1a.

|  |  |  |  |
| --- | --- | --- | --- |
| Stack | Buffer | New Dependency | Transition |
| [ROOT] | [Nadia, rode, the, old, donkey, with, dexterity] |  | Initial Config |
| [ROOT, Nadia] | [rode, the, old, donkey, with, dexterity] |  | SHIFT |
| [ROOT, Nadia, rode] | [the, old, donkey, with, dexterity] |  | SHIFT |
| [ROOT, rode] | [the, old, donkey, with, dexterity] | rode –nsubj-> Nadia | LEFT-ARC |
| [ROOT, rode, the] | [old, donkey, with, dexterity] |  | SHIFT |
| [ROOT, rode, the, old] | [donkey, with, dexterity] |  | SHIFT |
| [ROOT, rode, the, old, donkey] | [with, dexterity] |  | SHIFT |
| [ROOT, rode, the, donkey] | [with, dexterity] | donkey –amod-> old | LEFT-ARC |
| [ROOT, rode, donkey] | [with, dexterity] | donkey –det-> the | LEFT-ARC |
| [ROOT, rode] | [with, dexterity] | rode –dobj-> donkey | RIGHT-ARC |
| [ROOT, rode, with] | [dexterity] |  | SHIFT |
| [ROOT, rode, with, dexterity] |  |  | SHIFT |
| [ROOT, rode, with] |  | with –pobj-> dexterity | RIGHT-ARC |
| [ROOT, rode] |  | rode –prep-> with | RIGHT-ARC |
| [ROOT] |  | ROOT-root -> rode | RIGHT-ARC |

1b. the number of steps it will take is 2n + 1. For each word in the sentence, it will take one step to add the word to the stack and one step to remove the word from the stack. The added 1 is for initializing the commit.

1c. The reason can be shown using the example that is given.

|  |  |  |  |
| --- | --- | --- | --- |
| Stack | Buffer | New Dependency | Transition |
| [ROOT] | [John, saw, a dog, yesterday, which, was, a Yorkshire Terrier] |  | Init Config |
| [ROOT, John] | [saw, a dog, yesterday, which, was, a Yorkshire Terrier] |  | SHIFT |
| [ROOT, John, saw] | [a dog, yesterday, which, was, a Yorkshire Terrier] |  | SHIFT |
| [ROOT, saw] | [a dog, yesterday, which, was, a Yorkshire Terrier] | saw –nsubj-> John | LEFT-ARC |
| [ROOT, saw, a dog] | [yesterday, which, was, a Yorkshire Terrier] |  | SHIFT |
| [ROOT, saw, a dog, yesterday] | [which, was, a Yorkshire Terrier] |  | SHIFT |
| [ROOT, saw, a dog, yesterday, which] | [was, a Yorkshire Terrier] |  | SHIFT |
| [ROOT, saw, a dog, yesterday, which, was] | [a Yorkshire Terrier] |  | SHIFT |
| [ROOT, saw, a dog, yesterday, was] | [a Yorkshire Terrier] | was –nsubj-> which | LEFT-ARC |
| [ROOT, saw, a dog, yesterday, was, a Yorkshire Terrier] | [] |  | SHIFT |
| [ROOT, saw, a dog, yesterday, was] | [] | was –attr-> a Yorkshire Terrier | RIGHT-ARC |

From here you see the error. There should be a RIGHT-ARC from “a dog” to “which” and “saw” to “yesterday”. However, that cannot happen because neither the two sets are directly adjacent to each other in the stack. As such the program becomes stuck.

An attempt to fix this might be to backtrack to “a dog” and RIGHT-ARC instead of SHIFT.

|  |  |  |  |
| --- | --- | --- | --- |
| [ROOT, John, saw] | [a dog, yesterday, which, was, a Yorkshire Terrier] |  | SHIFT |
| [ROOT, saw] | [a dog, yesterday, which, was, a Yorkshire Terrier] | saw –nsubj-> John | LEFT-ARC |
| [ROOT, saw, a dog] | [yesterday, which, was, a Yorkshire Terrier] |  | SHIFT |
| [ROOT, saw] | [yesterday, which, was, a Yorkshire Terrier] | saw –dobj-> a dog | RIGHT-ARC |
| [ROOT, saw, yesterday] | [which, was, a Yorkshire Terrier] |  | SHIFT |
| [ROOT, saw] | [which, was, a Yorkshire Terrier] | saw –npadvmod-> yesterday | RIGHT-ARC |

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However, by doing so “a dog” gets taken out of the stack and now cannot have a RIGHT-ARC to “was”.