

Scientific Communication CITS7200

Computer Science & Software Engineering

Lecture 4

Composition

We will now consider some general points of composition. Specifically, we want to address global issues of form and content in scientific writing. In a later lecture we will look in detail about how to write a paper. Thus, the points we consider now will be relevant whether we are writing a single paragraph book review, a critical scholarly essay, a scientific paper, a thesis, or a book. Many of the ideas in this lecture come from Strunk's *The Elements of Style*.

The principle to keep in mind when thinking about composition is

Composition = Organisation + Simplification

1 Choose a suitable design

Whatever it is that you write, there should be an underlying structure to your work. For example, a haiku poem has 17 syllables, a sonnet 14 lines. Most forms of composition are less well defined but all have skeletons to which the writer should conform. Literary compositions, like musical compositions, are determined by the global structure. The better the shape of your work is conceived, the greater your chance of writing well.

For example, P. D. James has written about the structure, or blueprint, for the classical detective novel. Firstly, she tells us, there must be a mysterious death at its centre. There is always a small, closed circle of suspects (and the murderer must be one of these). Each of the suspects must be given a credible motive and opportunity to commit the crime. The central character must always be the detective (or some amateur playing this role), and this person must uncover the murderer by logical deduction from the facts put before the reader.

Scientific papers also must have a well-defined structure; indeed, this structure might be precisely defined by the conference or journal editors. Planning must be a deliberate prelude to scientific writing. Thus the first principle of composition is to determine the shape of what is to come and to pursue that shape.

2 Make the paragraph the unit of composition

A paragraph should be treated as a unit of thought, not of length. It must be homogeneous in subject-matter and sequential in treatment. As long as it is cohesive, a paragraph can be of any length. However, a succession of very short paragraphs is irritating, whilst very long ones are tiring. The purpose of a paragraph is to give the reader a break. Thus, try not to have more than about thirty lines without seeing whether you can break them up.

You can use paragraph structure to highlight the importance of the ideas you are trying to get across. In particular, it is a good idea to use the position and size of a paragraph to establish importance. Try to rank the ideas you have in order of importance, and put the most important ones first. A short, direct statement about your most important point, as a single-sentence paragraph, can also be a good way of letting the reader know which is your most important point. However, single sentence paragraphs should be rare, and you should avoid diluting the important ideas.

Begin each paragraph with a sentence that suggests the topic, or with a sentence that helps the transition from the previous paragraph to the current one. In the former case we can often use phrases such as *Our aim is to construct ...*, *We now show that ...*, *We compared the performance of our algorithm with* The latter case of transition can also often be done with a simple phrase, such as *on the other hand*, *again*, *next*, or *for the same reason*.

3 Use the active voice

We've said this before, but here it is again. The habitual use of the active voice makes for forcible writing, whereas the passive voice distances the writer from the action. Many a boring descriptive sentence can be made lively, and indeed concrete, by substituting a transitive in the active voice for some banal phrase such as *there is* or *can be seen*. Passivity is also a way of attempting to get out of responsibility. As such, it should not be used when describing your own scientific work.

Here are some examples where moving to the active voice makes the writing more direct and emphatic:

†There is a plethora of algorithms for sorting.

Sorting algorithms abound.

†Finally, the complexity of this algorithm can be seen.

We now see the complexity of this algorithm.

Generally, when a sentence is made stronger, it usually becomes shorter. Thus brevity is a side-effect of vigour.

Here is an example where the writer is attempting to relinquish responsibility:

In what might be called *reactive programming*, the distinction between input and output is often blurred.

The phrase *what might be* is an attempt to wriggle out of responsibility. The author wants to use the term *reactive programming*, but doesn't want to take responsibility for it. The phrase *is blurred* further distances the same expression. The author needs to take control here and decide whether this is the term to use or not. If so, then something like the following might be more appropriate:

We define *reactive programming* by algorithms and data, where both input and output data have been fuzzified using a Gaussian function, and the resulting distributions overlap by at least 90%.

4 Put statements in positive form

Always try to make definite, positive statements. Avoid tame, colourless, hesitating, noncommittal language. Use the word *not* as a means of denial or in antithesis, but never as a means of evasion.

For example:

He did not think that studying Scientific Communication was a sensible way to use one's time.

He thought the study of Scientific Communication a waste of time.

As a rule, it is better to express even a negative in positive form, as in

| | |
|---------------------------------|------------|
| not honest | dishonest |
| not important | trifling |
| did not pay any attention to | ignored |
| did not have much confidence in | distrusted |

If your every sentence admits a doubt, your writing will lack authority. Save words such as *would*, *should*, *could*, *may*, *might*, and *can* for situations involving real uncertainty.

5 Use definite, specific, concrete language

Prefer the specific to the general, the definite to the vague, the concrete to the abstract.

For example:

Vague. A period of unfavourable weather set in.

Specific. It rained every day for a week.

Vague. In proportion as the manners, customs, and amusements of a nation are cruel and barbarous, the regulations of its penal code will be severe.

Specific. In proportion as men delight in battles, bullfights, and the combat of gladiators, will they punish by hanging, burning, and the rack.

The surest way of arousing and holding your reader's attention is by being definite, specific, and concrete.

6 Omit needless words

Good writing is concise. It says precisely what needs to be said, and no more. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences. This doesn't mean that your sentences should be short. The ideal chart of sentence length should look like a normal distribution centred around 15 to 18 words per sentence. But every word should tell.

