Contents

- How to draft a paper
- Structure of a paper
  - Title, Abstract, Introduction, Body, Conclusion, Acknowledgment, References, Appendix
- Expressions
- Questions before submission
Efficient Paper Writing

1. Read **tech writing books**. Practice what are written there.
2. Prepare **slides first**. Assume you will perform an oral presentation w/ them.
   • W/ fonts ≥ 24 pt
   • Help extract the essence
   • Will make **good logical structure**.
3. Have your draft reviewed by others.

What is good logic?
◆ Easy to follow (No question/rethinking)
◆ Possible to predict the next content
Slide First!

- Page allocation
- Use a template (when you’re a novice)
- Establish a good problem-solution relation
  - Paired words often help
- Select figures/tables to use
- Fill in necessary information in each page
- Balance slide allocation and each slide
- Reorder slides to modify logic (easy)
<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>computations</td>
<td>efficient</td>
</tr>
<tr>
<td>inefficient</td>
<td>compact</td>
</tr>
<tr>
<td></td>
<td>low complexity</td>
</tr>
<tr>
<td></td>
<td>low power</td>
</tr>
<tr>
<td>slow convergence</td>
<td>fast convergence</td>
</tr>
<tr>
<td>degraded</td>
<td>good</td>
</tr>
<tr>
<td></td>
<td>superior</td>
</tr>
<tr>
<td>no analytical support</td>
<td>analysis</td>
</tr>
<tr>
<td>no implementation</td>
<td>implementation</td>
</tr>
</tbody>
</table>
Page Allocation

How many pages for what?

Usually, 10 – 15 pages.

- Page 1: Background
- Page 2: Conventional method
- Page 3: Problem of the conventional method
- Page 4: Point of the solution and its rationale
- Page 5-6: Details of the solution
- Page 7-9: Evaluation condition and results
- Page 10: Conclusion/Summary
Order of Preparation

- Page 5-6: Details of the solution
- Page 4: Point of the solution and its rationale
- Page 3: Problem of the conventional method
- Page 2: Conventional method
- Page 7-9: Evaluation condition and results
- Page 1: Background
- Page 10: Conclusion/Summary
Structure of a Paper

- **Title** – expresses the contents in a line or two
- **Abstract** – attracts people to the paper
- **Introduction** – describes background and motivation
- **Body** – beef of the hamburger, *reason d’etre* of the paper
- **Conclusion (Summary)** – summarizes the body
- **Acknowledgment** – expresses thanks to whom helped in the course of the research
- **References** – gives pointers to related readings and basis for the facts appeared in the paper
- **Appendix** – gives detailed derivation of equations, which is off the logical main stream
Title

- Not too general.
- Include words of the features.
- Specifies the features and clarifies the gains for readers.
  - e.g. new functionality, reduced computations/memories, fast convergence, easy design
- As short as possible (< 2 lines, generally).
- Simple expressions and/or noun phrase.
Example 1

Gain for the User + Most Important Keyword
e.g. Computations, Convergence time, Easy Design, etc.
Computationally Efficient $\text{xx}$ Algorithm
Fast Convergence Algorithm Suitable for $\text{xx}$
Easy-to-Design $\text{xx}$ System

Often found in papers that propose a new algorithm or system.
Example 2

Important Feature + Most Important Keyword
e.g. “High Quality 4 kb/s CELP Coding Based on Multistage Vector Quantization”
(May be considered as a combination of Ex. 1 and 2.)

“Contour Extraction Algorithm Based on Multiviews,”

“Low Bitrate Video Coding Based on Multiview Contour Extraction”
Example 3

Most Important Keyword+’What is done’

- e.g. “Evaluation of a Double-Talk Detection Algorithm,”
  “Chip Area Comparison for Multiply-and-Add Circuits”

Often found in papers that present comparison.
Abstract

Present tense in a single paragraph.
- Because it is a fact with “This paper” as the subject

Topic sentence (Contents in a single sentence)
- This paper proposes/presents “something like paper title.”

Contents in the same order as in Body.
- Features/Advantages of the proposed method.

Clearly state object(s)/condition of evaluation/investigation/comparison.

Be specific with values.
- As much as #\% compared to ….

Results and application/future study.
1st sentence represents the paper contents. (Topic sentence, similar to the title.)

1. New Proposal
   (In this paper,) xx is proposed.
   This paper proposes xx.

2. Comparison
   This paper presents xx.
   xx is similar/equal to the title.
Abstract: Second Part

Contents in the same order as in Body

1. Features of the proposed method and advantages over the conventional method.
   • e.g. pp eliminates qq (which was the serious problem in the conventional method).

2. Subject of evaluation/comparison/investigation and condition
   • Describe in a most specific way.
     • e.g. “as much as x%,” “y% in oo condition.”
     • “Effective/Useful for xx,” “applicable to xx.”
   • May present difference results for different conditions.
     • e.g. xx for the condition of yy,,,
Conclusion

1. Evaluation results/Applications.
2. Evaluation results(advantages)/Analysis/Discussion
Introduction

Most difficult in paper writing.
Write the position of the paper (research).

