Homework 4: Unit 1 Reflection and CFG Warmup

CSCI 161

Due 9pm, Friday, October 16, 2020

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Overview. This week's homework will be a quick turnaround but is also an easy opportunity to improve your homework grade. The first question (graded on completion only) is a relatively freeform reflection on how the course is going so far, and the second asks you to describe rules for a simple context-free grammar based on Wednesday's content. The extra credit question is an optional way to turn early practice with CFGs into homework points. As usual, turn in a modified version of this tex file with the associated compiled pdf for 5% extra credit. Recommend reading: Section 2.1 through Designing CFGs.

Question 0. What collaboration if any did you use for Q2 and the extra credit?

Question 1. (8pts) Spend a few minutes thinking about how you feel Unit 1 went in terms the effectiveness of your study strategies and your eventual comprehension of the material. What's a new strategy that you should **start** trying? What is something ineffective you've tried that you should **stop** doing? What's something that's working well that you should **continue**? Think about how use of class time, homework problems, and other aspects of test prep are and are not helpful for you. What are some suggestions you have for me to start, stop, or continue?

Question 2. (2pts) Give a CFG whose language is the set of of even-length palindromic binary strings:

$$\left\{ww^{\mathcal{R}} \mid w \in \{0,1\}^n, n \geq 0\right\}.$$

This can be done with a modification to the grammar $S \to 0S1 \mid \epsilon$, which we discussed on Wednesday for generating the language $\{0^n1^n \mid n \geq 0\}$. The first rule takes a seed S and expands it by producing a 0 on the left and a matching 1 on the right. The second rule allows expansion to stop by replacing the seed with the empty string. Palindromic binary strings can be generated similarly with a single variable associated with (different) expansion rules and a stopping rule.

Extra credit. (2pts) Give a CFG that recognizes all palindromic binary strings (of even or odd length):

$$\left\{ww^{\mathcal{R}} \mid w \in \{0,1\}^n, n \geq 0\right\} \cup \left\{wbw^{\mathcal{R}} \mid b \in \{0,1\}, w \in \{0,1\}^n, n \geq 0\right\}.$$

Extra practice. (0pts) Give a CFG for a language we will discuss in Wednesday's class:

$$\left\{a^ib^jc^k \mid i,j,k \geq 0, i = j \text{ or } i = k\right\}$$