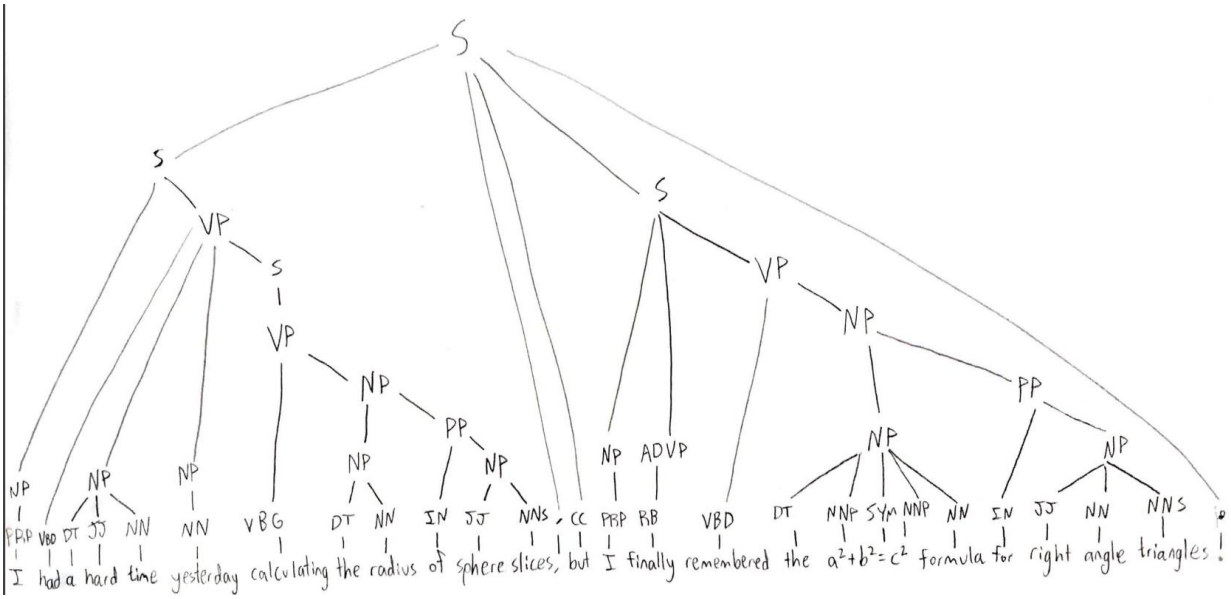
Sentence Parsing

Sentence parsing is done to glean more information about words in a sentence from their syntactic context, such as determining whether 'yellow' is a noun, an adjective, or a verb.

This demonstration uses the following sentence with several parsing techniques:

> "I had a hard time yesterday calculating the radius of sphere slices, but I finally remembered the $a^2+b^2=c^2$ formula for right angle triangles."

Phrase Structure Grammar (PSG) Parse



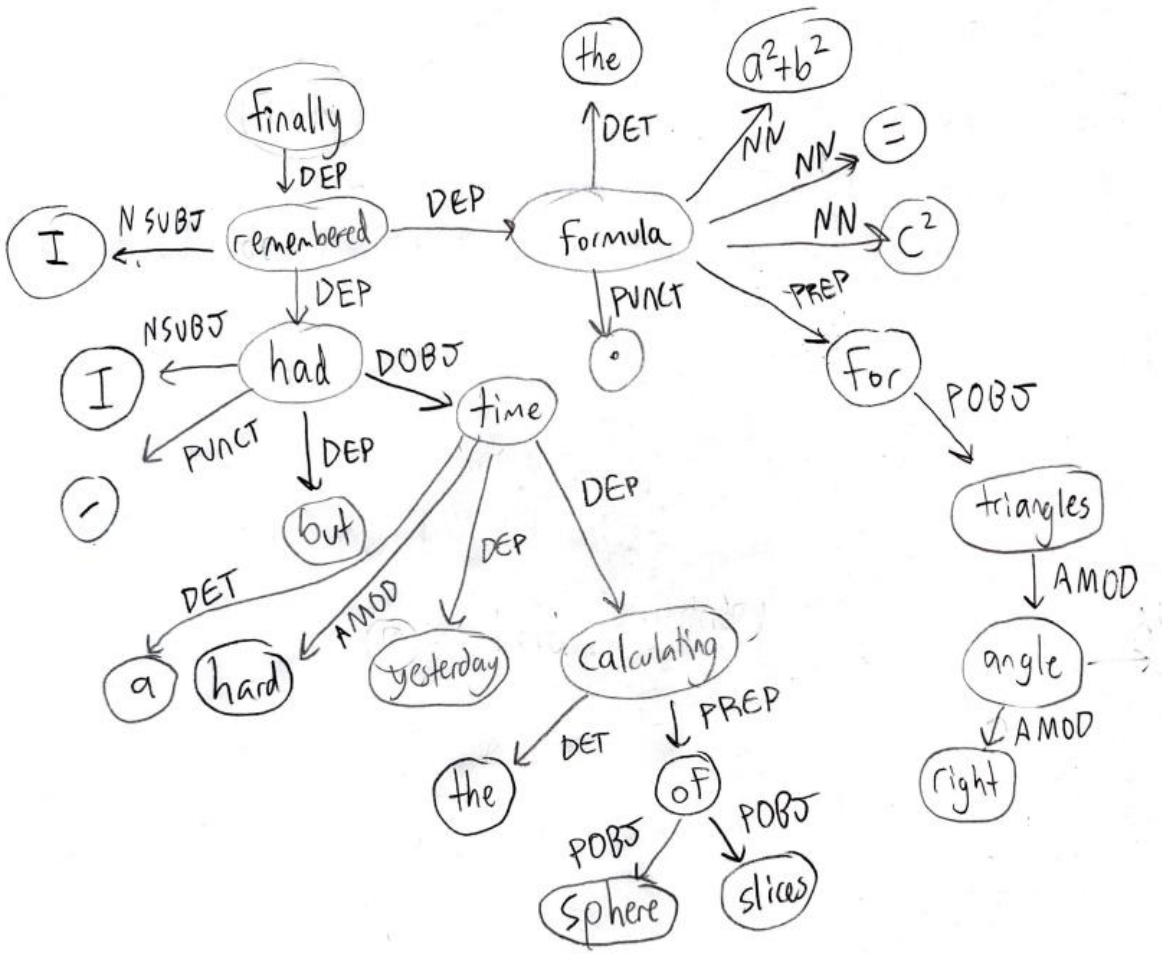
The PSG parse organizes a sentence into a hierarchy of phrases. This parse is often represented either as a tree or in a hierarchical bracket. The main types of phrases are noun phrases (NP), verb phrases (VP), and prepositional phrases (PP).