Many common expressions violate this principle.

| | |
|----------------------------|--------------|
| the question as to whether | whether |
| there is no doubt but that | doubtless |
| he is a man who | he |
| this is a subject that | this subject |
| the reason why is that | because |
| owing to the fact that | since |
| in spite of the fact that | though |

Waffle can also occur at the paragraph level. This is best cured by writing a one-sentence outline of each paragraph of text, looking for structures like "A but B but A but B". It also helps you with paragraphing; if you can't outline the paragraph in a single sentence it might be better broken into two paragraphs.

Here's an example of waffle:

We would like to have more information about the high-frequency data, but our model can account for all the information in our simulations. Observations in nature are, however, all too few. But the fact remains that much can be learnt by simulation. Acquisition of real data would necessarily mean that we would have to correct our initial model. In the meantime, the work on improving the simulation will continue.

7 Avoid a succession of loose sentences

This rule refers specifically to sentences that consist of two clauses, the second introduced by a conjunction or relative. Examples include connectives such as *and* and *but*, or joining the clauses with *who*, *which*, *when*, *where*, and *while*. Such writing appears trite and singsong. Here is an example:

The image is first thresholded, and then the binary version is extracted for further processing. The Laplacian pyramid is calculated, and the Gaussian pyramid is also computed for later use. The two pyramid structures are stored in an image structure of type image array, while the image itself uses the normal image structure. Wavelet transformation theory can be used to do scale analysis, but Fourier theory is usually adequate for most applications.

Here is a tighter version of the same ideas:

The image is first thresholded, and then the binary version is extracted for further processing. Both the Laplacian pyramid and the Gaussian pyramid are computed for later use; they are stored in an image structure of type image array, while the image itself uses the normal image structure. Although Fourier analysis is adequate for most purposes, recent research indicates that the wavelet transform gives much better results for scale analyses.

If you find you have written a series of loose sentences, you should try to recast enough of them to remove the monotony. Replace some by simple sentences. Join some clauses with a semi-colon, or give some sentences a periodic structure. Sentences with three clauses can also be useful.

8 Express coordinate ideas in similar form

This is the principle of parallel construction. Expressions that are similar in content and function should have the same outward structure. The likeness of form enables the reader to recognise more readily the likeness of content and function.

†In SIMD, the same instructions are applied simultaneously to multiple data sets, whereas in MIMD different data sets are processed with different instructions.

In SIMD, multiple data sets are processed simultaneously by the same instructions, whereas in MIMD multiple data sets are processed simultaneously by different instructions.

Of course the problem is, what if you need to express a rather large number of similar ideas? Do you write umpteen consecutive sentences in the same pattern? Upon closer inspection you might find that your ideas fall naturally into groups, so that you can use a similar sentence structure within each group. Otherwise, express your ideas in a table.

9 Keep related words together

The position of the words in a sentence is the main way of showing their relationship. Confusion and ambiguity result when words are badly placed.

†We notice a large loop in the algorithm that is right in the centre.

We notice a large loop right in the centre of the algorithm.

†New York's first commercial human-sperm bank opened Friday with semen samples from 18 men frozen in a stainless steel tank.

New York's first commercial human-sperm bank opened Friday when semen samples were taken from 18 men. The samples were then frozen and stored in a stainless steel tank.

10 In summaries, keep to one tense

It is often said that the Conclusion is the place where the author stopped thinking! Don't make this the case. A conclusion should not be a simple list of everything that has come before; it should be a revelation: "Remember this? And remember that? Well this is how they fit together."

Generally, you should use the present tense in summarising the contents of your text, although the past tense might also be appropriate. Whichever tense is chosen, stick to it. Shifting from one tense to another gives an impression of uncertainty.

11 Place the emphasis at the end

The correct place in the sentence for the word or group of words that the writer wishes to make most prominent is usually the end.

Compare this last sentence with:

The writer should usually place at the end of the sentence the words or group of words that need to be emphasised.

The word or group of words entitled to this position is the logical predicate - that is, the *new* element in the sentence.

†The simplest neural network, the perceptron, was introduced by Rosenblatt (1962).

Rosenblatt (1962) introduced the simplest neural network, the perceptron.

†This data structure is often used for images, because of its amenability to matching.

Because of its amenability to matching, this data structure is often used for images.

The principle that the proper place for what is to be emphasised is the end applies to words in a sentence, sentences in a paragraph, and paragraphs in a composition.

Other forms of emphasis include italics, bold face, capitalisation, and underlining. However, such forms of emphasis should be used sparingly. It is much better for the emphasis to be generated by the structure of your writing, rather than by the mechanics of the word processing.

12 Conclusion

In addition to all the structural detail we have considered, the following points will help you master the art of composition:

Start early. If you haven't already started writing, start writing today.

Write, rewrite, rewrite, rewrite, . . . Nobody ever gets it right first. Always consider your first attempt as a draft and be prepared to work on it, over and over again.

Read. Read as much as possible. It sharpens your style and improves your critical faculties. Read whatever you like; detective novels, classics, computer manuals, the newspaper. But read every day.

Model the reader. Keep in mind what the reader knows so far, and what the reader is expecting next.

Master the medium. You need a good vocabulary, skill on a good word-processing or typesetting program, the ability to create tables, graphs, images, indices, and bibliographies.

Master the material. Understand your work well, and use writing as a means of understanding it even better. Reorganise your material to see which organisational structure is best for writing.

Simplify. As Einstein said, “Everything should always be made as simple as possible, but not simpler.” Present the reader with something straightforward to start off with, then add in the details later.

Avoid recycling. Don’t use bits and pieces from old papers when writing a new paper. Always start again from scratch, and explain your material with a fresh view. Recycled material looks recycled, and the overall impression of your work will be disjointed.

Aim for excellence. As D’Israeli said:

It is a wretched taste to be gratified with mediocrity when the excellent lies before us.

Conversely:

Aim for excellence, not perfection.

Remember the law of diminishing returns.