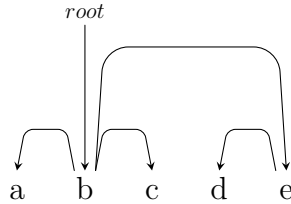


4 Formal Models of Language (pjb48)

The string ‘a b c d e’ has the following dependency parse:



The table shows the first two actions when deriving this parse using a modified shift-reduce parser which uses the actions: SHIFT, RIGHT-ARC and LEFT-ARC.

| STACK | BUFFER | ACTION |
|-------|--------|--------|
| | abcde | SHIFT |
| a | bcde | SHIFT |
| ab | cde | |

- (a) Describe the actions SHIFT, RIGHT-ARC and LEFT-ARC in terms of their effect on the stack and buffer. Also describe any arcs that are recorded when the actions are used. [5 marks]
- (b) The parser also uses the action TERMINATE which links a lone item on the stack to *root*. Complete the parse action table such that the actions derive the parse shown at the top of the page. [6 marks]
- (c) In Part (b) you have selected the parse actions by hand; explain how the sequence of parse actions is obtained from data in an automatic parser. [4 marks]
- (d) The dependency parse for the string ‘a b c d e’ is homomorphic with the English language string ‘Alice shook up the potion’. An alternative word order for this string is ‘Alice shook the potion up’.
 - (i) Draw the dependency parse for the alternative string. [1 mark]
 - (ii) Compare capturing natural language alternations using a context-free grammar as opposed to a dependency grammar. [4 marks]