# Assignment 2

Name: Yun Ni
Student ID: 40179774

Q1: This program takes the user's input as states and alphabet symbols and converts the input into a Deterministic Finite Automaton (DFA) or Non-deterministic Finite Automaton (NFA) corresponding diagram.

1. The user is first prompted to indicate if the input he is going to enter is for DFA and NFA.
2. Then the user is asked to enter the alphabet, the states, indicate which state is start, as well as which state / states are final.
3. For each state entered by the user, the program creates a node in the diagram.
4. For each user's input, the program creates an appropriate edge in the diagram.
5. Then the diagram is output using the 'graphviz' module.

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Do you want to creat a diagram for DFA or NFA? Please type NFA or DFA.
NFA
Please enter the alphabet symbol and separated by white spaces.
0 1
Please enter the states separated by white spaces.
q0 q1 q2
Please enter the Start state out of the list you entered.
q0
Please enter the Final state or states out of the list you entered.
If there are several Final states, separate them by white spaces.
q2
Entering input for row ->q0:
Please enter an input for alphabetical symbol 0.
If there are several states for one cell, separate them by commas, do not use whitespace.
If there are no transiton states in the cell, indicate it by 0
q0,q1
Please enter an input for alphabetical symbol 1.
If there are several states for one cell, separate them by commas, do not use whitespace.
If there are no transiton states in the cell, indicate it by 0
q0
Entering input for row q1:
Please enter an input for alphabetical symbol 0.
If there are several states for one cell, separate them by commas, do not use whitespace.
If there are no transiton states in the cell, indicate it by 0
0
Please enter an input for alphabetical symbol 1.
If there are several states for one cell, separate them by commas, do not use whitespace.
If there are no transiton states in the cell, indicate it by 0
q2
Entering input for row *q2:
Please enter an input for alphabetical symbol 0.
If there are several states for one cell, separate them by commas, do not use whitespace.
If there are no transiton states in the cell, indicate it by 0
0
Please enter an input for alphabetical symbol 1.
If there are several states for one cell, separate them by commas, do not use whitespace.
If there are no transiton states in the cell, indicate it by 0
0
FA_diagram.gv.pdf
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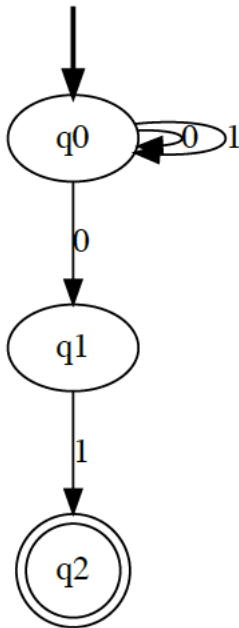
Q2: This program takes a text file as input and converts the input into a Non-deterministic Finite Automaton (NFA) table and then convert the NFA to corresponding DFA table in the output and generated a diagram.

1. Create a NFA instance object and create its own values like states, alphabets, final states, start states and transition functions.
2. The program takes the input by using text file, and read each line get the values of the NFA.
3. Create a DFA instance object and create its corresponding attributes.
4. Change NFA's transition to NFA transition dictionary, get its keys and values. Append the start states of DFA in a new list. (Because the start state should be the same for DFA and NFA)
5. Convert NFA transitions to DFA transitions by getting all of the DFA state (first state and length == 1) in the NFA transitions in the NFA transition dictionary and if there are new states for DFA, append it in the new list. Loop the alphabet in the DFA and if there has new state in the list, loop the states in NFA and get its value append in the list to create the new transition functions.
6. Convert NFA states to DFA states by using the key and value in the DFA dictionary.
7. Then the table of transition from NFA to DFA will present in the output and the diagram is output using the 'graphviz' module.

Below is the input NFA:
The alphabet is:
['0', '1']
The input states are:
['q0', 'q1', 'q2']
The Start state is:
['q0']
The Final state is:
['q2']
The Transition Function are:
[('q0', '0', 'q0'), ('q0', '0', 'q1'), ('q0', '1', 'q0'), ('q1', '1', 'q2')]

Below is DFA:
The alphabet is:
0 1
The new states are:
[('q0',), ('q0', 'q1'), ('q0', 'q2')]
The final state is:
('q0', 'q2')
The Start state is:
['q0']
The Transition Function are:
('q0',)0('q0', 'q1')
('q0',)1('q0',)
('q0', 'q1')0('q0', 'q1')
('q0', 'q1')1('q0', 'q2')
('q0', 'q2')0('q0', 'q1')
('q0', 'q2')1('q0',)
('q0',)0('q0', 'q1')
('q0',)1('q0',)
('q0', 'q1')0('q0', 'q1')
('q0', 'q1')1('q0', 'q2')
('q0', 'q2')0('q0', 'q1')
('q0', 'q2')1('q0',)

Another Transistion Function are:
('q0', '0', 'q1')
('q0', '1', 'q0')
('q1', '0', 'q1')
('q1', '1', 'q2')
('q2', '0', 'q1')
('q2', '1', 'q0')
In this transition, the final state is:
['q2']