CIT 596 Recitation, Week 5

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Usage of Pumping Lemma

Jean Gallier says in his Notes:

> *"In order to show that the pumping lemma is contradicted, one needs to show that for some DFA D, for every $m \geq 1$, there is some string $w \in L(D)$ of length at least m, such that for every possible decomposition $w = uxv$ satisfying the constraints $x \neq \epsilon$ and $|ux| \leq m$, there is some $i \geq 0$ such that $ux^i v \notin L(D)$."*

[Exercise] @sipser13 [p. 88-91] exercise 1.29, exercise 1.46, exercise 1.49, exercise 1.54

Determine if the following language is regular or not.

- $\{0^n 1^n 2^n | n \geq 0\}$
- $\{a^{2^n} | n \geq 0\}$
- $\{0^m 1^n | m \neq n\}$
- $\{1^k y | y \in \{0,1\}^*$ and y contains at most k 1s, for $k \geq 1\}$
- $\{a^i b^j c^k | i, j, k \geq 0$ and if $i = 1$ then $j = k\}$

[Exercise] @sipser13 [p. 90] exercise 1.45

- Let $A/B = \{w | wx \in A \text{ for some } x \in B\}$. Show that if A is regular and B is any language, then A/B is regular.