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Assignment Of Software-Engineering

# Ambiguity in Software Specs

[Natural language](http://en.wikipedia.org/wiki/Natural_language) is a powerful tool for communication. When communicating with each other we use the context of the current situation or topic of discussion—the current weather, the time of day, the previous conversation topics, etc.—to allow us to take shortcuts in our speech in order to convey thoughts.

For example, in the previous paragraph you knew when I said “we” that I was referring to human beings. This is because given the domain knowledge and context you have about this writing, you (reasonably) assumed that it was written by a human being. It is however possible to interpret “we” as referring to a different group, such as all software engineers, or all mammals.

In situations where despite the context of the discussion the meaning of the words are still open to multiple interpretations, we say that a word or set of words is [ambiguous](http://en.wikipedia.org/wiki/Ambiguity). Ambiguity is an inherent part of natural languages, but is usually kept in check when the right amount of context is provided, as that of most natural conversation. When there is more than one interpretation, we tend to pick the one that is the most likely given the context.

This phenomenon presents a problem when we start defining software requirements and specifications, as bad things can occur if interpreting an ambiguous requirement or specification incorrectly results in building software that doesn’t do what was originally requested. It is crucial that software engineers avoid this situation, as it can be extremely costly to fix if discovered too late—those months (but hopefully just a few days in most cases) of development building the wrong thing can’t be completely recouped!

There are three possible approaches you have to address ambiguity in software specifications:

* Learn to recognize ambiguity
* Learn to write less ambiguously
* Write in a formal, non-ambiguous language

The first two options will be discussed in depth. The last option is a very interesting field of exploration, but in practice tends to require more work to implement. Thus we’ll be exploring the first two options by showing some examples of ambiguous writing, describing the problem, and correcting the problem. Much of the following comes from a course I took on requirements specification and analysis at the University of Waterloo.

**Detecting Ambiguity**

When ambiguity exists in writing, there are different possible underlying causes of the ambiguity. These kinds of ambiguity are outlined below. Note that in the academic literature there are a few more than are mentioned here, but they start to blur the distinction between the different forms, and so they have been omitted in the interest of keeping the conceptual differences clear.

**Lexical Ambiguity**

[Lexical ambiguity](http://en.wikipedia.org/wiki/Polysemy) occurs when a word has several possible meanings, resulting in a sentence having multiple possible interpretations. In the sentence:

*I like writing.*

…it’s unclear whether or not the author is referring to the act of writing (the verb) or the result of writing (the noun). The best way to deal with lexical ambiguity is to use a word that does not have multiple meanings, or to rephrase the sentence such that the word now has only one possible meaning, for example:

*I like writing stories.*

In this case, however, we’ve narrowed the statement to referring to the act of writing stories, so it’s not a perfect match (though it may be what the author intended). If we wanted to remain general, we would have to say:

*An activity I like is writing.*

**Syntactic Ambiguity**

[Syntactic ambiguity](http://en.wikipedia.org/wiki/Syntactic_ambiguity) occurs when a sequence of words can be given more than one grammatical structure. For example, consider the sentence:

*The police shot the rioters with guns*

This can be interpreted as the rioters with guns were shot by the police, or that the rioters were shot by police with guns; the grammatical structure of the sentence is ambiguous.

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