PA Introduction

Brandeis University
Ryan Marcus

February 24, 2015

Introduction

Generating DFA from whitelist

Minimization

Representing graphs

Questions

Introduction

Warning! Some text may be kind of small.
Get the slides here: `http://rmarcus.info/dfa.pdf`

Whitelist

Serena Lily Vanessa Jenny Blair

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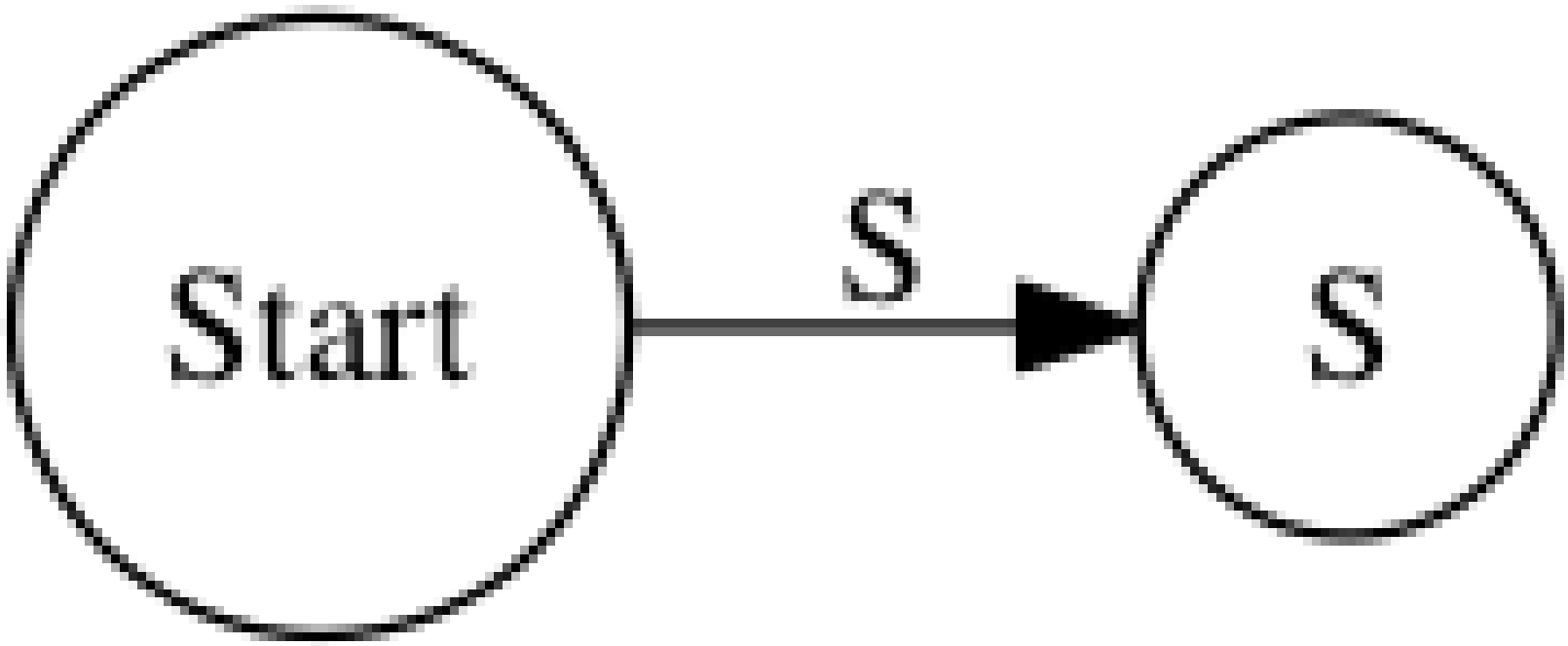

