Assignment Week 8&9

Saturday, April 30, 2022 3:23 PM

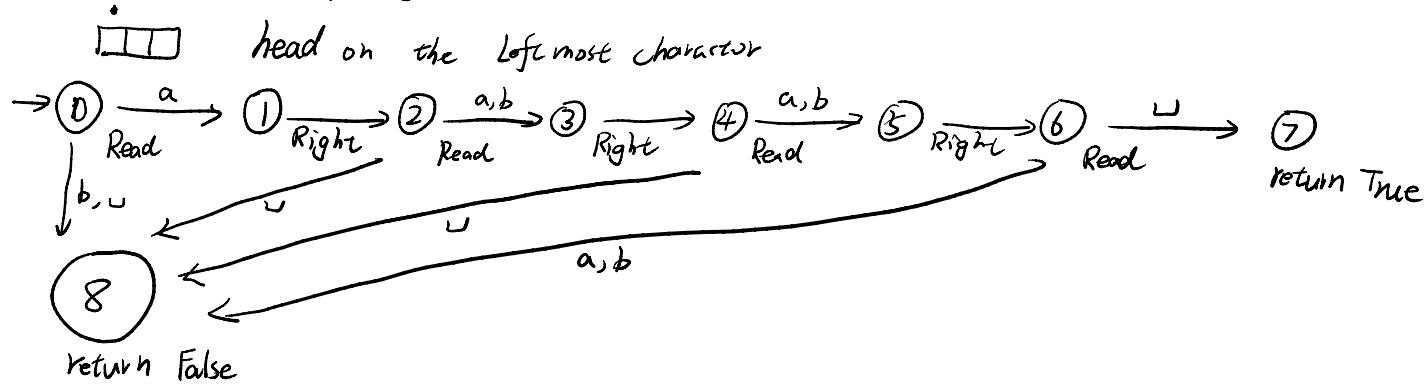
This exercise is about context free grammars on the alphabet $\Sigma = \{a, b\}$. You may use the following facts that were mentioned in Week 3.

- Whether a given CFG accepts a given word is decidable.
- Whether the language of a given CFG is empty is decidable.
- Whether the language of a given CFG is Σ^* is undecidable.

Say that a CFG is *red* when it accepts every word of length 3 that begins with a, and *extremely red* when it accepts every word that begins with a.

1. Is redness decidable? Is it semidecidable? Explain your answer. **[3 marks]**

Redness is decidable when there is a Turing machine that, when excuted on a tape containing just a word w with the head on the leftmost charactor, terminates by returning True if w begin with a with length 3 and False otherwise.
It is semidecidable. Any property that is decidable must be semidecidable



2. Is extreme redness decidable? Is it semidecidable? Explain your answer. (Hint: you may find it helpful to think about the negation of this property.) **[3 marks]**

Redness is decidable when there is a Turing machine that, when excuted on a tape containing just a word w with the head on the leftmost charactor, terminates by returning True if w begin with a and False otherwise.
It is semidecidable. Any property that is decidable must be semidecidable