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Software for checking style and grammar in scientific writing

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The IEEE Professional Communication Society promotes that technical and scientific communication is an essential part of engineering. Engineering students are required to write reports, research papers, theses, and dissertations. After you graduate, you will be asked to write many other types of documents.

To be successful in your field, you must be able to write clearly. Many excellent resources provide examples and tips on how to write well (e.g, "Scientific Writing Resource" from Duke University).

For scientific writing, forget some of the "rules" that you learned at school. Imagine that you are seven years old, and the teacher asks you to write an essay about your summer vacation. "It was a nice day, so we went to the zoo. The zoo was nice, because of the nice animals. Then I ate a nice ice cream…" The teacher suggests that you use some alternatives to *nice*, and soon, you have a large vocabulary of synonyms for the word. That is good, when you write literature. But, for technical documents, variety and complexity are not good, because readers can become confused.

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Frequently, text is not clear for various reasons.

- The grammatical structures are too complex.
- The words are not correct. For example, many people write *utilize* when they mean *use*.

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- The text contains unnecessary words and phrases. For example, "It must be remembered that..." does not provide useful information.

Many software products are available to help you to improve the quality of your text. But, many of the low-cost products find only spelling errors and grammatical errors. Some products that cost many thousands of dollars can find other errors. Open-source software is also available.

Using LanguageTool open-source software (www.languagetool.org), TechScribe developed a term checker for Simplified Technical English (STE). Many of the problems that the term checker identifies (Fig. 1) are the same as the problems that can cause your text to be unclear and which standard spelling and grammar checkers cannot find.

STE for safety-critical instructions

Technical writers have the same problems as people who write scientific texts: A subject can be complex, and it can have thousands of technical terms, each of which must be used correctly. For safety-critical instructions, some technical writers use STE, specification ASD-STE100. The purpose of STE is to make text as simple as possible. The specification contains both a dictionary of terms and their meanings as well as a set of rules for writing.

The dictionary contains a list of approved terms. For example, the term *make sure* is approved. A writer must not use synonyms such as *verify*, *check*, *confirm*, or *ensure*. This part of the specification targets the standardization of language. The principle is "one term, one meaning." (The word *word* has its usual dictionary meaning. The word *term* means one or more words that have a specified meaning. *Make sure* is a two-word term.)

The writing rules specify the structure of the text. For example, descriptive sentences must have no more than 25 words. (This rule puts a number on the plain English

