

How to Write an Effective Technical Paper

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IEEE Bangalore Section Mysore Region
Webinar, 24 August 2020

Webinar Speaker,

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Education

Ph.D., Electrical Engineering, Virginia Polytechnic Institute and State University, 1978.

M.S., Electrical Sciences, State University of New York at Stony Brook, 1975.

B.Sc., Electrical Engineering, Bangladesh University of Engineering and Technology, Dhaka, 1972

Professional Society Activities

- IEEE Member since 1975, Fellow 1998, Life Fellow 2014
- President, IEEE PES, 2018-2019
- Vice president, Publications, IEEE PES, 2001-2003, 2012-2013
- Vice President, Publications, IEEE, 2006
- Editor-in-Chief, IEEE Transactions on Sustainable Energy, 2010-2012
- Editor-in-Chief, IEEE Electrifications Magazine, 2013-2014
- Launched, the IEEE Power & Energy Technology Systems Journal (Open Access), 2014

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Writing Quality Technical Papers (Webinar)

Authoring Webinar

Presenter

Saifur Rahman, Ph.D.
Professor and Director
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Education

Ph.D., Electrical Engineering, Virginia Polytechnic Institute and State University, 1978.
M.S., Electrical Sciences, State University of New York at Stony Brook, 1975.
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Saifur Rahman

Candidate for IEEE President-Elect 2021

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AWARDS

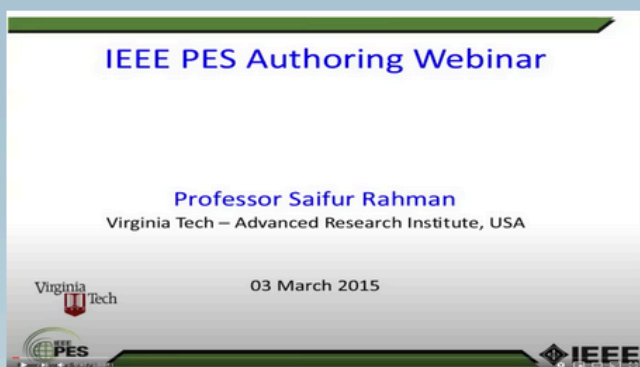
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Audience





Audience

Basic Questions

1.Are you writing this paper for the sake of writing a paper?

2.Or do you want to show how others can benefit from your work?

Audience

Scientific research publishing

- Who writes scientific papers?
 - Engineers, scientists, educators and researchers from:
 - Corporations
 - Academia
 - Government
 - Students typically write and present conference papers before submitting journal articles



Audience

What IEEE editors and reviewers are looking for

- Content that is appropriate, in scope and level
- Clearly written original material that addresses a new and important problem
- Extension of previously published work
- Valid methods and rationale
- Illustrations, tables and graphs that support the text
- References that are current and relevant to the subject

Audience

How does the review process work?

- Editor-in-Chief gets the paper after it goes through content match check (iAuthenticate) and “banned author” check
- If the paper is in scope for the journal, it is assigned to an editor (associate editor)
- Editor assigns the paper to five or more reviewers
- Reviewers send their comments back to the editor
- Editor makes a recommendation to the EIC as follows:
 - Accept
 - Revise & Resubmit
 - Reject
- The EIC makes the final decision and informs the corresponding author

Audience

Why IEEE editors and reviewers reject papers

- The content is not a good fit for the publication
- There are serious scientific flaws:
 - Inconclusive results or incorrect interpretation
 - Fraudulent research
- It is poorly written
- It does not address a big enough problem or advance the scientific field
- Most of the work was previously published
- The quality is not good enough for the journal
- Reviewers have misunderstood the article

