

Ambiguity

Shoes
Must
Be Worn

Dogs
Must
Be Carried

- Common signs on escalators in the UK
- What do they mean?
 - if I carry two pairs of new shoes I just bought?
 - if I have no shoes?
 - if I have no dog?

Formalisms to the Rescue?

- Use the Predicate Calculus:

For All x ($\text{OnEscalator}(x) \rightarrow \text{Exists } y \text{ such that } (\text{PairOfShoes}(y) \text{ AND } \text{IsWearing}(x,y))$)

and for the second sign we'll have:

For all x ($(\text{On Escalator}(x) \text{ AND } \text{IsDog}(x)) \rightarrow \text{IsCarried}(x)$)

Do Dogs Have to Wear Shoes?

- The formalism did not automatically remove ambiguity
 - do dogs have to wear shoes?
 - what counts as a pair of shoes?
 - what counts as “wearing” shoes?
 - there are ways to fix this, but it shows formalisms are not magic
- Did you notice the signs read “must” ?
 - this is known as “optative” mood (the language of requirements, normative concerns)
 - but the formalism is in the “indicative” mood

Refutability

- To “refute” an assertion is to demonstrate that it is wrong
 - not merely a competing assertion, to really show it incorrect
- All respectable *scientific theories* are refutable
 - this supports peer review for correctness
- A theory that is not refutable will not be taken seriously

- Software Requirements must be refutable! (Science in what we do?)
 - A domain description of the system’s environment or domain claims to describe the way things are
 - it should be written to invite counterexamples!
 - A requirement claims to describe how things ought to be when the system is installed
 - the customer should be able to look at it and say, “NO, that isn’t what I want.”
 - OR, “yes, this is the right requirement, but your product has failed to meet it.”

Designations

- A designation singles out some sort of phenomena and tells you how to recognize it and gives it a name
 - note: a “definition” can be neither true nor false
- All designations in your requirements document must be reliably and unambiguously recognizable
 - you should never be able to weasel out of a refutation by saying, “it all depends on what you mean by *payment*.” (fill in your favorite observable your document)
 - if this does happen, you need to fix the designation
- You proceed to write requirements by describing relationships among the designated phenomena, the entities and data items of interest.
 - you will run the risk of refutation because your readers can use your designations to pin you down and give a counterexample.

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- Your reader can say something like, “This is a motor vehicle, right? And here are the roadwheels as you’ve defined them. Your description says all motor vehicles have an even number of roadwheels. But here, your user has a motor vehicle with 3 roadwheels. So you’re wrong.