Decision problems about regular languages:

What can you write a computer program to tell you about the reg. lang given a regular language as input

Input: A complete description of a DFA (or an NFA, or a reg. exp, or a right linear grammar)

We can write a program that

a) Tells you if the language has any strings at all.

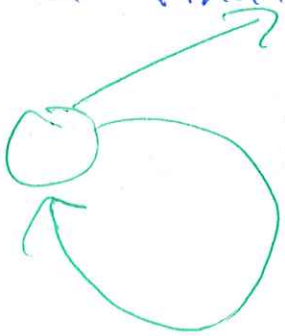
How- check if you can get to a final state from an initial state.

b) Tells you if the language is every string on the alphabet.

By checking that every reachable state is final.

c) Tells if the language is finite or infinite.

By checking if DFA has a loop that can reach a final state and is reachable from an init. state.



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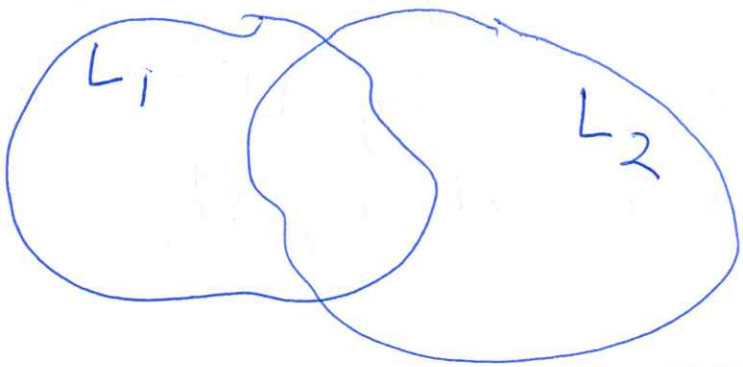
d) Tells if 2 languages are the same.



L_1 and L_2 are the same if

$L_1 \cap \overline{L_2} = \emptyset$

and $L_2 \cap \overline{L_1} = \emptyset$

So we can "build" the DFA for $L_1 \cap \overline{L_2}$ and for $L_2 \cap \overline{L_1}$ ~~and see~~ (we showed how to do this Friday) and use (a).

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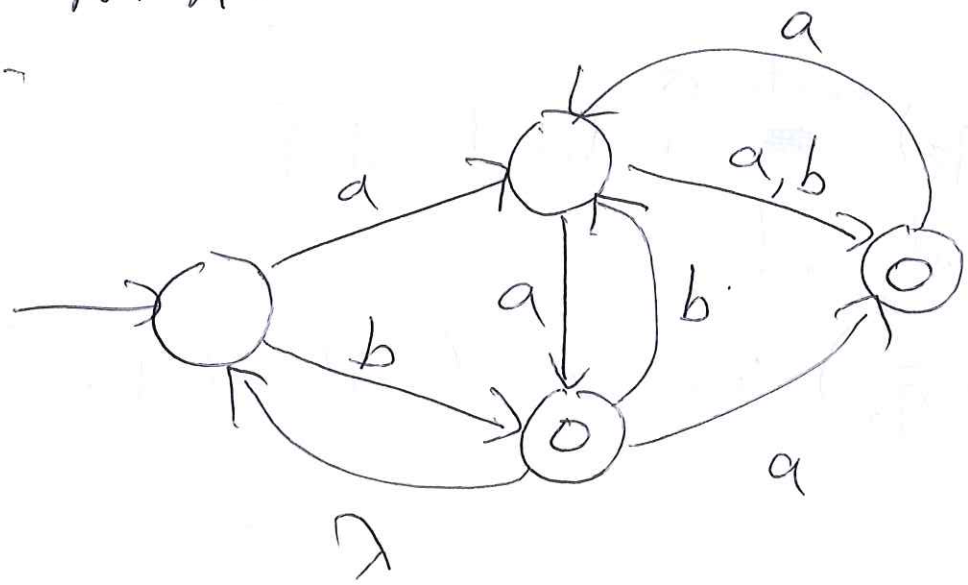
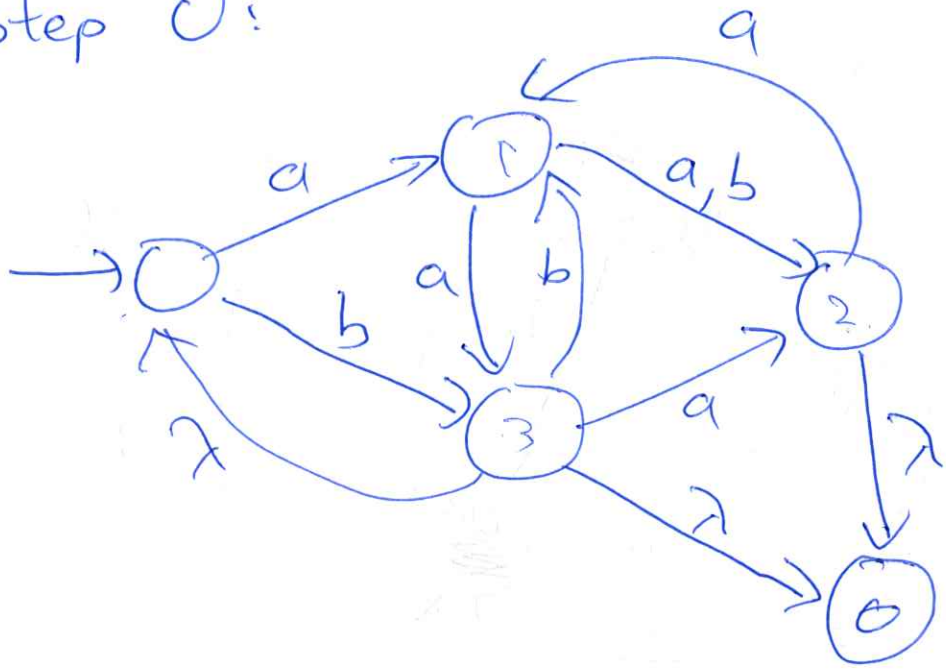
e) Tells you if the language contains the string "abba".

