Arden's Theorem

The Arden's Theorem is useful for checking the equivalence of two regular expressions as well as in the conversion of DFA to a regular expression.

Let us see its use in the conversion of DFA to a regular expression.

Following algorithm is used to build the regular expression form given DFA.

1. Let q_1 be the initial state.

2. There are q_2, q_3, q_4 ....q_n number of states. The final state may be some q_j where j<= n.

3. Let α_{ji} represents the transition from q_j to q_i.

4. Calculate q_i such that

$$q_i = \alpha_{ji} * q_j$$

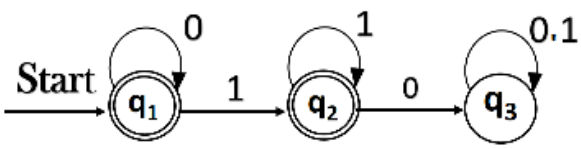
If q_j is a start state then we have:

$$q_i = \alpha_{ji} * q_j + \varepsilon$$

5. Similarly, compute the final state which ultimately gives the regular expression 'r'.

Example:

Construct the regular expression for the given DFA



Solution:

Let us write down the equations

```
q1 = q1 0 + ε
```

Since q1 is the start state, so ε will be added, and the input 0 is coming to q1 from q1 hence we write
State = source state of input × input coming to it

Similarly,

```
q2 = q1 1 + q2 1
q3 = q2 0 + q3 (0+1)
```

Since the final states are q1 and q2, we are interested in solving q1 and q2 only. Let us see q1 first

```
q1 =  q1 0 + ε
```

We can re-write it as

```
q1 = ε + q1 0
```

Which is similar to R = Q + RP, and gets reduced to R = OP*.

Assuming R = q1, Q = ε, P = 0

We get

```
q1 = ε.(0)*
q1 = 0*    (ε.R*= R*)
```

Substituting the value into q2, we will get

```
q2 = 0* 1 + q2 1
q2 = 0* 1 (1)*   (R = Q + RP  →  Q P*)
```

The regular expression is given by

$$r = q1 + q2$$
$$= 0^* + 0^* 1.1^*$$
$$r = 0^* + 0^* 1^+ \quad (1.1^* = 1^+)$$

← Prev Next →

Learn Latest Tutorials

Splunk tutorial
Splunk

SPSS tutorial
SPSS

Swagger tutorial
Swagger

T-SQL tutorial
Transact-SQL

Tumblr tutorial
Tumblr

React tutorial
ReactJS

Regex tutorial
Regex

Reinforcement learning tutorial
Reinforcement Learning

R Programming tutorial
R Programming

RxJS tutorial
RxJS

React Native tutorial
React Native

Python Design Patterns
Python Design Patterns

Python Pillow tutorial
Python Pillow

Python Turtle tutorial
Python Turtle

Keras tutorial
Keras

Preparation

Aptitude
Aptitude

Logical Reasoning
Reasoning

Verbal Ability
Verbal Ability

Interview Questions
Interview Questions

Company Interview Questions
Company Questions

Trending Technologies

Artificial Intelligence Tutorial

AWS Tutorial
AWS

Selenium tutorial
Selenium

Cloud Computing tutorial

Hadoop tutorial
Hadoop

Artificial Intelligence

Cloud Computing

ReactJS Tutorial

ReactJS

Data Science Tutorial

Data Science

Angular 7 Tutorial

Angular 7

Blockchain Tutorial

Blockchain

Git Tutorial

Git

Machine Learning Tutorial

Machine Learning

DevOps Tutorial

DevOps

B.Tech / MCA

DBMS tutorial

DBMS

Data Structures tutorial

Data Structures

DAA tutorial

DAA

Operating System tutorial

Operating System

Computer Network tutorial

Computer Network

Compiler Design tutorial

Compiler Design

Computer Organization and Architecture

Computer Organization

Discrete Mathematics Tutorial

Discrete Mathematics

Ethical Hacking Tutorial

Ethical Hacking

Computer Graphics Tutorial

Computer Graphics

Software Engineering Tutorial

Software Engineering

html tutorial

Web Technology

Cyber Security tutorial

Cyber Security

Automata Tutorial

Automata

C Language tutorial

C Programming

C++ tutorial

C++

Java tutorial

Java

.Net Framework tutorial

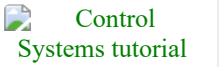
.Net

Python tutorial

Python

List of Programs

Programs



Control Systems tutorial

Control System

Data Mining Tutorial

Data Mining

Data Warehouse Tutorial

Data Warehouse