenda

Anatomy of Research Papers

Types of Research Papers

Citations and References

HW4

Anatomy of a Research Paper

Abstract

Introduction

Related Work

Design and Implementation

Evaluation

Conclusion

Quick Exercise

Look through three research papers

Identify the sections we discussed so far

Share with the class any variations
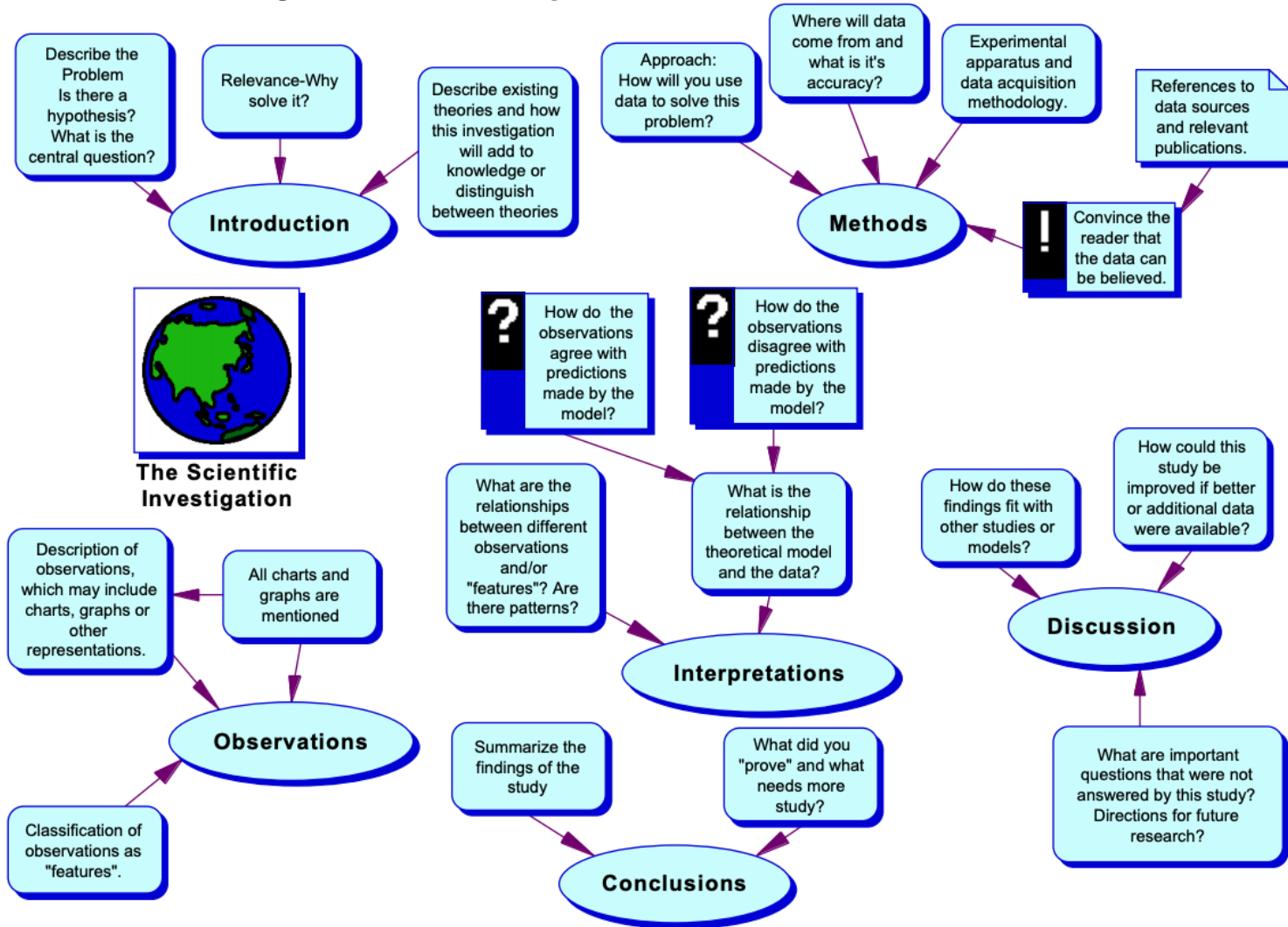
Anatomy of a Science Paper

Figure 3.1. This diagram shows the headings that must be used for this science paper. Please pay careful attention to the boxes with arrows pointing at each elliptical heading box. These boxes are reminders of the content that belongs with each heading.

https://earthweb.ess.washington.edu/creager//ess202/Ch3.Anatomy.pdf

Types of Papers (mechanical)

Technical Reports

    Project description

    Research paper

Conference

Journal

Magazine

Find out what type your group and community writes.

Which papers are more important?

Conference

Journal

Magazine

Impact factor

CORE ranking

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

Publications – Looking Ahead

Blogs?

Facebook?

Twitter?

LinkedIn?

GitHub?

YouTube?

arXiv?

…..

Citation and References

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*.

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 (2007-05-02)*. 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.

References

Can take a long time to format references.

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:
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.

Abstract

Document Sections

I.   Introduction
II. Related Work
III. System Overview
IV. Evaluation
V.   Conclusions

Authors
Figures
References
Citations
Keywords

Published in: 2016 IEEE Global Communications Conference (GLOBECOM)

Date of Conference: 4-8 Dec. 2016
Date Added to IEEE Xplore: 06 February 2017
▸ **ISBN Information:**

INSPEC Accession Number: 16655135
DOI: 10.1109/GLOCOM.2016.7842344
Publisher: IEEE
Conference Location: Washington, DC, USA

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@INPROCEEDINGS{7842344,
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.

Citations

- Systems and artifacts
  - Generally immediately after the names

    AnguLoc [5] is better than SideLoc[6].

- Narrative
  - Generally at the end of the sentence

  Researchers have made a lot of progress in this field in the last five years [6]

This solution is scalable as the number of transmitting anchors can be small and can be scheduled in different time slots. With the usage of inter-anchor concurrency, solutions like AnguLoc [1] managed to make it more efficient. However, this architecture is not cost-effective as described earlier.

In addition to that, new light-emitting technologies, such as LEDs, become more popular and accessible, enabling new perspectives for optical wireless communication [7], [8]. Finally, the increasing interest and exploration of the

Bad form:
  [1] presents a new technique.

Citation Format

Number: [n]

Author / year: [Gnawali et al. 2020]

In text without [] or (), e.g., Gnawali et al. proposed a new technique.

Consult the instruction for your conference or journal. Number [n] format common in our fields.

HW4 – Paper Review

Pick a research paper that is considered important in your area of research.

Write a review for that paper

    Summary

    Strengths

    Weaknesses

    Details

    Overall recommendation