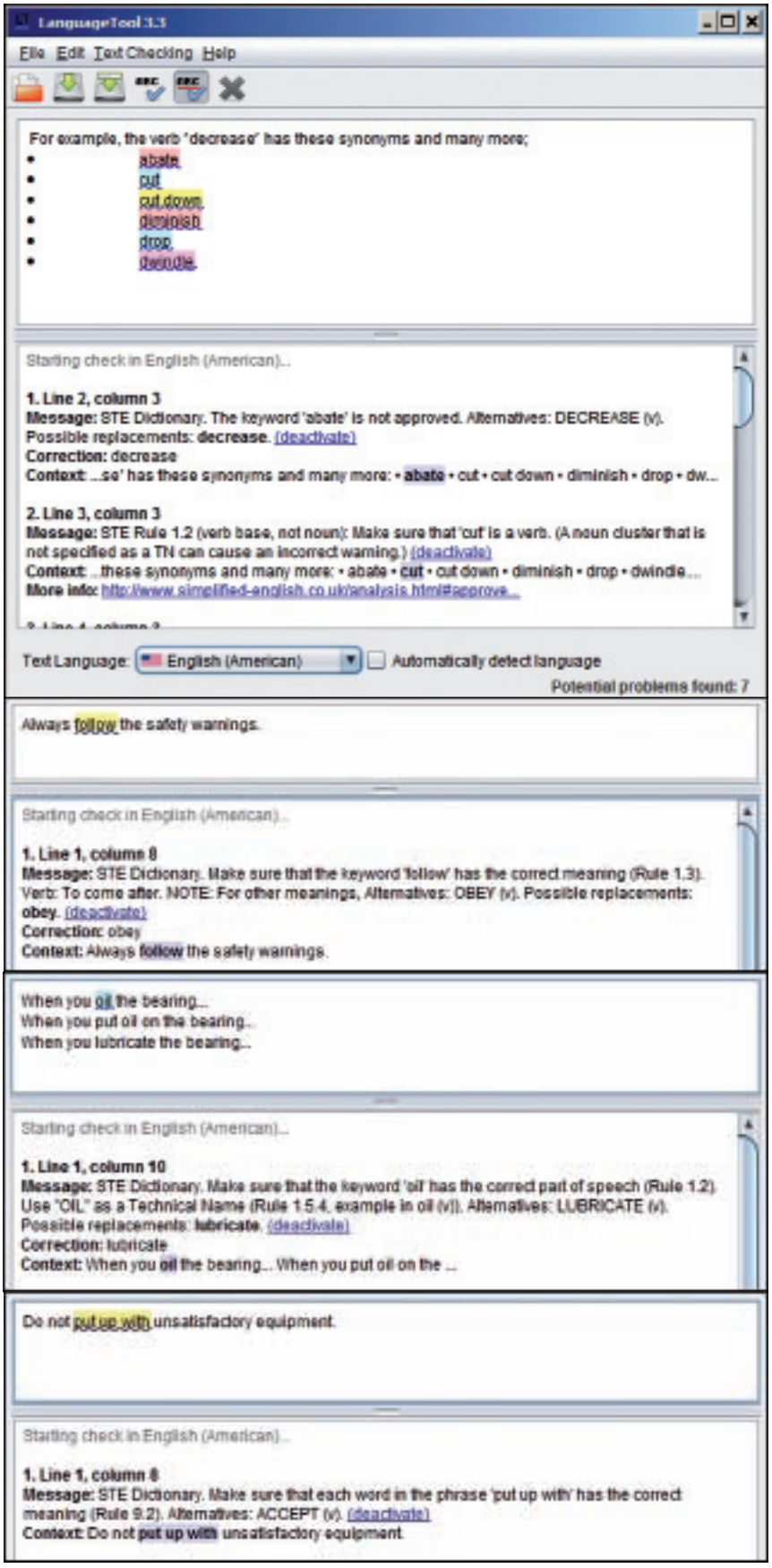

FIG 1 Problems that the STE term-checker finds: a) unapproved synonyms, b) possible incorrect meaning, c) incorrect part of speech, and d) incorrect word combination.

guideline to keep sentences short.)

Tenses are restricted. For example, you cannot use the present perfect tense. As an alternative, write the sentence in the simple past tense:

- "We have received the technical reports from HQ" is not permitted, because the sentence uses the present perfect tense.
- "We received the technical reports from HQ" is permitted, because the sentence uses the simple past tense.

Each industry has its technical terms. Thus, each organization must create a dictionary of approved terms.

Difficult standardization problems

Spell checkers can find incorrectly spelled words, text in the passive voice, and long sentences. But, a spell checker cannot find errors if you do not obey these STE rules:

- Use an approved term, not its synonyms.
- Use a term with its correct meaning.
- Use a term only as the approved part of speech.
- Make sure that in a combination of words, each word has its correct meaning.

Using LanguageTool, you can make rules to find problems that most spell checkers cannot find.

Use an approved term, not its synonyms

When you write a scientific text, how do you make sure that you use only the approved terms, not their synonyms? In English, many different words can refer to same thing. For example, the verb *decrease* has these synonyms and many more:

- *abate*
- *cut*
- *cut down*
- *diminish*
- *drop*
- *dwindle*.

