Properties So Far

What are Properties?

Properties vs. Relations

The domain of a property is an Entity, but the range is a value, not another Entity. The value can be a cardinal (e.g., `weight:15`), an ordinal (e.g., `rank:first`), a scalar (e.g., `temperature:pretty_darn_hot`) or a categorical (e.g., `color:puce`).

Properties vs. States

Properties are like *Qualities* in the study of *situation types* (stative vs. dynamic). Qualities appear at the stative extreme, Punctuals (our discrete Actions) appear at the dynamic extreme. Our States are closer to the stative end.
How do we differentiate between the Qualities and Statives? So far, we've been using intuitive tests. Given a predication on some entity `p(e)`, does p refer to a Quality (property) of e or a State that e is in? An intuitive test is to ask: does it make sense to say "how did e get p?" or "how did `p(e)` come about?" ('`*`' means ill-formed):

```
- Kim is tall
  * How did Kim get tall?
- Gert is sick
    How did Gert get sick?
- The alarm clock is heavy
  * How did the alarm clock being heavy come about?
- The network is down
    How did the network being down come about?
```

In the library, this means that defining a State for p might be more appropriate than inventing a slot for p if it makes sense to consider Actions that result in p. We haven't applied this rule consistently in the library, keeping state-like slots around for convenience (and maybe for fear of making the set of slots smaller :-). For example, `temperature` might not meet our criteria for slots; and neither does `content`.

What are the Properties?

Adjective Studies

Our Entity→Entity slots correspond (roughly) to semantic relationships between a noun and a modifier (usually a noun or a *nonascriptive* adjective). An *ascriptive* adjective ascribes to a value of some feature to the Entity represented by its modificand (head noun). A *nonascriptive* adjective represents an Entity of its own (which is why nonascriptives are usually nominal). Instead of ascribing a feature value, the nonascriptive relates the Entity it represents to the Entity represented by its head.

WordNet explicitly encodes the ascriptive/nonascriptive distinction. Nonascriptive adjectives (WN calls them *pertainyms*) have links to their noun (and sometimes adjective) roots. For the ascriptive adjectives, there are occasionally links to the noun that best describes the "attribute" to which the ascriptive adjective ascribes a value. For example, the attribute for 'large' is 'size'. The complete list of attributes can be had by running every adjective in the WN adjective index through WN asking for attributes. The result is a list of about 160 unique noun (synsets) that are used as attributes.

There are about 20,000 adjectives in WN1.6. Of these only about 1,000 are pertainyms. About 3,000 are polygraphic (phrasal). It should be possible to check if the remaining 16,000 are indeed ascriptive and if they cluster into the WN-inspired Properties.

In Roget's Thesaurus, semantically similar words are grouped under *headwords*. Each headword heads several paragraphs; each paragraph contains words of the same part of speech. Although the headwords themselves are all nouns, some of them are nominalizations and represent Events more naturally than Entities (for example, headword #142: *Cessation*). For these headwords, the verb paragraphs are the richest. For other headwords, the adjective paragraphs are the richest (for example, headword #192: *Size*). Some of the headwords so naturally indicate properties that the verb paragraphs are nearly vacuous. Often, the verb paragraph contains little more than "be <adj>". For example, in headword #201: *Shortness*, the first entry in the verb paragraph is "be short". The thesis, then, is that headwords whose verb paragraphs begin with copular adjectival complementation phrases are the best candidates for Properties. This test also singles out ascriptive adjectives, since nonascriptive adjectives do not appear as copular complements. (Nonascriptive adjectives can usually only appear in attributive position (before the noun), not in predicative position (as the adjective complement of a copula).

There are ~230 Roget headwords whose first verb entry is of the form <copula>-<adjective> (including those expressing comparatives not expressing properties, such as "be identical to", "be different from", etc.).

KM property slots and Values

See Properties web page

Properties To Come

Should we Keep all the Properties?

- should we keep slots only for intrinsic properties (like mass) and get rid of slots for the more extrinsic ones (like content, and maybe temperature)
- (conversely, we could — somewhat controversially — introduce slots for States)

The semantics of Values

cardinals

- increase/decrease (constraints?)
- converting between different Us-of-M

scalars

- scales (disjoint, overlapping, one-ended, two-ended)
- increase/decrease (constraints? movement along scale?)
- intensifiers?
- different ref classes?
- several thorny issues:
  - hot ⇒ not cold; cold ⇒ not hot; not hot ⇏ cold; not cold ⇏ hot
  - The box is heavy, but lighter than yesterday; The box is light, but heavier than yesterday
    Iris is bad, but better than yesterday; * Iris is good, but worse than yesterday
    * It’s cold, but hotter than yesterday; * It’s hot, but colder than yesterday
  - a bad student?

categoricals

- comparatives, intensifiers? (by definition, no; but never say never)

Actions

- generic Increase/Decrease
- specific to particular properties
- continuous? (temperature gradually increases throughout scenario)

```
(Set-Property has
  (superclasses (Action)))

(every Set-Property has
  (object ((a Tangible-Entity)))
  (val ((a Value)))

  (del-list ((:triple (the object of Self)
                      (the prop-slot of Self)
                      *)))

  (add-list ((:triple (the object of Self)
                      (the prop-slot of Self)
                      (the val of Self))))
)
```

Interface

- how do we represent constants in SHAKEN?
- we should avoid creating a brand new mode