Structure

Paper Structure

Elements of a manuscript

Title

Abstract

Keywords

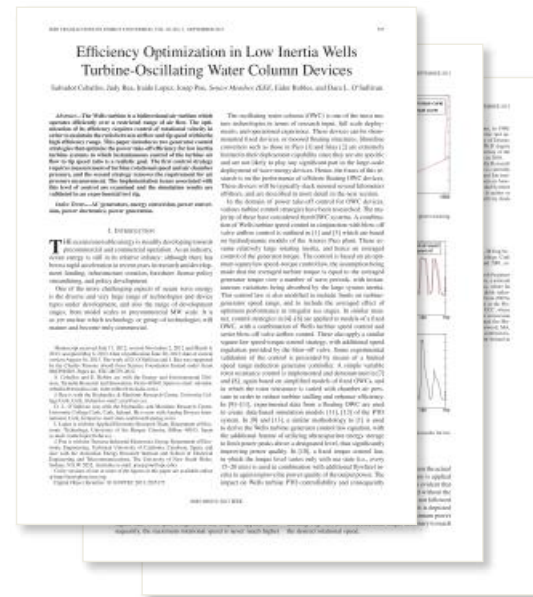
Introduction

Methodology

Results/Discussions/Findings

Conclusion

References



Paper Structure

Title

An effective title should...

- Answer the reader's question:
"Is this article relevant to me?"
- Grab the reader's attention
- Describe the content of a paper using the fewest possible words
 - Is crisp, concise
 - Uses keywords
 - Avoids jargon

Good
Title

VS.

Bad
Title

Title Dos and Don'ts

- ✓ *A Human Expert-based Approach to Electrical Peak Demand Management*
- VS
- ✗ *A **better** approach of managing **environmental and energy sustainability** via a study of different methods of electric load forecasting*

Paper Structure

Abstract

A “stand alone” condensed version of the article

- No more than 250 words; can use past or present tense
- Uses keywords and index terms

Why they're useful & important
& move the field forward

Why you did it

What you did

How the results
were useful,
important & move
the field forward

Paper Structure

Abstract Dos and Don'ts



The objective of this paper was to propose a human expert-based approach to electrical peak demand management. The proposed approach helped to allocate demand curtailments (MW) among distribution substations (DS) or feeders in an electric utility service area based on requirements of the central load dispatch center. Demand curtailment allocation was quantified taking into account demand response (DR) potential and load curtailment priority of each DS, which can be determined using DS loading level, capacity of each DS, customer types (residential/commercial) and load categories (deployable, interruptible or critical). Analytic Hierarchy Process (AHP) was used to model a complex decision-making process according to both expert inputs and objective parameters. Simulation case studies were conducted to demonstrate how the proposed approach can be implemented to perform DR using real-world data from an electric utility. Simulation results demonstrated that the proposed approach is capable of achieving realistic demand curtailment allocations among different DSs to meet the peak load reduction requirements at the utility level.

Vs



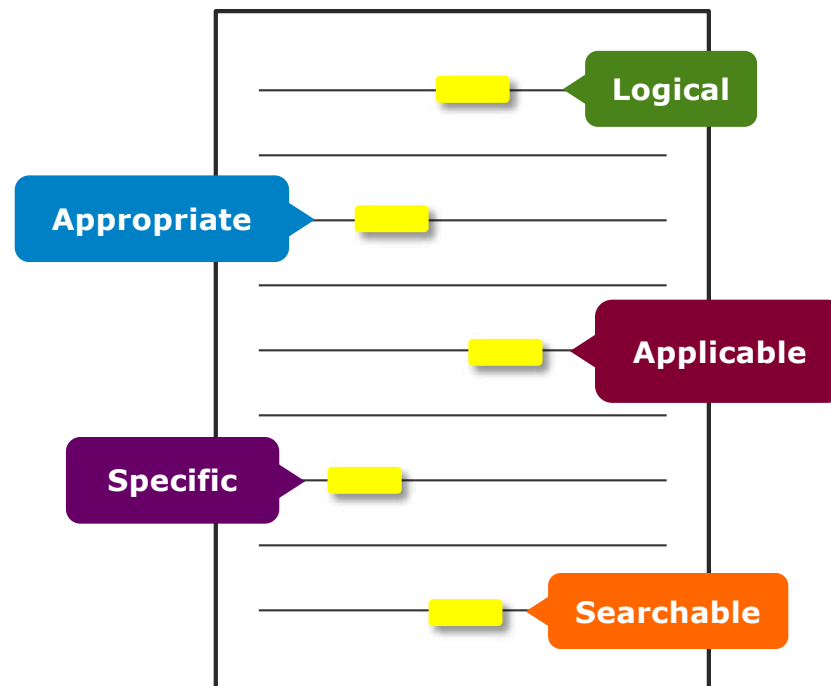
This paper presents and assesses a framework for an engineering capstone design program. **We explain** how student preparation, project selection, and instructor mentorship are the three key elements that must be addressed before the capstone experience is ready for the students. **Next, we describe** a way to administer and execute the capstone design experience including design workshops and lead engineers. **We describe the importance** in assessing the capstone design experience and report recent assessment results of our framework. **We comment** specifically on what students thought were the most important aspects of their experience in engineering capstone design and provide quantitative insight into what parts of the framework are most important.

