Improving Writing Quality–Style

Readership, critical analysis, precision, *etc.*

Ming-Ming Cheng, Ning Sun

Nankai University

2022/05/24

Table of Contents

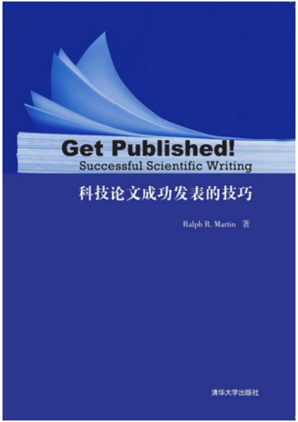


Fig.: Sections 4.

Improving writing quality–style

Good writing displays several characteristics:

- Take into account who the **readers** are.
- Contain **critical analysis**.
- Should be **precise**, **concise**, **logical**, **balanced** and **complete**.

Don't underestimate the professionalism of reviewers.

Readership: who & what

Before starting writing, consider **who** the intended readers are, and **what they know**.

- They are experts in one field, but you have to explain to them the knowledge of another field.
- They are not professionals, you need to give them professional knowledge.
- They are familiar with your field, how to write properly.

Readership: examples of who & what

Example 1

If you are writing a paper on computational relativity for an astrophysics journal, you can assume that your readers are familiar with physics, but may be less familiar with advanced computing techniques.

Example 2

If writing such a paper for a scientific computing journal, the readers may be more familiar with computer science, but less so with relativity.

Readership: examples of who & what

Example 3

If you are writing an undergraduate textbook, the readers will know a lot less than if you are writing a research monograph.

Example 4

If you want to use PID method in your paper, but PID is a classical scheme in engineering. At this time, you do not need to explain its principles in details, which will make the reviewers think you paper is worthless.

Readership: tips

- Start by assessing what the readers are **likely to know** about the subject area.
- Do **not** assume that the readers shares your knowledge of the background to the problem (*e.g.* , applications, current state-of-the-art).
- The reader may **not** share your **understanding** of the problem itself (**they may not even know anything**).

Readership: examples of tips

Example 1

The 'well-know radiation transport problem' may not be well-known at all if your readers are biologists and not physicists.

Example 2

If you use special physical equations in the field of control, you need to explain their principles. Because your readers in the control field are not necessarily familiar with these.

Readership: consider the readers' familarity

Consider the extent to which readers are likely to be familiar with the approach you take in your paper.

- Are similar approaches **common** for problems of this kind?
- Or do you have a **new** approach?
- Have you taken an approach which is **well-known** in some other area, but **not** to the current readership?

Make sure your paper is innovative. Plagiarism is strictly prohibited!

Readership: your gain

Establishing what readers are likely to be familiar with should give you clear guidance:

- What to assume.
- What to explain.
- How much explanation is needed.

Things that may be obvious to you may not be obvious to the reader.

Critical Analysis

When writing your paper, your aim should be to provide the reader with **insight** and **understanding**.

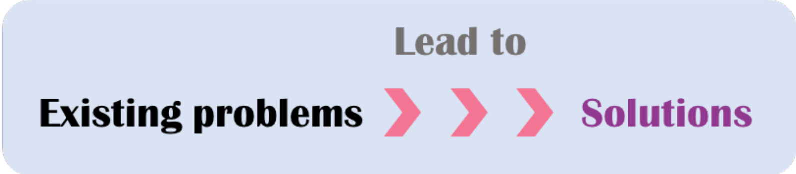
- The most significant difference between good papers and weak papers is **critical analysis**.
- The difference can run right through the paper.
- Do not just state what has been done previously, but **compare** their approach to your own work and that of others.
- Discuss the **strong** and **weak** points of other authors' work.

Critical Analysis: an example

Smith's text detector [3] is fast, but only works for Roman characters. Li's text detector [4] is more general and can also handle Chinese text, but is much slower. Our novel approach is almost **as fast as** Smith's method, can handle Chinese text like Li's method, and can **also** handle a wide range of special mathematical symbols.

