It is a group assignment. Each group consists of 7-8 students.

Common task for all groups:

Download jflap from address www.jflap.org/
Install the software following this direction

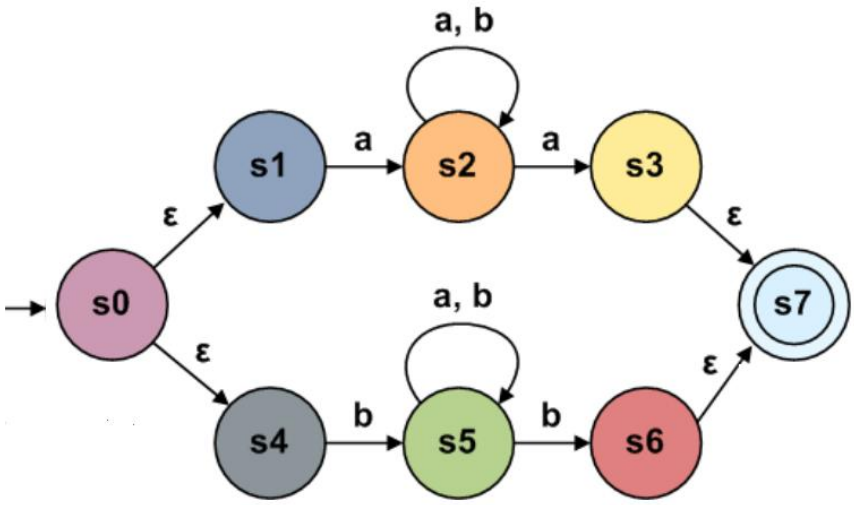
https://www.youtube.com/watch?v=-KNnBBUPX2k

https://www.youtube.com/watch?v=4UDWyW5m73I

Group 1

1/Overview of DFA, NFA

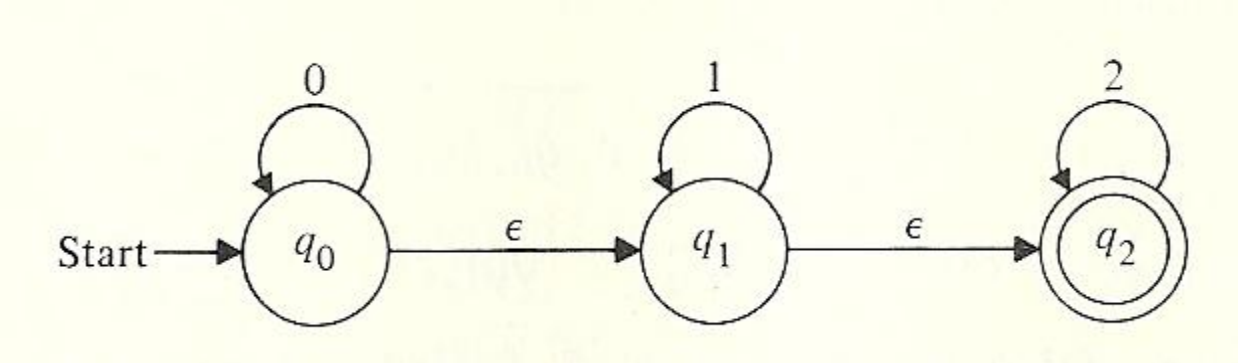
2/ Create the following NFA N1 using Jflap



3/Test NFA on strings: abaabba and abbbbb

4/Explain why a string is/is not accepted by N1

5/Convert the following NFA N2 to the equivalent DFA D2



6/Test DFA D2 on the strings 0112 and 01201

7/ Save DFA D2 to a file. Describe how jflap stores the set of states and distinguishes the set of final states

8/ Show the difference between the file of NFA N1 and the file of DFA D2

Videos:

https://www.youtube.com/watch?v=e0jHJOdR3cw

https://www.youtube.com/watch?v=f54ISUVE0p0&list=PLeaAjeNjt7tTAH3LvvMVeR_rOVOgLLx6D&index=4

Group 2

1/Overview the pumping lemma for regular languages and context free languages. Script of Jflap

Use the pumping lemma for regular languages to prove that the following languages **are not regular**

2/ $\{a^n \mid n \text{ is a prime number}\}$

3/$\{(ab)^n a^k \mid n > k, k \geq 0\}$

Use the pumping lemma for regular languages to prove that the following languages **are not context free**

4/ $\{a^n b^n c^n \mid n \geq 1\}$

5/ $\{ww \mid w \in \{0,1\}^*\}$

6/ $\{a^m \mid m$ is a proper square of an integer$\}$

7/ Is it possible to prove that a new language (not in the list of jflap) is not regular?

Videos:

https://www.jflap.org/tutorial/pumpinglemma/regular/index.html

https://www.jflap.org/tutorial/pumpinglemma/context_free/index.html

https://www.youtube.com/watch?v=IsNOCTyymTI

Group 3

1/ Overview of Regular expression

2/ Enter regular expression (a + b) * aaa (a + b) * and 01(0+1)*()

3/ What kind of syntax errors does jflap detect in a regular expression syntax?