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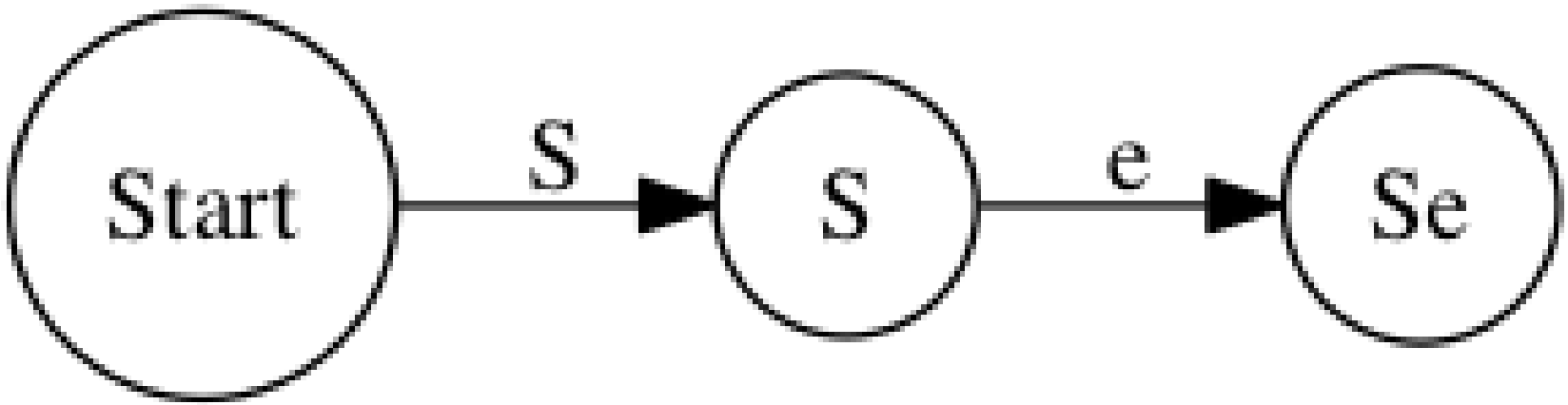

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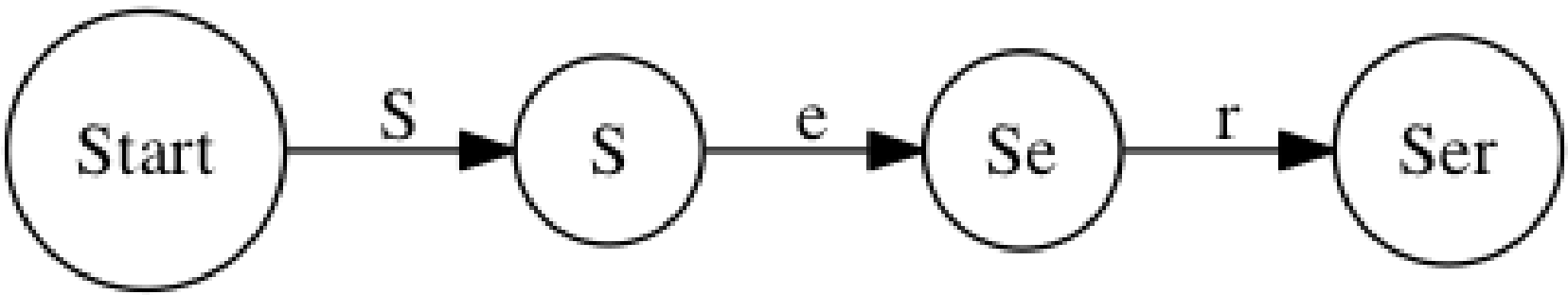

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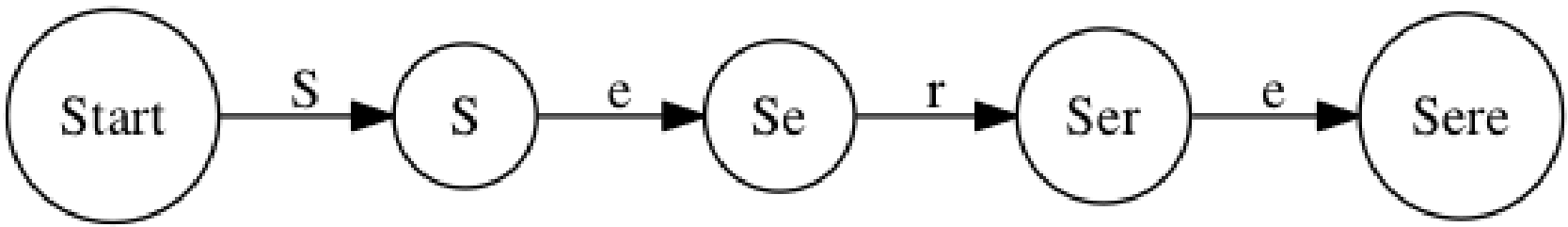