“Position” should have been clarified in the beginning of research.

1. Research background
2. Research history
3. Research topic
4. Paper structure
Introduction - Background

- From general description to specific description
- General description = what are found in the newspaper
- Clearly describe the position in the overall research
- Clarify the application
Introduction – Research History

Research overview (Who has done what, directly related to the paper)

Introduce past important research and explain the position of the paper from viewpoints of technology and performance.

- A. “Who,” (“when”), “what,” and “how it was.”
- B. Its feature(s) or contribution
- C. Its problem(s)

Repeat A ~ C a couple of times.

The problem described finally should be equal to that solved in the paper. Clearly state this problem.
Describe what you have done in the present tense.

- *e.g.* This paper proposes + topic sentence
  
  This paper presents + topic sentence

  xx is achieved by doing yy.

Use the present tense, because it is a fact.
Introduction – Paper Structure

For making a long paper easy to read.
Not included in short papers.

- *e.g.*
  The next section explains xx.
  Section 2 explains xx to clarify the problem.
  The proposed method is presented in details in the following section.
Finally, by computer simulation results, yy is validated.
Finally, hardware evaluation confirms its validity.
The Three Sentence Introduction

What has been presented as a conventional method?
- Describe it with the advantage(s) and a reference.

What is the existing problem?
- Describe the problem(s) of the conventional method.

What is the topic of the paper?
- This paper proposes “something like the paper title.”

3 Sentences become 3 paragraphs in a long paper.
Conventional Method

What has been presented as the conventional method?

Useful Expressions.

A has(A and B have) been proposed [1].

A [1] is one of the most promising systems(techniques) in field B.
What is the existing problem?

Useful Expressions

A large number of computations are required.
The convergence speed is slowed down.
A is not efficient. (A is not sufficiently B.)
The quality of C is degraded.
It requires function D.
There is no theoretical support for A.
No implementation of A has been reported.
A does not provide E and F simultaneously.
This paper proposes (presents):

- A computationally efficient A based on B.
- A fast convergence A based on B.
- An efficient A based on B.
- A with good C quality.
- A which does not require function D.
- An analysis of A.
- An implementation of A.
- An A which provides E and F simultaneously.
Keep the following in mind:

- Describe what you have done.
- May have a section for conventional method when problems are complicated.
- In the same order as in the Abstract.
- Never in the order of how you have done (A paper is not a report of an experiment).
- Provide detailed information concisely so that readers may verify the results.
- Never make a contradiction with the position made in the Introduction.
Description in Body

Top-Down Description

- Position first, then, describe the basis
- From higher- to lower-level description
- Lower-level description should be more detailed with a larger volume
- Each low-level description forms a paragraph.

High LVL

Title of low-level description may be stated

Low LVL

Each forms one paragraph
Pattern I: Proposal of a New Algorithm (System, Method, …..)

- (1) Conventional Algorithm -> Emphasize problems (=what is solved by the proposed)
- (2) Proposed Algorithm
- (3) Evaluations (Conditions, Results, Discussions)

Pattern II: Comparison and Evaluation

- (1) Description of the System for Evaluation
- (2) Conditions for Evaluation
- (3) Evaluation Results
- (4) Analysis and Discussions
Conclusion

Similar to Abstract.

May be made by changing the Abstract to the present perfect tense. (e.g. A has been proposed. A has been presented.)

Everything should have appeared in the body.

Chronological order as in the body.

Collecting the topic sentences from the body and changing the tense should make a good conclusion, assuming a good body.

Future research topics may be added if there is any. (e.g. Future research includes investigation of A.)
Acknowledgment

Be Specific

- Full name and his/her affiliation (so that s/he can be identified)
- Clearly state what is acknowledged. e.g. “The authors would like to thank firstname lastname of affiliation for providing data from real environment.”
Supplement for simplifying a topic in the paper, which is off the main stream.

Basis for background (Text books, Tutorial papers, etc.)

Basis for parameter settings.

Follow the specified format for the journal.

- Different commas and/or parentheses for different journals.
Appendix

- Eliminate unimportant explanation, which is off the main logical stream.
  - *e.g.* Basis for parameter settings.

- Derivation of equations, proofs, etc. (Put only the result in the body).
Expressions

1 Sentence for 1 Content. A single sentence for multiple contents makes a “twisted” description.

Avoid multiple of’s in a single sentence. (Up to 2).

No redundant expressions.
  * e.g. *This report reports ,,,,,.

Acronyms should be fully spelled out at its 1st appearance.
  * FFT (fast …. ) or fast Fourier transform (FFT) ?
Problem-Solution pair is the key

1. Clarify the benefit(s) of the research (Paper)
2. What brings the benefit(s)?  [Drawback]
3. What is the opposite of the benefit(s)
4. What is the conventional technology w/ the drawback?
5. Describe it in the 2nd last paragraph of Introduction and design Introduction
6. Put general applications in the 1st paragraph
Introduction

Applications.
How the solution benefit the daily life.

“Who,” (“when”), “what,” and “how it was.”
B. Its feature(s) or contribution
C. Its problem(s)

Most relevant …. has …. problem.

