Language Engineering - A nice set of notes

Josh Felmeden

October 14, 2019

Contents

1 Introduction to Semantics

Semantics are really complex and they actually exist in the real world as problems that can arise when the semantics are unclear. In the example of the Derek Bentley case, Bentley tells Chris (who is holding a gun, and a policeman standing in front of him to 'let him have it!'. Here, it appears that he could be talking about the gun, or to kill him. The same kind of thing can happen in computing when we are unsure of the references of certain objects.

Here are some examples learned from natural languages:

- Syntactic complexity
  - Jack built the house the malt the rat the cat killed ate lay in
- Syntactic ambiguity
  - Let him have it, Chris!
- Semantic Complexity
  - It depends on what the meaning of the word 'is' is!
- Semantic ambiguity
  - I haven't slept for ten days
- Semantic undefinedness
  - Colourless green ideas sleep furiously
- Interaction of syntax and semantics
  - Time flies like an arrow, fruit flies like a banana.

We can apply these things to computing terms, too.

- Syntactic complexity

```
x-=y = (x=x+y) - y      //switches variables x and y
```

- Syntactic ambiguity

```
if (...) if (...) ..; else ..       //dangling else
```

- Semantic Complexity

```
y = x++ + x++       //sequence points
```

- Semantic ambiguity

```
(x%2=1) ? "odd" : "even"        //unspecified in C89 if x<0
```

- Semantic undefinedness

```
while(x/x)      //division error or infinite loop
```

- Interaction of syntax and semantics

```
A * B       //lever hack
```