4/ Convert the regular expression a(a+b)* to the equivalent NFA by using the algorithm in my slides.

5/ Convert the regular expression a(a+b)* to their equivalent NFA using jflap. Compare with the result of 4/

6/ Convert the regular expression a^*b^+ to their equivalent DFA:

7/ Save a received NFA of 5/ to a file. Describe how jflap stores the set states and the ε-transitions of the NFA?

Group 4:

1/ Overview of context free grammars.

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Given the context free grammar G with the following set of productions:

S → aB | bA

A → a | aS | bAA

B → b | bS | aBB

Use jflap to

2 Enter productions of G

3/ Draw a parse tree for string aaabbabbba

4/ Prove that G is ambiguous

5/ Convert G to Chomsky Normal Form (CNF). Name the result grammar G1

6/ Check if string aaabbabbba is generated by G1

8/ Remove λ(epsilon) from the following grammar:

S->XYX

X->0X| λ

Y->1Y| λ

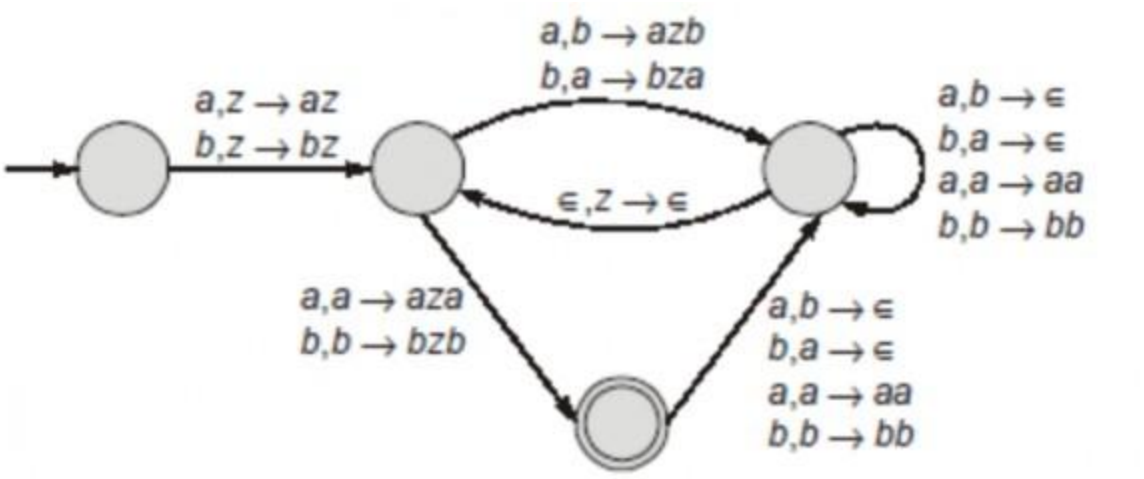
Notice: Video for creating a grammar and testing on strings

https://www.youtube.com/watch?v=GPG1-s7HJmU&index=11&list=PLeaAjeNjt7tTAH3LvvMVeR_rOVOgLLx6D

Group 5:

1/ Overview of PDA and the equivalence of PDA and CFG

Given the PDA P



2/Write the computation of the PDA with string aababaa without using Jflap

3/ Create the PDA using jflap and test with string aababaa

3/ Give an example of a string over {a, b} that is not accepted by P. Explain why?

4/ Save the PDA in a file and describe how it is stored

6/ Convert P to its equivalent grammar

7/ Convert Grammar G with the following production rules to its equivalent push down automaton.