Critical Analysis: describe your work

- Do not just say **what** you did, but start by saying what the aims are and **why**.
- Say what **alternatives** you considered.
- Say **why** you chose the alternatives you did–you should **justify** your approach.



Critical Analysis: an example

The first step of our text detector looks for strokes which make up a character. Although a general approach would try to find arbitrary polynomial curves, this would both be **slow**, and **unreliable** due to ambiguity of shape. Instead, we simply look for straight lines and circular arcs. For recognition purposes, these are adequate to distinguish one character from another in most cases. The remaining cases are handled by a separate procedure described later.

Critical Analysis: an example

Remember that **stating** something, and **explaining** it, are quite different. As well as giving the approach, you should **explain the reasoning** behind it.

The shapes seen in the two images are identical. Therefore at most one point in image A can correspond to one point in image B. We thus find a key point in image A by ..., and then find the corresponding point in image B by....

Critical Analysis: compare in results

Do **not** just state the results obtained by your method, but **compare** them to the results of other methods.

If the results are better, explain why

The novel use of gold in our mechanism allows it to be heavier than one made of plastic, increasing frictional forces.

If the results are unexpectedly inferior, explain why

Unfortunately, dilithium failed to catalyse the reaction as expected. Although initial experiments were promising, alternative sources of dilithium failed to give such good results. Ultimately it was established that an im-purity within the original dilithium was responsible for the catalysis, not the dilithium itself.

Critical Analysis: compare in results

Carefully **justify** why you carried out the test in the way you **did**.

To ensure that our system would be suitable for both law enforcement and sports broadcast tasks, we tested our system on cars moving at speeds between 20 and 200 miles per hour.

Discuss **what** could be done to **improve** your results.

While our speed measurement system works well for most video, it can fail for grey cars which have too similar a colour to the road. An improved gradient detector could be a more sensitive way to determine the car's location in such cases.

Critical Analysis: tips

Try to **imagine** a reviewer, or an examiner, or perhaps an intelligent layman, sitting next to you as write, who keeps asking you '**why**'?

Precision: be careful

- Precision means making careful use of **language**.
- Make sure that what you **write** is what you really **mean**.
- **Avoid** ambiguous or vague statements.

For example, do not use '***etc.***' unless the items referred to are obvious to the reader.

It is acceptable to write

The days of the week are Monday, Tuesday, *etc.*

It is not acceptable to write

We have tested our algorithm for speed, robustness, *etc.*

Do not write like this ↗

Precision: be careful

Being precise also means **not omitting anything significant**.

- **Definitions** of concepts specific to your paper.
- **Units** when giving a measurement.
- Be careful **not** to state conjectures as facts.

Precise writing should advoid phrases like

It is obvious that...

which often means ‘I **cannot** be bothered to explain why...’ or **worse** ‘I **do not know how** to convince you that...’.

Statements should be based on evidence, not opinion or belief.

Precision: avoid vague phrases

‘**Possibly**’ or ‘**maybe**’ is often an indication that something

- has **not** been thought through properly,
- or is **lacking** in justification,
- or has **not** been adequately tested.

Do not write like this↓

Examples

- We use Ding’s algorithm as it is possibly faster than Dong’s algorithm.
- This segmentation procedure normally works.

Precision: quantitative description

Statements and ideas should be presented **quantitatively**, not just **qualitatively**, to add to precision.

An example

For images of size 1024$\times$1024, our C++ implementation of Ding's algorithm, on a 4GHz PC with an AX23 processor (running Linux), is 2.7 times faster than Dong's algorithm.

- Make full and clear **notes** (on any papers, decisions, alternatives...).
- **Document** any computer programs that you write.
- **Collect** information as you go along, and **recording** it carefully.