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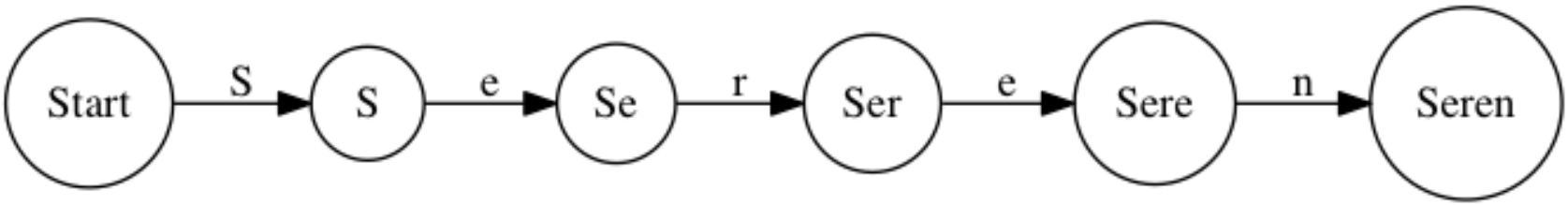

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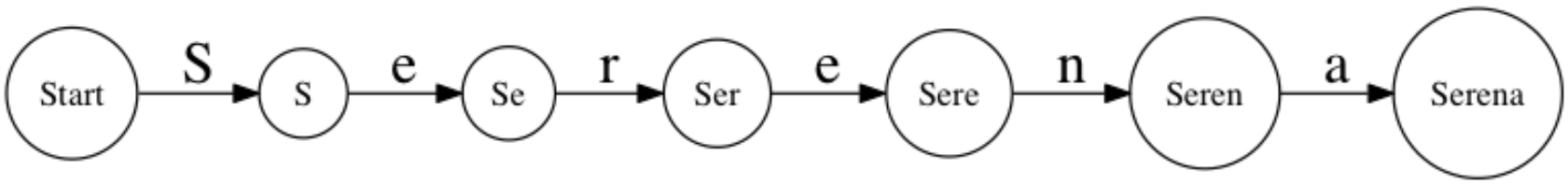

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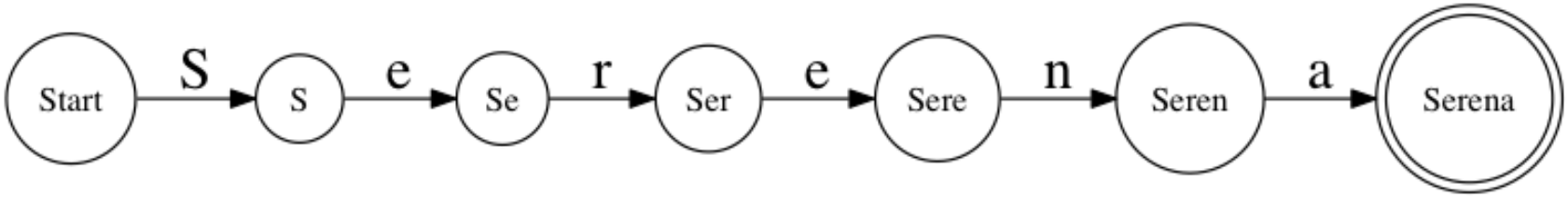

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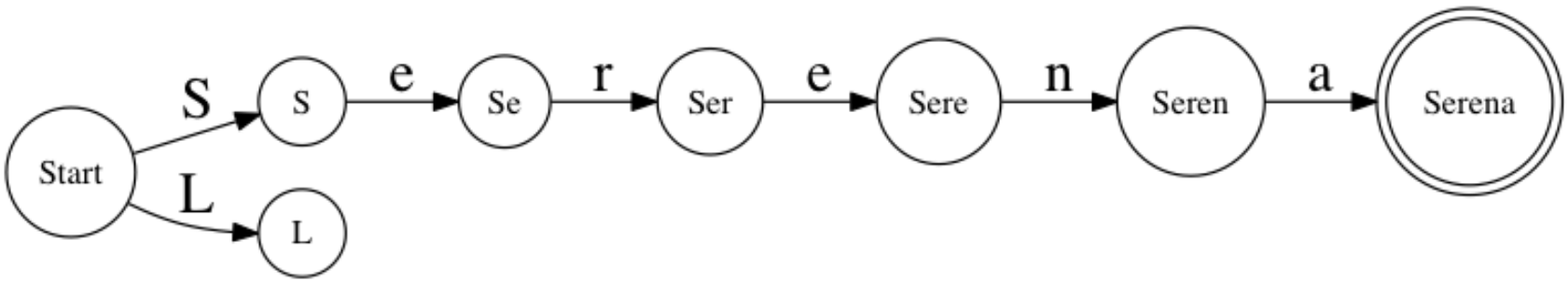