The same type of problem occurs with technical terms. A shipping company had these synonyms for a location:

- designated lightering area
- lightering area
- lightering area coordinates
- lightering area location
- lightering coordinates
- lightering location
- lightering operation rendezvous position
- rendezvous location
- rendezvous position.

Many years ago, for a project about software for scheduling, I wrote *dairy*, not *diary*. The spell checker did not find the error.

With LanguageTool, you can make rules that find unapproved synonyms of approved terms, and you can also form a rule that finds all unknown terms. (An unknown term is neither approved nor unapproved, as with the word *dairy* in the previous example. Such a rule can find terms such as *utilize*, *elucidate*, and *methodology* that infest some scientific texts.)

Use a term with its correct meaning

In STE, each approved term has a specified meaning. For example, *follow* means *to come after*. It does not mean *obey*. The Federal Register provides the following example: as an alternative to "The tank had a 200-gallon tank for fuel", write, "The tank had a 200-gallon fuel container."

The Scientific Writing Resource discusses the differences between *use* and *utilize*. *Utilize* is a good word, but only if you mean "to use something for which it was not designed." Most times that the word appears in a scientific text, the writer uses it incorrectly.

Use a term only as the approved part of speech

Many terms in STE are approved only for a specified part of speech. For example, the word *oil* is approved as a noun but not as a verb. If the part of speech is correct, then a message about the term is not necessary. Thus, part-of-speech disambiguation is necessary.

Some commercial style guides have rules about parts of speech. For example, in the Microsoft Manual of Style, the word *input* is permitted as a noun but not as a verb. (To make rules that find words that have an incorrect part of speech is difficult. First, you must make rules that can find the part of speech that a word has. TechScribe spent many thousands of hours on the problem.)

Make sure that in a combination of words, each word has its correct meaning

Some people put up with low-quality text. In STE, the words *put*, *up*, and *with* are approved. But, if you use the words as the verb "put up with," then each word does not keep its approved meaning. Nothing is put anywhere—neither up nor down—and certainly not with some other thing.

In "Plain English? A Study of Plain English Vocabulary and International Audiences," Emily A. Thrush shows that nonnative speakers can struggle to understand multiword verbs and idioms. (In *The Global English Style Guide*, John R. Kohl gives the same advice).

Many readers of scientific documents do not read English as their first language. Be courteous. Make sure that each word you write has its primary meaning.

Benefits to students

To achieve your professional goals, you must communicate clearly. You can use software to help you to write clear text.

Here are some benefits of LanguageTool:

- It is free and open source.
- It has rules for more than 20 languages.
- It highlights problems that many other products do not find.
- You can integrate LanguageTool with other software.
- You can customize the rules in LanguageTool.

If you want powerful software to help you to write clearly, join the LanguageTool community and create rules that are applicable to scientific texts.

Valuable resources

If you are interested in learning

more about improving your writing skills, the following resources are extremely effective:

- *Global English Style Guide*, Kohl: http://support.sas.com/publishing/authors/kohl.html
- IEEE Professional Communication Society: http://sites.ieee.org/pcs/
- LanguageTool: https://languagetool.org/
- Scientific Writing Resource, Duke University: https://cgi.duke.edu/web/sciwriting/
- Simplified Technical English, ASD-STE100: www.asd-ste100.org
- Term checker for Simplified Technical English: www.simplified-english.co.uk.

About the author

Mike Unwalla (mike@techscribe.co.uk) is currently a freelance technical writer. He began his technical writing career at a software company in 1995. From 2004 to 2007, he was the principal U.K. expert for software documentation. He was appointed by The British Standards Institution to serve on the System Software Documentation working group, which is part of the International Organization for Standardization. He is a member of the IEEE Professional Communication Society.

Callouts:

For technical documents, variety and complexity are not good, because readers can become confused.

Technical writers have the same problems as people who write scientific texts: A subject can be complex, and it can have thousands of technical terms, each of which must be used correctly.

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