Precision: you should know

- It is **your responsibility** to make sure you are understood.
- If reviewers **misunderstand** you, your paper may be rejected even if the underlying work is good.
- If readers of your paper **misunderstand** you, they may **misjudge** you when summarising your work in their papers, or build **faulty** solutions to real world problems.
- Make sure you do **not misrepresent** the work of others.
- Make sure you read their work carefully, and **understand** it clearly before describing or summarising it.

You are directly responsible for your paper.

Conciseness: enough, not redundant

Conciseness means using **just enough** words to get the information across, while not leaving anything out.

Do not write like this↓

For example, the text

Let us look at Figure 1. From the figure, it can be seen that...

could much more briefly be written

Figure 1 shows that...

Conciseness: enough, not redundant

Avoid using **long**, **rambling** paragraphs or sentences, the key points can become hard to follow in amongst all the extra words.

- One of the main causes of overlong sentences is a **lack** of clear thinking–the resulting vagueness is often embodied in extra words like ‘essentially’, ‘probably’ and ‘generally’.

Do not write like this↓

For example,

Essentially, the optimisation process...

could more briefly be written

~~Essentially,~~ The optimisation process...

Conciseness: enough, not redundant

- Try to get **clear** in your mind what you **want** to say and **need** to say before starting to write.
- Other redundant words which can be **omitted** are those which add no new information.

For example,

large size⇒large, as large refers to size.

- Conciseness also means not explaining concepts which are already familiar to the intended readership.

For example,

no need to explain the definition of Lagrange's method in detail, just mention it briefly: By using Lagrange's method, it can be derived as...

Conciseness: enough, not redundant

When you do **need to explain** something, make sure you really do give an **explanation**.

- State something at **greater length** is not an explanation.
- Do not repeat an idea in different words.

Both make the paper **longer** but **not clearer**.

Do not write like this↓

The image should be large. In other words, it should be at least 1024×768 pixels.

should be replaced by

The image should be at least 1024×768 pixels in order that any text within it is clearly readable.

Conciseness: enough, not redundant

Avoid **prose** where a **shorter** way of conveying information is more suitable.

Use a bullet-pointed list, which makes the distinct ideas clear at a glance.

Three groups of experiments are implemented by considering the following conditions:

- **Case 1:** Nonzero initial conditions. The initial values of the two TORAs are $x_1(0) = -0.14$m, $x_2(0) = -0.03$m, $\theta_1(0) = -30$deg, $\theta_2(0) = 45$deg.
- **Case 2:** External disturbances to the translational displacement of each cart. As shown in Fig. 4, three waves of external disturbances are added to $x_1(t)$ and $x_2(t)$ at about 1.5s, 3.1s, and 5.2s.
- **Case 3:** External disurbances to the rotational angle of each rotor. As shown in Fig. 5, four waves of the external $\cdots$

Conciseness: enough, not redundant

- A **table (or graph)** can often be the **shortest and best** way of presenting numerical results, with additional explanation in the text.
- Similarly, a **pseudocode** listing can be the best way to present an algorithm.

TABLE I
STATES VARIABLES AND PARAMETERS

Symbols	Parameters/Variables	Unit
m_t, m_c	trolley and cargo masses	kg
L	rope length	m
J	jib moment of inertia	kg·m^2
g	gravity constant	m/s^2
x	trolley translational displacement	m
θ_s	jib slew angle	rad
θ_1, θ_2	cargo radial and tangential swing angles	rad

Fig.: Use a table to describe system parameters.

Conciseness: no more complicated

Conciseness may also be interpreted at a **higher level**.

- Make things **no more complicated** than they need to be.
- Avoid present what are actually quite **simple** ideas in complicated-looking mathematical notation.
- Avoid using **long** words, prefer **simpler and shorter** words.

Do not write like this↓

Carry out the necessary modifications to the settings to achieve the greatest possible intensity.

can be written much more simply as

Change the settings to give maximum brightness.

Conciseness: jargon

Some papers use **jargon** to make simple ideas sound more academic. Jargon should only be used if everyday language

- would require a much **longer phrase** in its place,
- or could be **misleading** or **ambiguous**.