This paper proposes ..
The next section …..
Three Point Analysis

1. Point of Your Paper

2. Solved Problem

Title of the Paper

Topic Sentence of Abstract

3. Most Relevant Conventional Technology
Point of Your Paper

What is the first in the world?
A. 

What is the trick/function to achieve it?
B. 

What is a user benefit(s)?
C. 

Use the same font size (36 pt), never make box big.
What is the opposite from the benefit (C)?
Express it w/ C+no or not.

D. 

Express D w/o no or not.

E. 

E may not exist.

Use the same font size (36 pt), never make box big.
Title of the Paper

Title w/ A and B
F=A+B or B+A, may use up to one conjunction
F

Title w/ all or a part of A, B, and C
if use of C makes the title better than F
G

Use the same font size (36 pt), never make box big.
Topic Sentence of Abstract

Topic sentence using F or G
This paper proposes/presents followed by the title (F or G)

This paper proposes/presents

Use the same font size (36 pt), never make box big.
Most Relevant Conventional Technology

Conventional technology which has E or D.

1\textsuperscript{st} author

Title starts w/

Reference (conference/journal) w/ month/year

Use the same font size (36 pt), never make box big.
Example: Blue LD

Blue LD : 2014 Nobel Prize in Physics
Problem Analysis and Solution

MOCVD (Metalorganic Chemical Vapor Deposition)

- Pressing Gas
- Reactance Gas

Substrate

Xtal Film
Point of Your Paper

What is the first in the world?
A. MOCVD for blue LD crystal

What is the trick/function to achieve it?
B. NH₃ delivery by pressing gas

What is a user benefit(s)?
C. Blue LD crystal deposition

Use the same font size (36 pt), never make box big.
What is the opposite from the benefit (C)?
Express it w/ C+no or not.

D. No deposition of blue LD crystal

Express D w/o no or not.

E. Blue LD crystal was not deposited

E may not exist.
Toyota’s 5 Why’s (Tai’Ichi Ohno, former EDP)

Find the root cause of the problem to fix it.

Problem 1st Why 2nd Why 3rd Why 4th Why 5th Why

1st Cause

2nd Cause

3rd Cause

4th Cause

5th Cause

Problem: Crystal is not deposited
Cause 1: Reactance gas is not delivered
Cause 2: Reactance gas goes up
Solution: Gas delivery by pressing gas

http://www4.tokai.or.jp/advi-qc/p01.htm
Title of the Paper

Title w/ A and B
F = A + B or B + A, may use up to one conjunction
F
MOCVD for blue LD crystal
with pressing gas

Title w/ all or a part of A, B, and C
if use of C makes the title better than F
G
MOCVD for blue LD crystal deposition
with pressing gas

Use the same font size (36 pt), never make box big.
This paper proposes/presents MOCVD for blue LD crystal fabrication with pressing gas
Most Relevant Conventional Technology

Conventional technology which has E or D.

1st author: Y. Koide

Title starts w/ Epitaxial growth and

Reference: (conference/journal) w/ month/year

J. Electrochemical Society, Sep. 1986

Use the same font size (36 pt), never make box big.
Novel metalorganic chemical vapor deposition system for GaN growth

A novel metalorganic chemical vapor deposition (MOCVD) system, which has two different flows, has been developed. One flow carries reactant gas parallel to the substrate, and the other an inactive gas perpendicular to the substrate for the purpose of changing the direction of the reactant gas flow. The growth of a GaN film was attempted using this system, and a high quality, uniform film was obtained over a 2 in. sapphire substrate. The carrier concentration and Hall mobility are $1 \times 10^{18}/\text{cm}^3$ and 200 $\text{cm}^2/\text{Vs}$, respectively, which are the highest for GaN films grown directly on a sapphire substrate by the MOCVD method.
Be Prepared for Traps

- Frequency bands, where an estimated SNR is low, are replaced

Wrong!

Bands are not replaced, but their components.

Components in the frequency bands, where an estimated SNR is low, are replaced

Components in the frequency bands, where an SNR is estimated low, are replaced
So, What?

One of the ways to identify objects is to measure their micro-displacement. To recognize these objects simultaneously, micro-displacement measurement method for multiple objects is desired.

However, it is not possible to identify multiple objects simultaneously. To recognize these objects simultaneously, micro-displacement measurement method for multiple objects is desired.
Another Example of So What?

**So, What?**

First, consider the frequency responses without regularization defined as...

... some equation ...

To avoid singular $P(f,l)$, a preprocessed multichannel far-end signal is used...

First, consider the frequency responses without regularization defined as...

... some equation ...

$P(f,l)$ in this equation is singular. To avoid singular $P(f,l)$, a preprocessed multichannel far-end ....
Questions before Submission

Ask yourself again:

- What is the benefit of the research? (in what application)

- What makes it possible to achieve that benefit? List all components for the benefit.

- How good is it? (evaluation results)
Summary

How to draft a paper
Structure of a paper
- Title, Abstract, Introduction, Body, Conclusion, Acknowledgment, References, Appendix
Expressions
Possible traps
Questions before submission
Empowered by Innovation