First person

No actual results, only describes the organization of the paper

Paper Structure Keywords

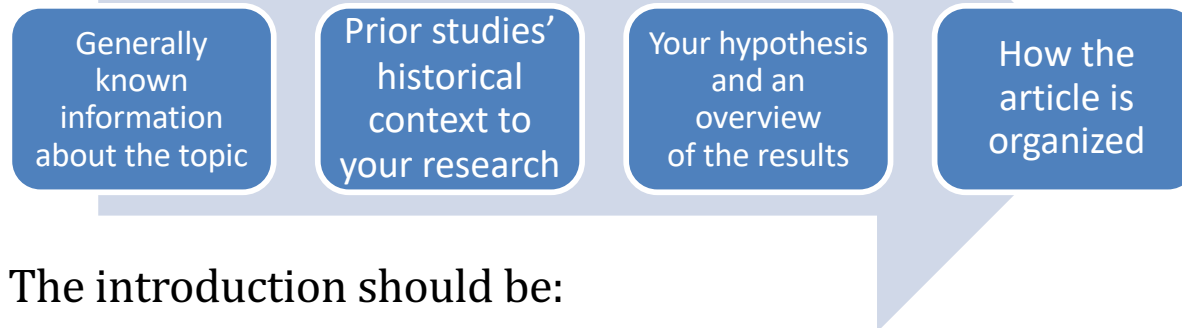
Use in the Title and
Abstract for enhanced
Search Engine Optimization



Paper Structure

Introduction

- A description of the problem you researched
- It should move step by step through:



- The introduction should be:
 - Specific, not too broad or vague
 - About 1-2 pages
 - Written in the present tense

Paper Structure

Methodology

- Problem formulation and the processes used to solve the problem, prove or disprove the hypothesis
- Use **illustrations** to clarify ideas and support conclusions:

Tables

Present representative data or when exact values are important to show



Figures

Quickly show ideas/conclusions that would require detailed explanations



Graphs

Show relationships between data points or trends in data



Paper Structure

Results/discussion

Demonstrate that you solved the problem or made significant advances

Results: Summarizes the Data

- Should be clear and concise
- Use figures or tables with narrative to illustrate findings

Discussion: Interprets the Results

- Why your research offers a new solution
 - How can it benefit other researchers
- professionals

Discussion

Results

IMENES-OLIVEIRA et al.: LST ESTIMATION METHODS FROM LANDSAT-4 THERMAL INFRARED SENSOR DATA

1803

the SC algorithm over the whole range of w values increase to 3–4 K, except for the TIGR₀₋₁₀ database, with an RMSE of 2 K. This result is explained by the w distribution, which is biased toward low values of w in this database. When only atmospheric profiles with w values lower than $3 \text{ g} \cdot \text{cm}^{-2}$ are selected, the SC algorithm provides RMSEs around 1.5 K, with almost equal values of bias and standard deviation, around 1 K in both cases (with a negative bias, thus the SC underestimates the LST). In contrast, when only w values higher than $3 \text{ g} \cdot \text{cm}^{-2}$ are considered, the SC algorithm provides RMSEs higher than 2 K. In these cases, it is preferable to calculate the atmospheric functions of the SC algorithm directly from (3) rather than approximating them by a polynomial fit approach as given by (4).