Example 1–codec

A '**codec**' is a device or computer program capable of encoding or decoding a data stream or signal. There is **no good** everyday word for this concept, and a phrase would clearly be longer.

Conciseness: jargon

Some papers use **jargon** to make simple ideas sound more academic. Jargon should only be used if everyday language

- would require a much **longer phrase** in its place,
- or could be **misleading** or **ambiguous**.

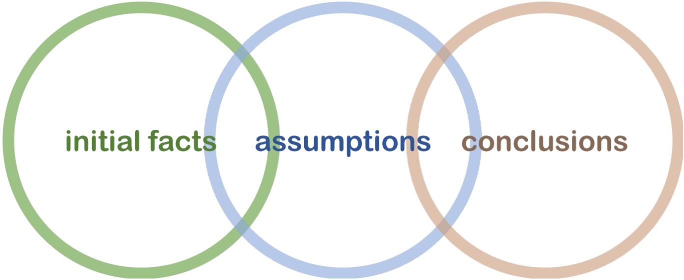
Example 2–adaxial

Leaves on some plants are highly curved, and the phrase '**upper surface**' may lead to confusion: the same surface may be uppermost at the base of the leaf, but facing downwards at the tip of the leaf. Referring to the '**adaxial**' surface is unambiguous.

Logical Writing: step by step

Being **logical** means that any arguments you give follow a **sound chain** of reasoning **step by step** from the initial facts and assumptions through to the conclusions

- It should be clear **how** each idea is derived from the **previous** one.
- **Reasons and justifications** should be given for you assertions.



Logical Writing: present in an order

Logical writing also means presenting the material **in an order** which the reader will find **easy** to understand.

- If you are describing a series of events or steps of a **procedure**, please describe them in their correct **time sequence**.

Compare

The anode should be lowered into (step 2) the electrolyte, but before this is done, the anode must be carefully cleaned (step 1).

with

First, carefully clean (step 1) the anode, then lower it into (step 2) the electrolyte.

Logical Writing: tips

- If instructions are in the **wrong** order, the reader may **fail** to follow them correctly, with **undesirable** consequences.
- If explanations are in the **wrong** order, it is **harder** to follow the argument.
- Concepts should be **defined** before they are used.

An example: The image is first segmented to give a TextNet. A TextNet is a graph whose nodes...and edges...This TextNet is used to...

- Ideas should **build upon** each other.
- Forward references should be **avoided**, except for things briefly explained in an **introduction or overview**.

Balance: allocate space

Another important aspect of writing is **balance**.

- Allocate an amount of space in your paper according to the **importance** of the topic.

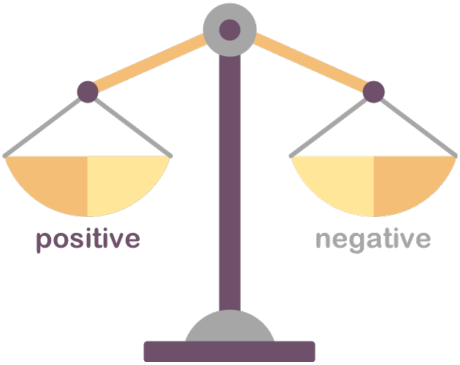
For example

The related work section is **important**, but your own ideas are **even more** important. It follows that the related work should only be a **small** part, say 10%–15% of the paper.

If you approach has **two main** steps of equal importance and difficulty of concept, roughly **equal space** should be given to them.

Balance: allocate space

Balance also has another meaning–showing **both** sides of an **argument**.



Discuss negative aspects as well as the positive.

Balance: Example 1

Discuss negative aspects as well as the positive aspects.

The benefits of initially sorting the data are that queries can be answered in just a few seconds, rather than minutes. The disadvantage is that the system is unavailable for several hours while sorting takes place.