Just run DFA on "abba".

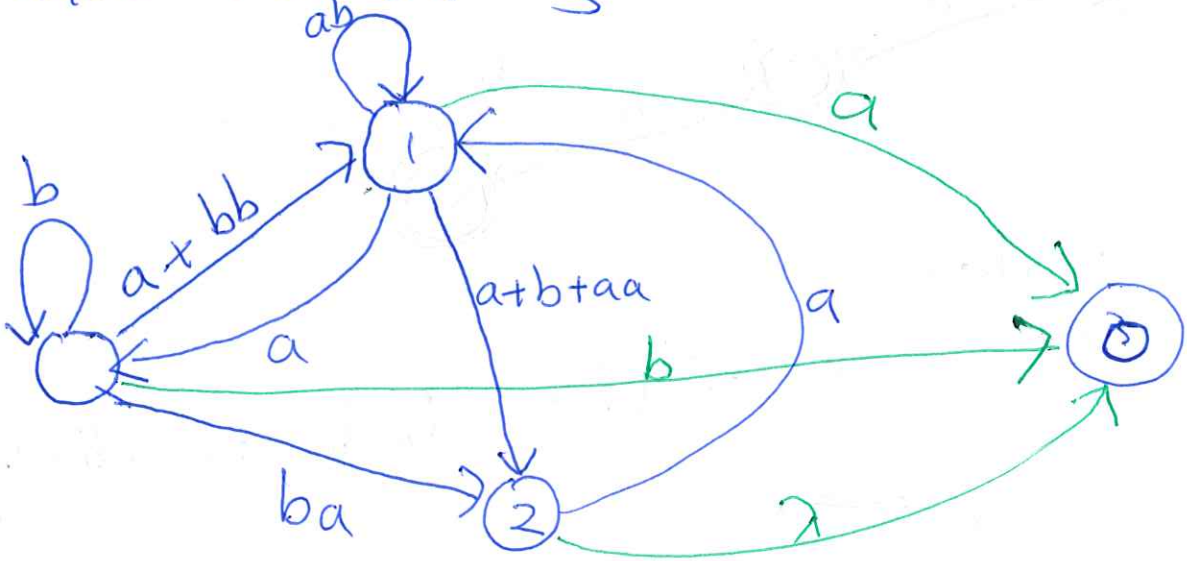
Example of getting a reg exp from an NFA:



Step 0:

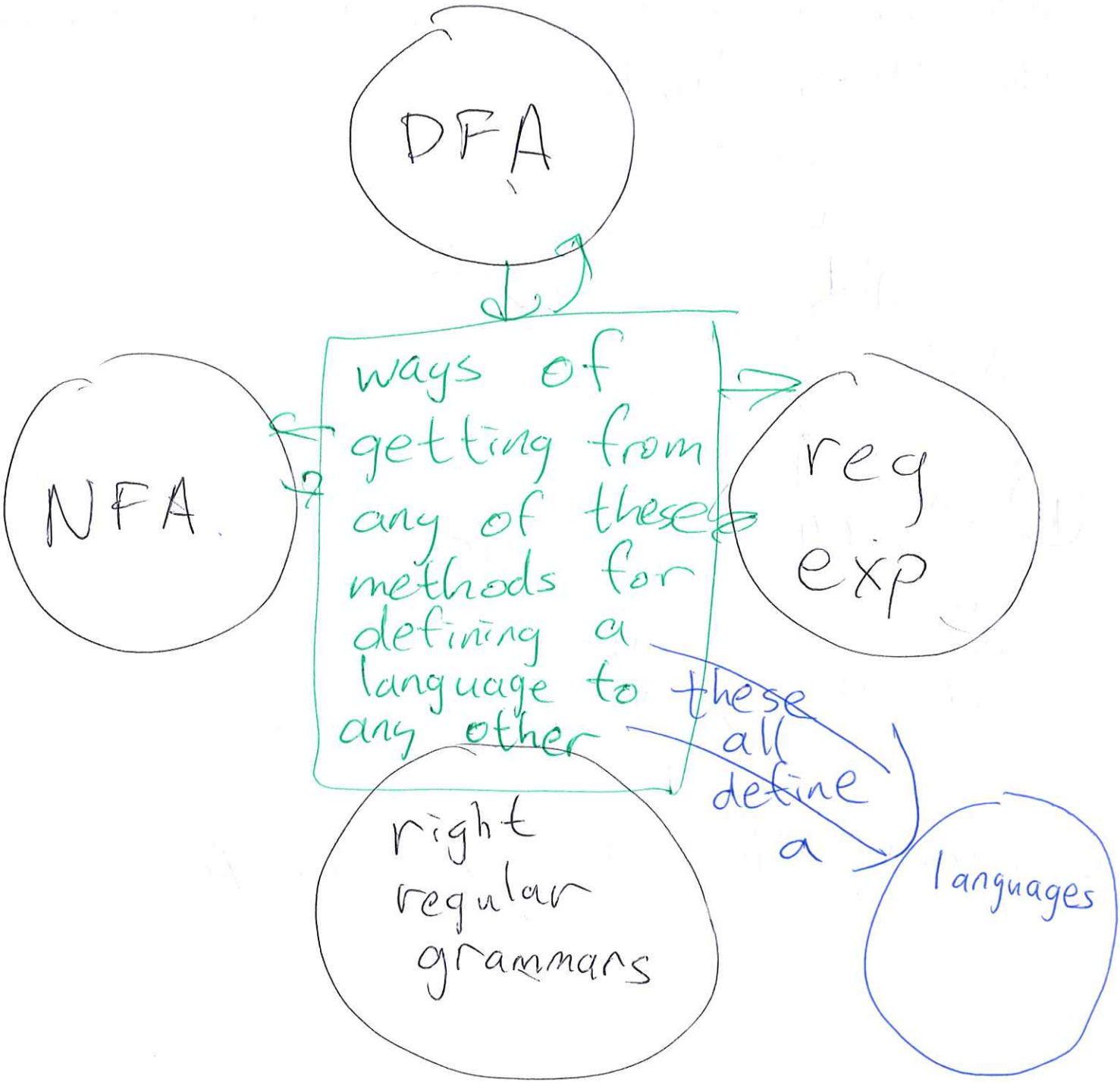


Get rid of 3



We can get rid of more states, but we don't feel like it right now.

Quick overview of first several weeks



Kinds of objects:

letters
strings
languages - sets of strings
DFAs/NFAs/reg. exp/grammars/

From a DFA, we get a language - the set of all the strings it accepts