Here are the phrase terms that appear in this parse, though they are not exhaustive of a PSG parse:

ADVP: adverb phrase
CC: coordinating conjunction
DT: determiner
IN: preposition / subordinating conjunction
JJ: adjective
NN: noun (singular)
NNP: singular proper noun
NNS: noun (plural)
NP: noun phrase
PP: prepositional phrase

PRP: personal pronoun
RB: adverb
S: simple declarative clause
SYM: symbol
VBD: verb (past tense)
VBG: verb (present participle)
VP: verb phrase

Dependency Parse



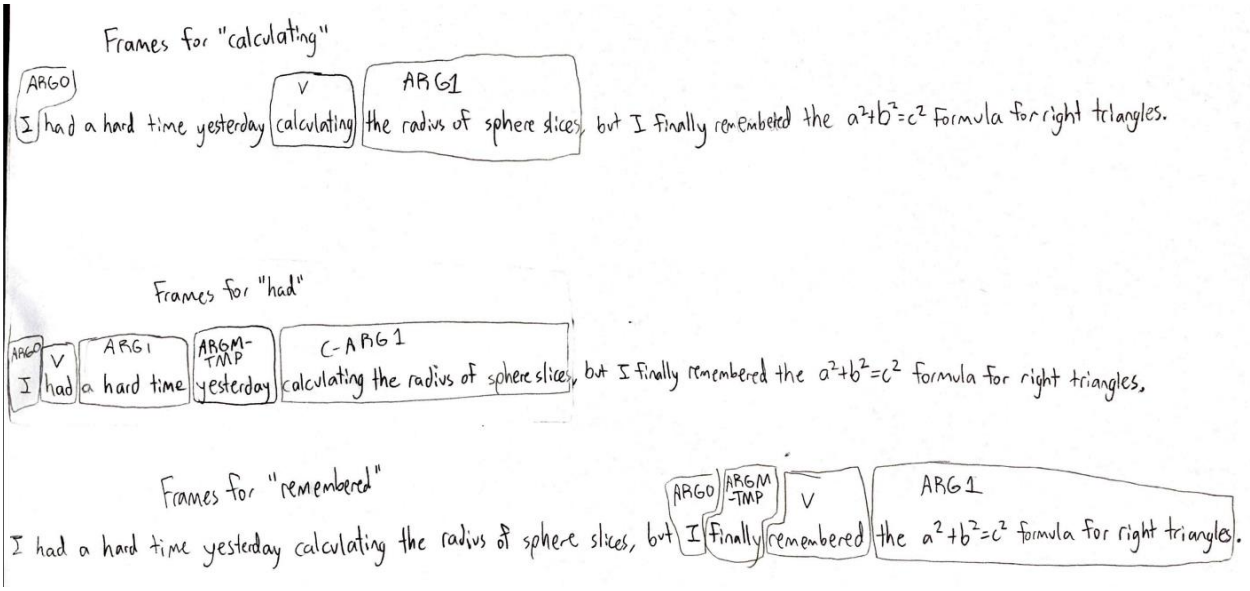
A dependency parse produces an acyclic graph that demonstrates relationships between words. The creation of this particular graph was aided by AllenNLP. The parse generated by AllenNLP incorrectly identified a few of the sentence components, attributing the closing punctuation as a modifier instead of punctuation.

Here are dependency relations depicted in the graph:

AMOD: adjectival modifier, modifies meaning of noun phrase
DEP: dependent (unable to determine a more precise dependency relation)

DET: determiner, relation of the head of a noun phrase and the rest of the phrase
DOBJ: direct object; noun phrase that is the accusative object of a verb
NN: noun compound modifier, modifies the head noun
NSUBJ: nominal subject; syntactic subject of a clause
POBJ: object of a preposition
PREP: prepositional modifier; modifies meaning of a verb, adjective, noun, or preposition
PUNCT: punctuation

Semantic Role Label (SRL) Parse



The SRL parse labels parts of a sentence to extract semantics, such as identifying ‘who did what to whom’.

Here are the parts identified in this parse:
ARG0: the agent doing something (actor of verb)
ARG1: the agent receiving the action of a verb
ARGM-TMP: a modifier representing a time when a verb took place
C-ARG1: predicate modifying ARG1
V: verb

Conclusion

The PSG parse breaks a sentence into different phrases. It considers parts of speech syntactically and could be useful as a mid-level analysis for other analysis techniques, but it does not consider semantics of the sentence. The dependency parse generates semantic relationships between words but is difficult to interpret into useful information about a sentence. Furthermore, the dependency parse used to test the parsing failed to correctly identify the role of all the tokens given. The SRL parse labels parts of the sentence with action, actor, and modification labels in a pure semantic labeling scheme. It doesn’t consider the parts of speech in the final result but is straightforward for higher level processing.