Balance: Example 2

servo valves [7]. The special working principle of PAM systems brings many advantages for applications, e.g., flexible tubular structures, lightweight materials, high power-to-weight/volume ratios, clean power, etc. [7]–[12]. Based on these merits, PAM systems are mainly applied to micromanipulation robots and biomimetic rehabilitation robots. However, the force generated by pressurized air inside PAM systems also brings complicated inherent characteristics, such as high nonlinearities, complex hysteresis, and time-varying characteristics, which make the control issues challenging and nontrivial.

Completeness: in sufficient detail

Make sure that **all** steps are described and explained in **sufficient detail** that others can reproduce your work.

- If a step is **your** novel **contribution**, then clearly you must explain it in detail.
- If an idea is a **standard** approach in your community, you should at least give a **reference** to aid readers who are not experts in your field.
- If using **another author's work**, again give a **reference**, and briefly summarise the idea.

Completeness: Example 1

Give a reference

We use Li's method [27] for finding side views of cars in images. It works by first finding circles which are assumed to be the wheels, then checking if there are windows in appropriate locations.

Completeness: Example 2

B. Fuzzy logic systems

Considering the literatures [42]-[45], a FLS consists of four parts: the knowledge base, the fuzzifier, the fuzzy inference engine working on fuzzy rules, and the defuzzifier. The knowledge base for FLS is comprised of a collection of fuzzy If-then rules in the following form:

$$R^l\text{: If } x_1 \text{ is } F_1^l \text{ and } x_2 \text{ is } F_2^l \text{ and } \ldots \text{ and } x_n \text{ is } F_n^l,$$

$$\text{then } y \text{ is } G^l, \quad l = 1, 2, \ldots, N \qquad (13)$$

where $x = (x_1, \ldots, x_n)^{\mathrm{T}}$ and y are the FLS input and output, respectively. Fuzzy sets F_i^l and G^l are associated with the fuzzy membership functions $\mu_{F_i^l}(x_i)$ and $\mu_{G^l}(y)$, respectively. N is the number of rules.

Fig.: Provide references and explain briefly before using the fuzzy method. (Adaptive Fuzzy Output Feedback Control of MIMO Nonlinear Systems with Unknown Dead-Zone Inputs, IEEE TFS, 2012)

Completeness: every symbol is fully defined

Make sure that **every** mathematical **symbol** used in the paper is fully **defined** and **explained**.

TORA are fixed to the material frames by springs. By applying Lagrange's modeling technique, the dynamic model of the multi-TORA system is written as follows:

$$(M_i + m_i)\ddot{x}_i - m_i L_i \dot{\theta}_i^2 \sin\theta_i + m_i L_i \ddot{\theta}_i \cos\theta_i + k_i(x_i - x_{i-1}) + k_{i+1}(x_i - x_{i+1}) = 0, \quad (1)$$

$$(J_i + m_i L_i^2)\ddot{\theta}_i + m_i L_i \ddot{x}_i \cos\theta_i = \tau_i, \quad (2)$$

where $i = 1, 2, \cdots, N$. For the ith TORA subsystem, $x_i(t)$ denotes the cart displacement, $\theta_i(t)$ represents the rotational angle of the rotor, M_i and m_i denote the masses of the cart and the rotor, respectively. L_i is the rotational radius of the rotor, J_i is the inertia of the rotational center, and $\tau_i(t)$ represents the actuating torque which is the control input of the ith TORA subsystem. In addition, k_i represents the stiffness coefficient of the ith springs. It is worthwhile to mention that, $x_0(t)$ and

Completeness: tips

Never ignore the completeness of the paper, otherwise it will leave a **bad** impression on the **reviewers**. If some obvious requirement is **ignored**, the readers **cannot** follow the author's meaning.

- Make sure that you **explicitly** state **all** of your assumptions.
- If you paper concerns a procedure, **carefully** describe **all** inputs and outputs.
- **State typical** values used for parameters.

Carefulness and rigor are the keys to success.

Q & A?