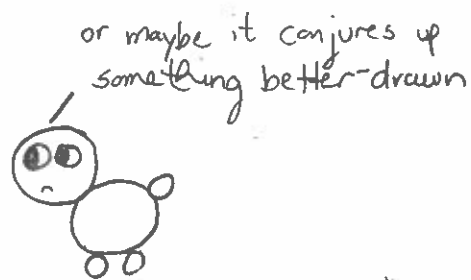


LANGUAGE AND SEMANTICS

① If I write the following English phrase:

a small apple

it probably conjures some mental image like:




but it's important to recognize that there is a difference between the words "a small apple" and the idea of a small apple.

② To make this distinction easier (for some), consider the following sequence of symbols:

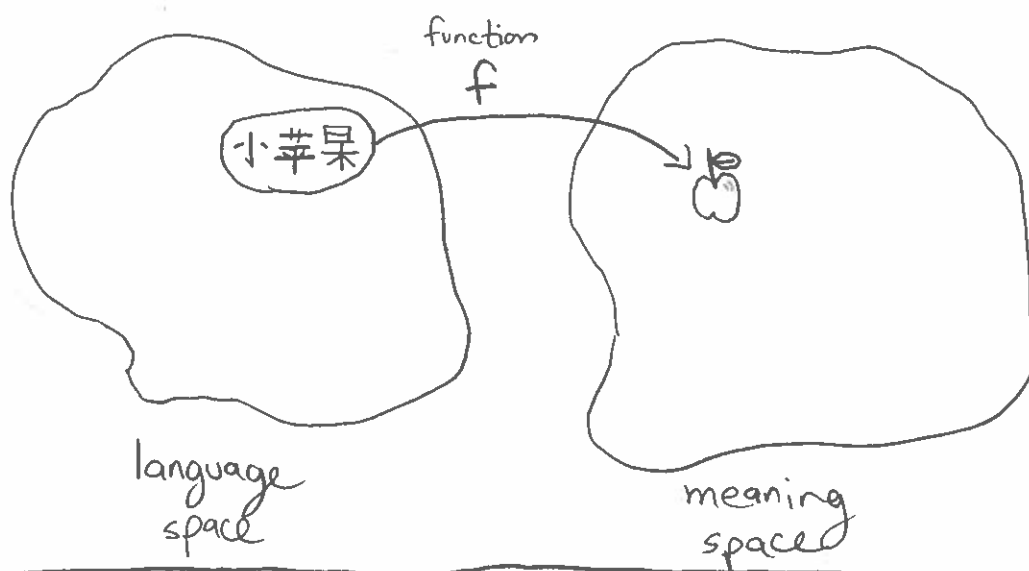
小苹果

If you speak Chinese, then this sequence probably also conjures up the image of a small apple.

Otherwise, it probably doesn't conjure much at all — it's just a jumble of symbols.

- ③ How is it that to one person, "小苹果" means , but to another, it means nothing at all?

The difference is that some people can map "小苹果" to an interpretation using some function that they have learned at some point in their lives.



- ④ To define a language space, we first need an alphabet, which is simply a finite set of symbols. For English, this could be the letters and punctuation, i.e.

$$A_{\text{eng}} = \{a, b, c, \dots, x, y, z, A, B, C, \dots, Z, ., : , j, \dots\}$$

For Chinese, this could be the ^{entire} character set and punctuation:

$$A_{\text{chi}} = \{‘小’, ‘苹’, ‘果’, \dots, ., : , j, \dots\}$$

A string from alphabet A is any sequence of symbols from A . Denote the set of all strings from alphabet A as A^* .

e.g. $\langle ‘小’, ‘苹’, ‘果’ \rangle \in A_{\text{chi}}^*$
aka "小苹果"

$\langle a, p, p, l, e \rangle \in A_{\text{eng}}^*$
aka "apple"

LANGUAGE AND SEMANTICS

⑤ A language over alphabet A is a subset of A^* .

e.g. We could define English as:

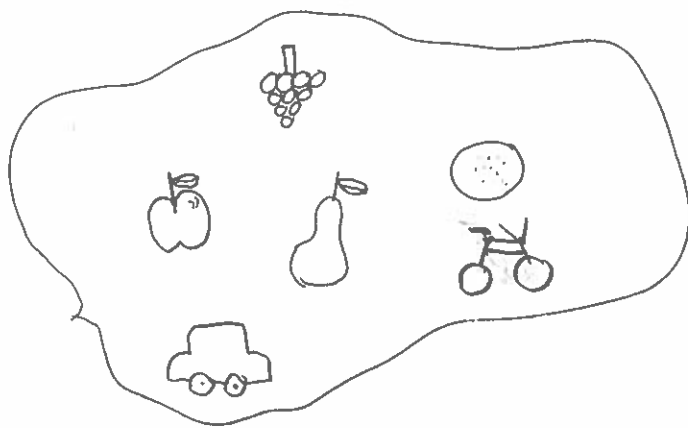
$$L_{\text{eng}} = \{ \text{"apple"}, \text{"an apple"}, \text{"a small apple"}, \dots \}$$

Note that most strings in A_{eng}^* are NOT in L_{eng} , e.g.

$$\text{"axqz xij"} \notin L_{\text{eng}}$$

⑥ By itself, a language has no meaning. It is just a jumble of symbols. If you don't "know" English, then "a small apple" should mean nothing to you, just as "小苹果" might have meant nothing to you if you don't "know" Chinese, just as "sagar txikia" likely means nothing to you, unless you "know" Basque.

⑦ So how do we define (formally) what it means to "know" a language? Before we do that, let's first assume that we have a space of possible meanings:

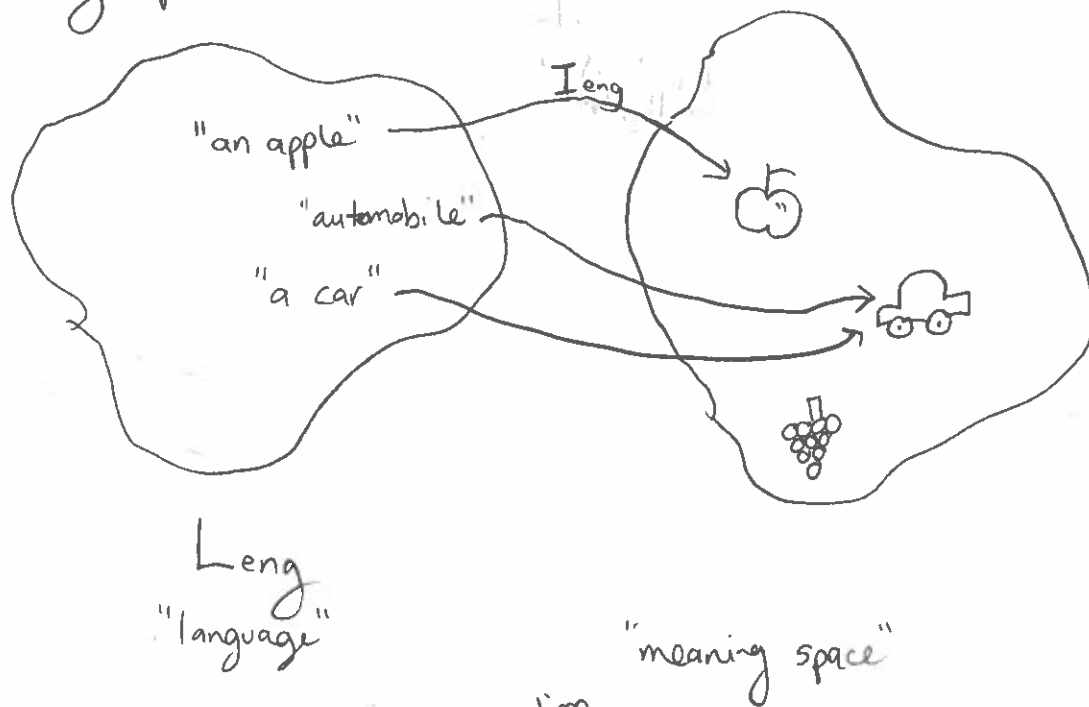


This can be an infinite set.