V. DISCUSSION AND CONCLUSION

The two Landsat-5 TIR bands allow the intercomparison of two LST retrieval methods based on different physical assumptions, such as the SC (only one TIR band required) algorithm (two TIR bands required). Downward inversion of the transfer function, which can be considered a "ground-truth" condition that the information about the ground L_d is accurate enough. The SC algorithm presented in this letter is a continuation of the previous SC algorithm developed for Landsat-4 and Landsat-5 TM sensors, and is implemented on the ETM+ sensor on board the Landsat-7 platform [9], and it could be used to generate consistent LST products from the historical Landsat data using a single algorithm. An advantage of the SC algorithm is that, apart from surface emissivity, only water vapor content is required as input. However, it is expected that errors on LST become unacceptable for high water vapor contents (e.g., $> 3 \text{ g} \cdot \text{cm}^{-2}$). This problem can be partly solved by computing the atmospheric functions directly from τ , L_w , and L_d values [see (2)], or else by including air temperature as input [10]. A main advantage of the SW algorithm is that it performs well over global conditions and, thus, a wide range of water vapor values; and that it only requires water vapor as input (apart from surface emissivity at the two TIR bands). However, the SW algorithm can be only applied to the new Landsat-8 TIRS data, since previous TM/ETM sensors only had one TIR band.

The LST algorithms presented in this letter were tested with simulated data sets obtained for a variety of global atmospheric conditions and surface emissivities. The results showed RMSE values of typically less than 1.5 K, although for the SC algorithm, this accuracy is only achieved for w values below $3 \text{ g} \cdot \text{cm}^{-2}$. Algorithm testing also showed that the SW errors are lower than the SC errors for increasing water vapor, and vice versa, as demonstrated in the simulation study presented in Sobrino and Jiménez-Muñoz [15]. Although an extensive validation exercise from *in situ* measurements is required to assess the performance of the two LST algorithms, the results obtained for the simulated data, the sensitivity analysis, as well as the previous findings for algorithms with the same mathematical structure give confidence in the algorithm accuracies estimated here.

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Paper Structure

Conclusion

- Explain what the research has achieved
 - As it relates to the problem stated in the Introduction
 - Revisit the key points in each section
 - Include a summary of the main findings and implications for the field
- Provide benefits and shortcomings of:
 - The solution presented
 - Your research and methodology
- Suggest future areas for research



Paper Structure

References

- Support and validate the hypothesis your research proves, disproves or resolves
- There is no limit to the number of references
 - But use only those that directly support your work (about 30)
- Ensure proper author attribution
 - Author name, *article title*, publication name, publisher, year published, volume and page number, Digital Object Identifier (DOI)

**Properly
cited
material**

1974

IEEE TRANSACTIONS ON SMART GRID, VOL. 5, NO. 4, JULY 2014

We then have

$$\begin{aligned} (P_t^{A,+} + P_t^{A,-})^2 &= (P_t^{A,+} - P_t^{A,-})^2 + 4P_t^{A,+}P_t^{A,-} \\ &< (\hat{P}_t^{A,+} - \hat{P}_t^{A,-})^2 + 4\hat{P}_t^{A,+}\hat{P}_t^{A,-} \\ &= (\hat{P}_t^{A,+} + \hat{P}_t^{A,-})^2. \end{aligned} \quad (32)$$

Since $P_t^{k+} - P_t^{k-} = \hat{P}_t^{k+} - \hat{P}_t^{k-}$, we then have $P_t^{k+} < P_t^{k+}$, and $P_t^{k-} < P_t^{k-}$. Because the operational cost is an increasing function of (P_t^{k+}, P_t^{k-}) , we obtain that

$$c_{0/m}[P_s^{s,+}, P_s^{s,-}] < c_{0/m}[\hat{P}_s^{s,+}, \hat{P}_s^{s,-}], \quad (33)$$

Therefore the optimal pair $\{P_i^{k,+}, P_i^{k,-}\}$ must satisfy that $P_i^{k,+}P_i^{k,-} = 0$, i.e., only one of $P_i^{k,+}, P_i^{k,-}$ can be non-zero. ■

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Ethics

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Results/Discussion
Write the Conclusion
Collect the components – Prepare the draft
All members comment on the draft
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I would like to see a broader IEEE

We need to ensure that we are “READY FOR RECOVERY”, when we get back to the “NEW NORMAL” after COVID-19. Let us enhance cooperation, collaboration and community spirit.

For this we need to make IEEE broader so that IEEE is more relevant to the work our members do regardless where they work.

We need more participation from volunteers globally in IEEE governance. A broader based IEEE will make the Institute more relevant to technologists and academics from all parts of the world.

I would like to see more **IEEE Senior Members** and **IEEE Fellows** from Regions 8, 9 & 10

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