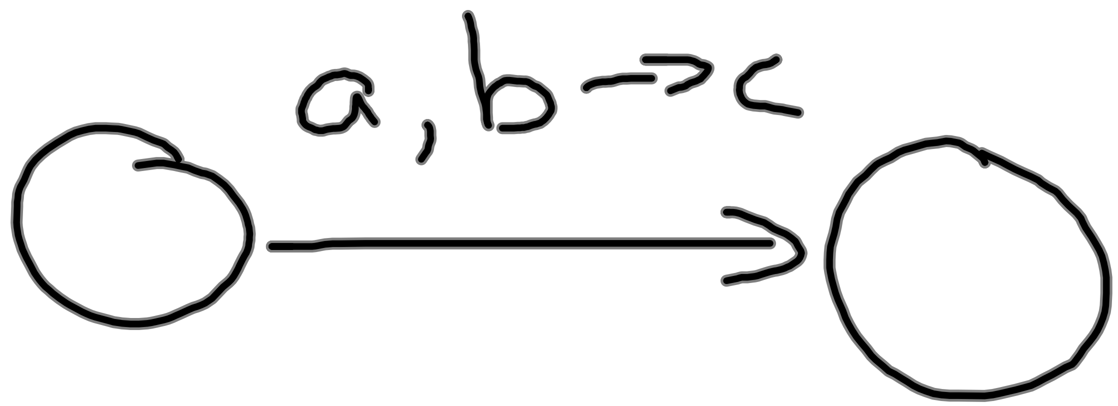
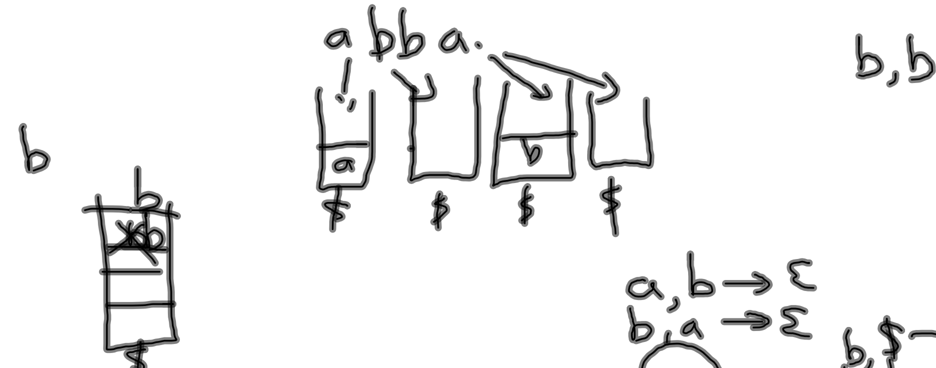
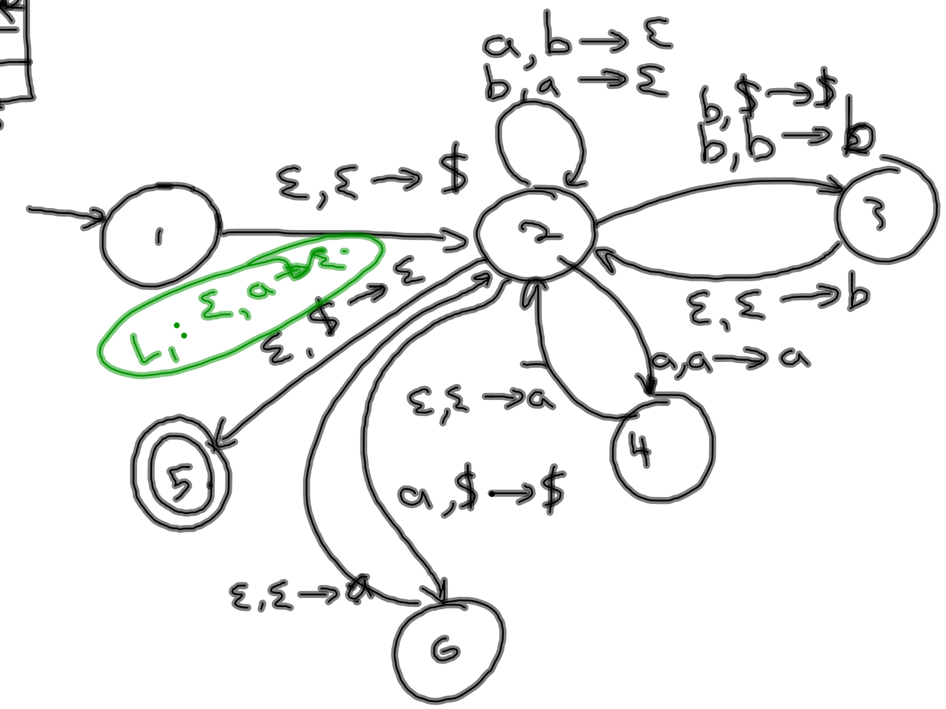

a, b->c

$L_1 = \{ w \mid w$ has more a's than b's $w \in \{a,b\}^* \}$

$L_2 = \{ w \mid w \in \{a,b\}^*$ w has the same number of a's as b's $\}$

- stack:





Pumping Lemma for CFL-s.

$$V \overset{*}{\Rightarrow} uVw$$ u,w: strings of vars and terms.

$$\overset{*}{\Rightarrow} uuVww$$

If A is a context free language, then there is a number p (the pumping length) where, if $s \in A$ of length at least p, then s may be divided into 5 pieces,

$s = uvxyz$ satisfying the conditions:

1. for each $i \geq 0$ $uv^ixy^iz \in A$
2. $|vy| > 0$
3. $|vxy| \leq p$

$L = \{a^n b^n c^n \mid n \geq 0\}$ is not a CFL.

Proof by contradiction

Suppose L is context free.

Let p be the pumping length

Choose a string $s = a^p b^p c^p$.

So s can be split into 5 pieces, $s = uvxyz$ according to the pumping lemma, because $s \in L$ and $|s| \geq p$.

Since $|vxy| \leq p$, there can be at most 2 symbols in vxy.

Therefore uv^2xy^2z would have more of one or two symbols than the third so $uv^2xy^2z \notin L$, which is a contradiction.

$\therefore L$ is not a CFL.