

Research Document

Graph Theory

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1 Introduction

When I started this project I was confused on many aspects and failed to grasp them, but after watching several YouTube videos and all the recorded demonstrations given , I managed to slowly grasp the idea of the Thompson's Construction Algorithm.a machine which performs a range of functions according to a predetermined set of coded instructions

2 Project Problem

You must write a program in the Python programming language [2] that can build a non-deterministic finite automaton (NFA) from a regular expression, and can use the NFA to check if the regular expression matches any given string of text.

3 What is an automaton?

An automaton performs a range of functions according to a predetermined set of coded instructions. The language accepted by finite automata can be easily described by simple expressions called Regular Expressions. Regular expressions are used to match character combinations in strings.

4 '+' Operator

The '+' operator stands for One or more. It will accept one of the first inputted character and many of the next. Example : 'ca+r' matches 'car' and 'caaar', but not 'cr'.

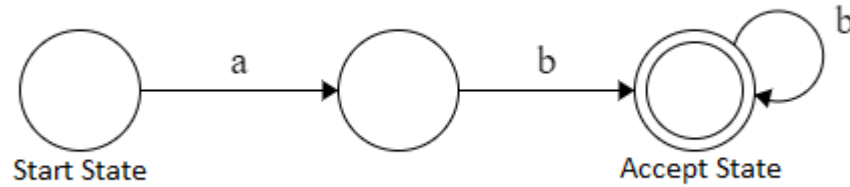


Figure 1: A drawn NFA of the + operator

5 OR Operator

If you want to search for something like cat or dog, separate both options with a vertical bar: cat|dog. If you want more options, simply expand the list : cat|dog|mouse|fish.

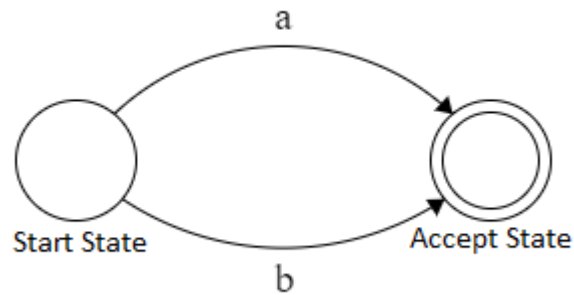


Figure 2: A drawn NFA of the OR operator

6 Concat Operator

The concat operator connects 2 fragments together For example 'a.b' would be true if 'ab' is entered

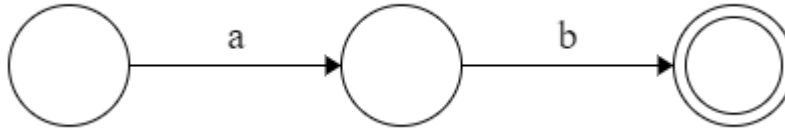


Figure 3: A drawn NFA of the Concat operator

7 Kleeney Operator

The Kleeney Star / * stands for 0,1 or more. For example 'a* : ' , 'a* : a ', 'a* : aaa ' would all be true

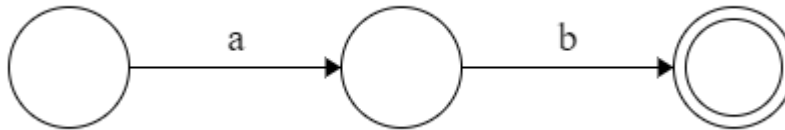


Figure 4: A drawn NFA of the Kleeney Star operator

8 '?' Operator

The '?' operator stands for 0 or 1.
For example 'a?' : ' ' or 'a' would be true but 'aa' would not.

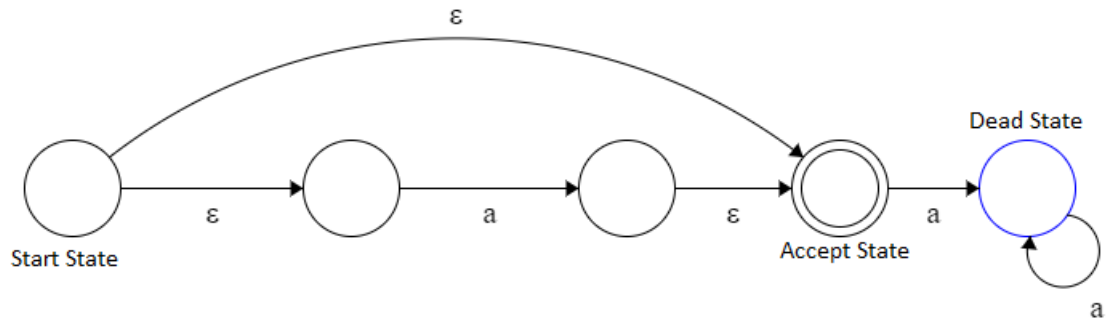


Figure 5: A drawn NFA of the '?' operator

9 References

Ian McLoughlin - Provided Notes and videos on Thompsons Construct
Made by Evan - Provided a Finite State Machine Designer to draw my automaton

10 Bibliography

Ian McLoughlin . *GMIT Lecturer*.
Check out his Github!