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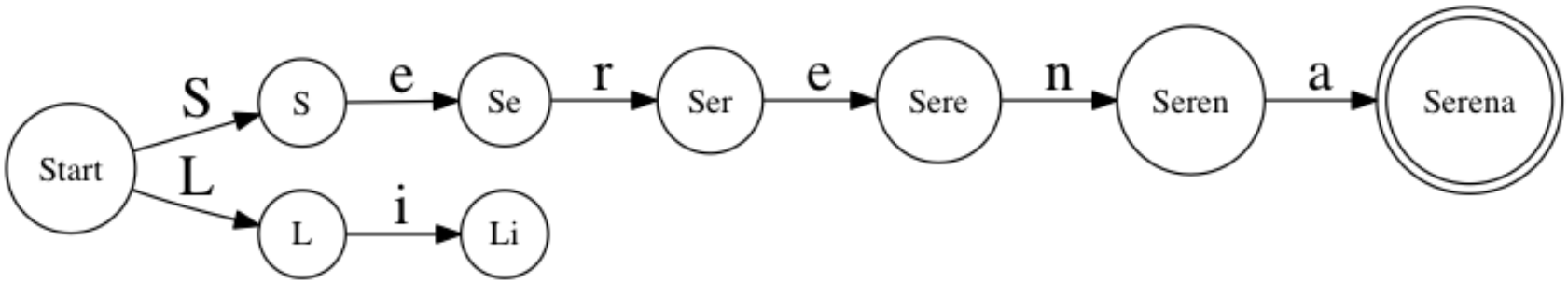

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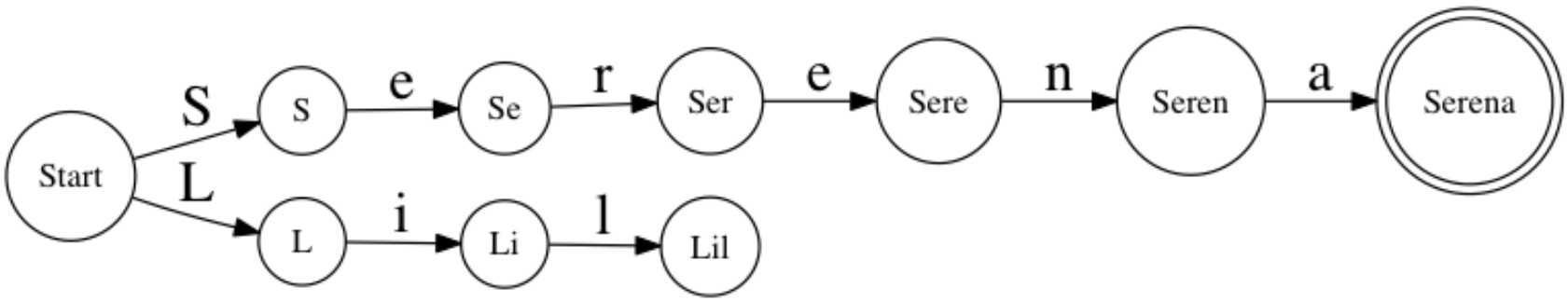

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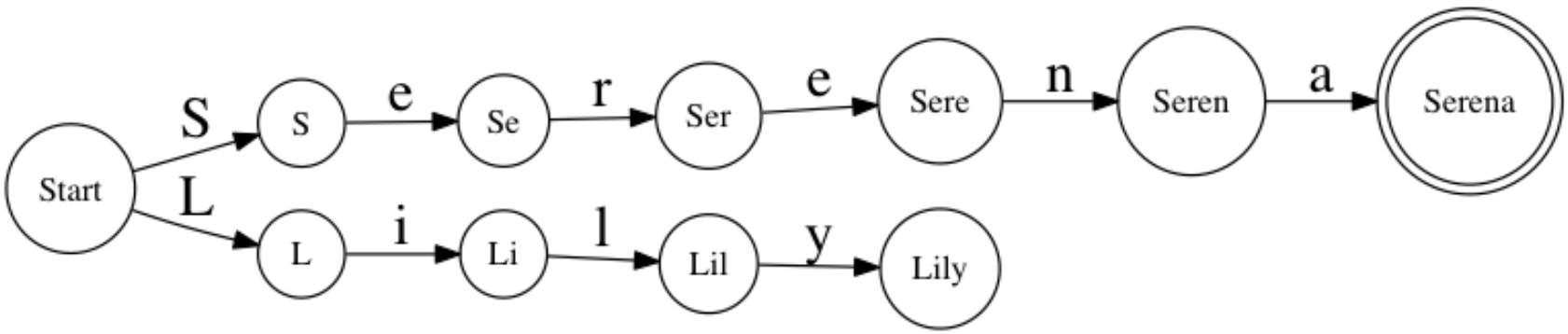

