CS580 Homework 8

Fall 2024

October 16, 2024

(Due 4:10pm, October 23, 2024)

Email homework assignments to ldojcsak@vols.utk.edu by the beginning of class time.

1. Use Ogden's lemma to show that the following language is not context-free. Hint: Try a string of the form $a^n b^n c^{n!+n}$.

$$L = \{a^j b^j c^k \mid j \neq k\}$$

2. For each of the following languages, construct a deterministic TM to recognize the language.

   a. $L = \{\ a^{2^i} \mid i \geq 1\}$

   b. $L = \{w \in (a+b+c)^* \mid w$ does not contain abc as a substring$\}$

   c. $L = \{\ a^i b^{i+1} c^{i+2} \mid i \geq 1\}$

   Instructions: Turing machines should be in the format required for the TM simulator at `https://www.inf.u-szeged.hu/~zlnemeth/TM2/tm_source/tmdoc.html`. The website has instructions for the format and an example at the end, and more examples come with the simulator. The installation instructions are outdated so here are the simplified instructions. After installation, the website's instructions for using the simulator are good.

   - Download and unpack the tar or zip file from the website.
   - Navigate to the "classes" directory in a terminal or DOS window.
   - Type "java TM" for the interactive program, or "java Grader" for the testing program.

   Requirements:

   - You should set the number of tapes to 1, the number of tracks to 1, and use a 1-way infinite tape.
   - Please put each TM in a separate text file. Name each file ⟨your last name⟩_⟨problem number⟩.txt in all lowercase (e.g. "smith_1a.txt").