S → aB | bA

A → a | aS | bAA

B → b | bS | aBB

8/ Show the computation of the PDA with string aaabbabbba

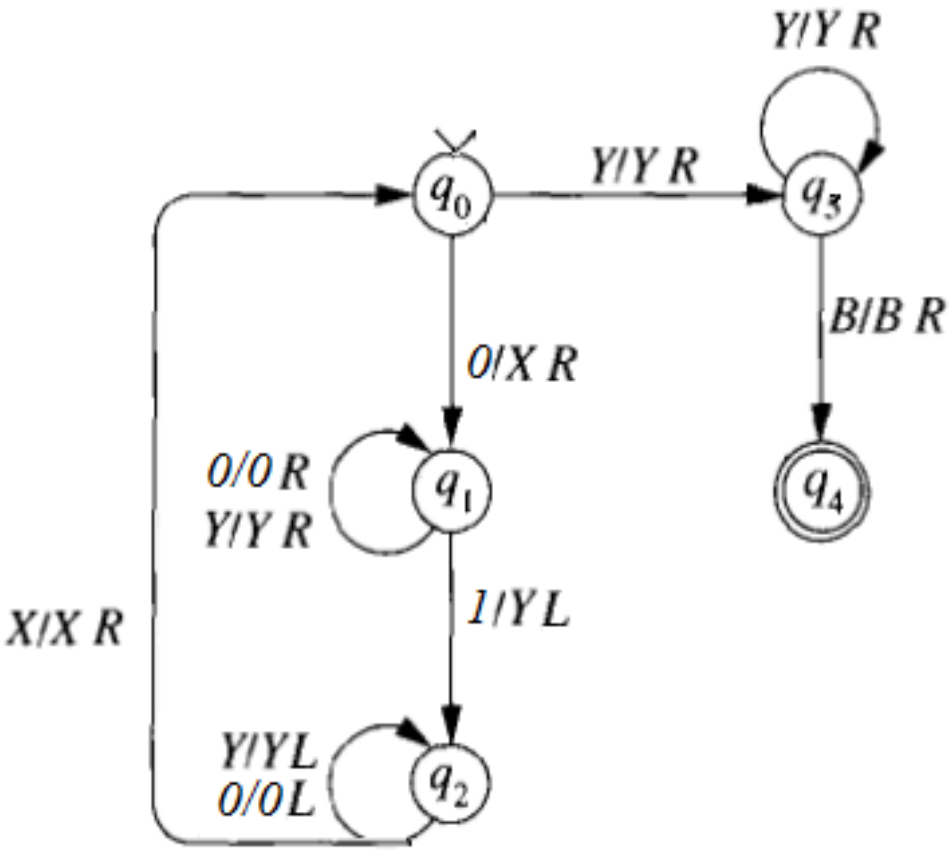
Video: Create a PDA

https://www.youtube.com/watch?v=rN-kjnCokwY

Group 6

1/ Overview of the model of Deterministic Turing machines and another variant: model of 2-tape Turing machines

Given a deterministic Turing Machine M:



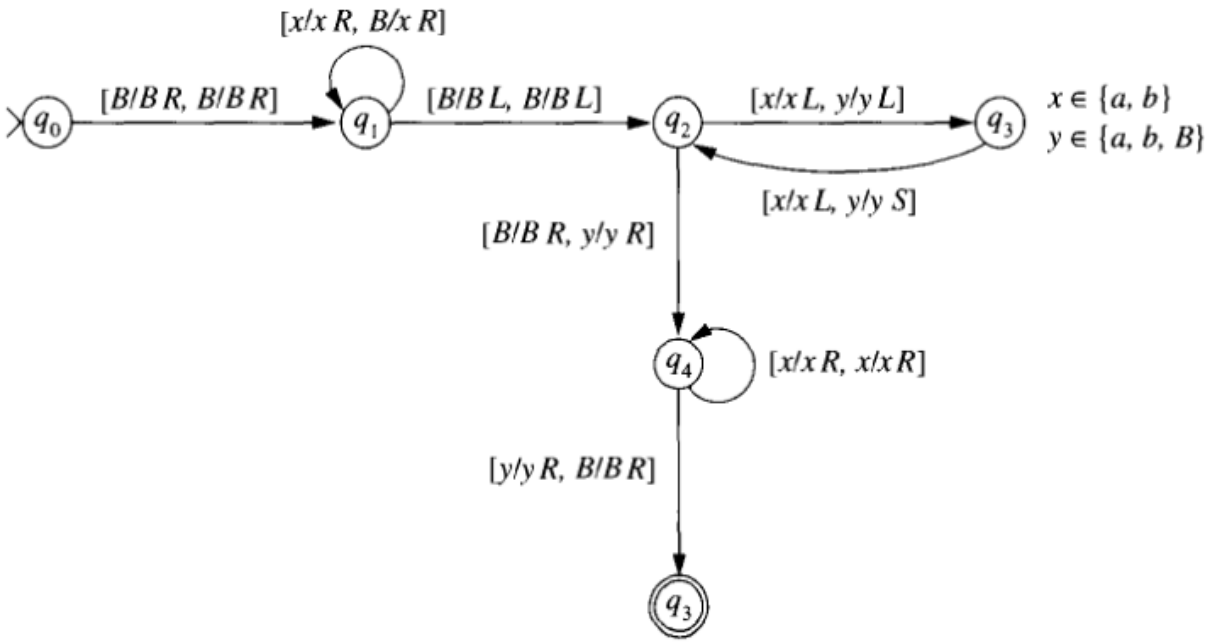
2/ Write the computation of M with string 000111 following my slides

3/ Use jflap to enter M and test with string 000111. Compare with the computations made manually.

4/ Give an example of a string over {a, b} that is not accepted by M. Explain why?

5/ Use jflap to enter the following 2-tape TM (named N)

6/Test N with string abababab



7/ Give an example of a string over {a, b}that is not accepted by N. Explain why?

8/Save the Turing machines to files. Distinguish between 1-tape Turing machine and 2-tape Turing machine in file.

Video: create a Turing machine and test on strings

https://www.youtube.com/watch?v=SA2o7UnYqbw&t=4192s