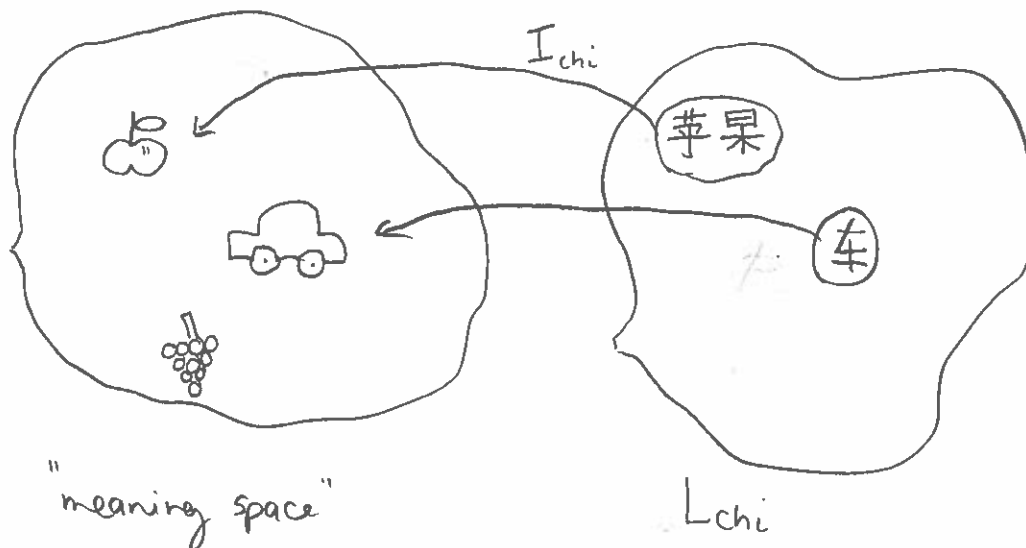
LANGUAGE AND SEMANTICS

- ⑧ We'll define this "meaning space" very generally as just a set of arbitrary elements (of whatever form you like — here we just have a set of pictures)

An interpretation function I maps a language L to a meaning space:

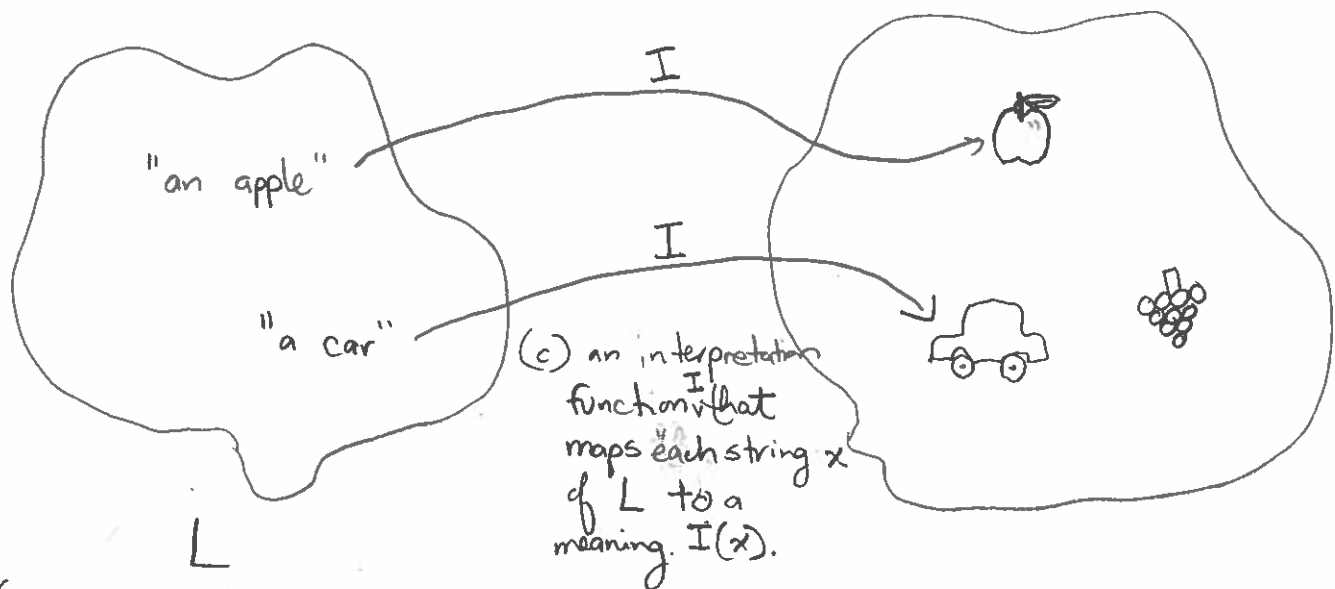


Note that the interpretation^{function} does not have to be 1-to-1 or onto. Also, different languages/interpretation functions can share the same meaning space:



LANGUAGE AND SEMANTICS

⑨ In summary, to create a language and imbue it with meaning, we need three things:



(a) the language (a subset of A^* for some alphabet A)

(b) the "semantic" space
(a set of possible meanings)