CompSci 162
Spring 2023 Lecture 6:
~~Closures and~~ Infinite Regular Languages

Questions 28 and 29

How to tell if regular language L is *infinite*?

Look at DFA; $n = \#$ states

$w \in L$ and $|w| > n$?

Some vertex repeated

strings len $\geq p$ can be "pumped"

$xy^iz \in L$ all $i \geq 0$

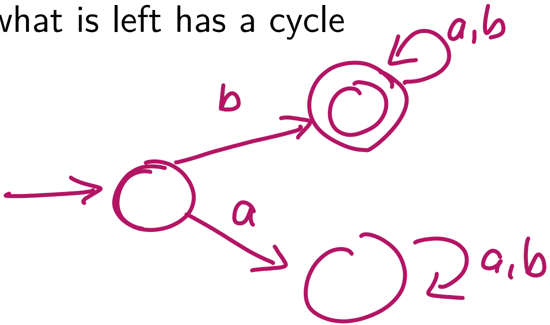
$w = xyz$

$xyyz \in L$ also

$xz \in L$

Determining a regular language is infinite

- Eliminate states not reachable from start
- Eliminate states that cannot reach an accept
- Test if what is left has a cycle



Qs 30 & 31: The Pumping Lemma

For every regular language L

- There is an $n \in \mathbb{N}$ such that
  - for every string $w \in L$ with $|w| \geq n$
    We can write $w = xyz$ such that:
    1. $|xy| \leq n$
    2. $|y| > 0$
    3. For all $i \geq 0, xy^i z \in L$

$\{a^n b^n \mid n \geq 1, n \in \mathbb{N}\}$ is **not** regular.

Applying the pumping lemma

$L = \{a^n b^n \mid n \geq 1, n \in \mathbb{N}\}$ is **not** regular.

FSOC suppose L is regular.

Let p be the pumping length.

$w = a^p b^p \in L$ and $|w| \geq p$

By Pumping Lemma, we can write $w = xyz$.

w/ $|xy| \leq p$ and $|y| > 0$ and $\forall i \; xy^i z \in L$

So $xyyz \in L$

x, y only a.

z is maybe as, plus all bs

But that means $xyyz$ is $a^{p+|y|} b^p \notin L$

Supplemental #1

no. Give a specific

$\cancel{w = \{a,b\}^p}$

$L_1 = \{ww | w \in \{a, b\}^*\}$

$w = a^p b a^p b \in L$

$|xy| \le p$ $|y| > 0$ Tell me about y. It is a^t.

$x : a^*$

Tell me about $xyyz$

$a^{|p| + |y|} b a^p b \notin L. \rightarrow\leftarrow$

Supplemental #2

$$L_2 = \{a^{n^2} | n \geq 0\}$$

attempt over weekend.
We'll discuss Monday.

Supplemental #3

$$L_3 = \{a^i b^k | i > k\}$$

See last slide.