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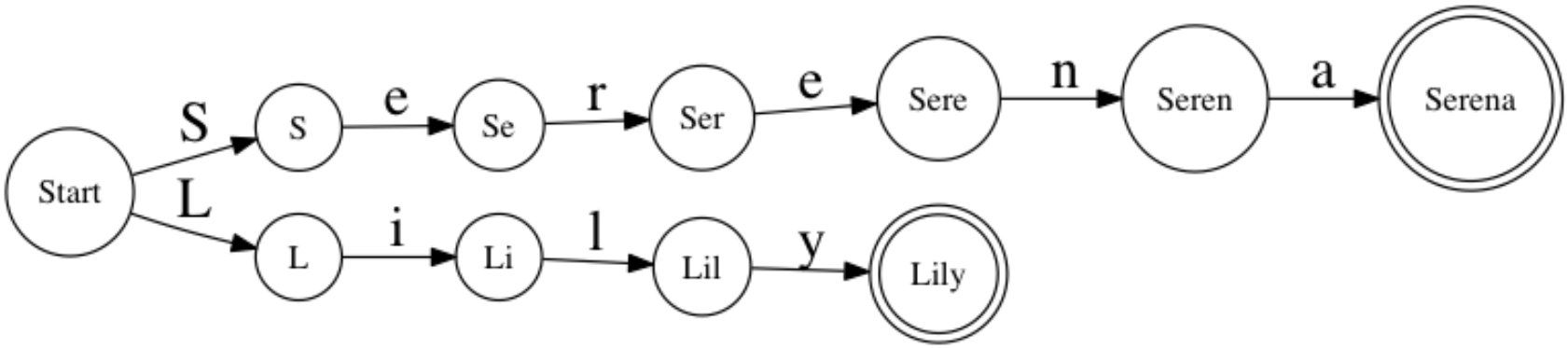

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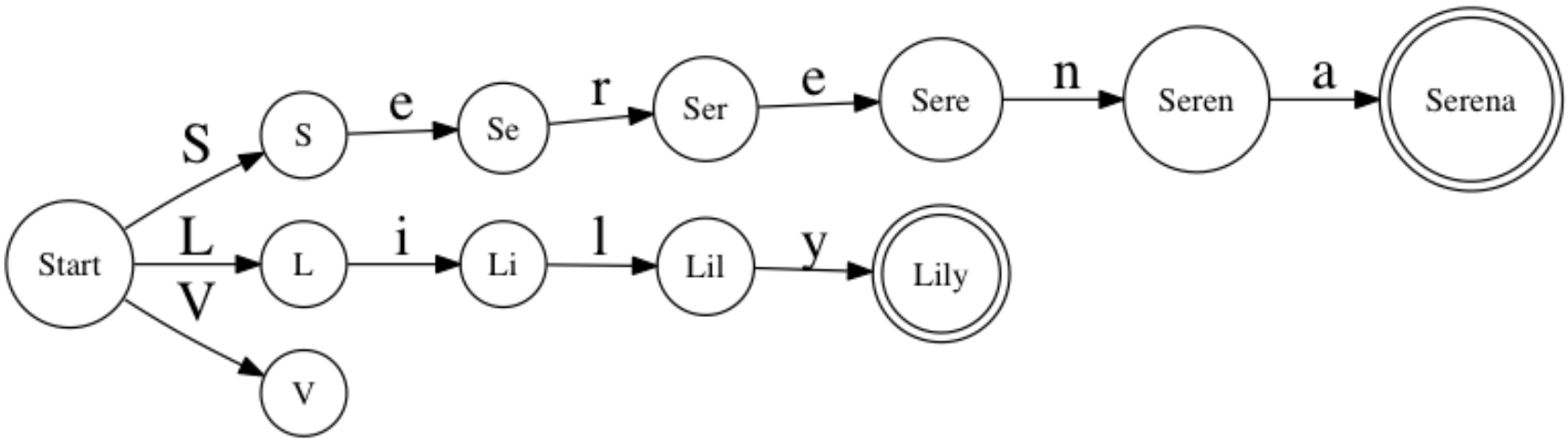

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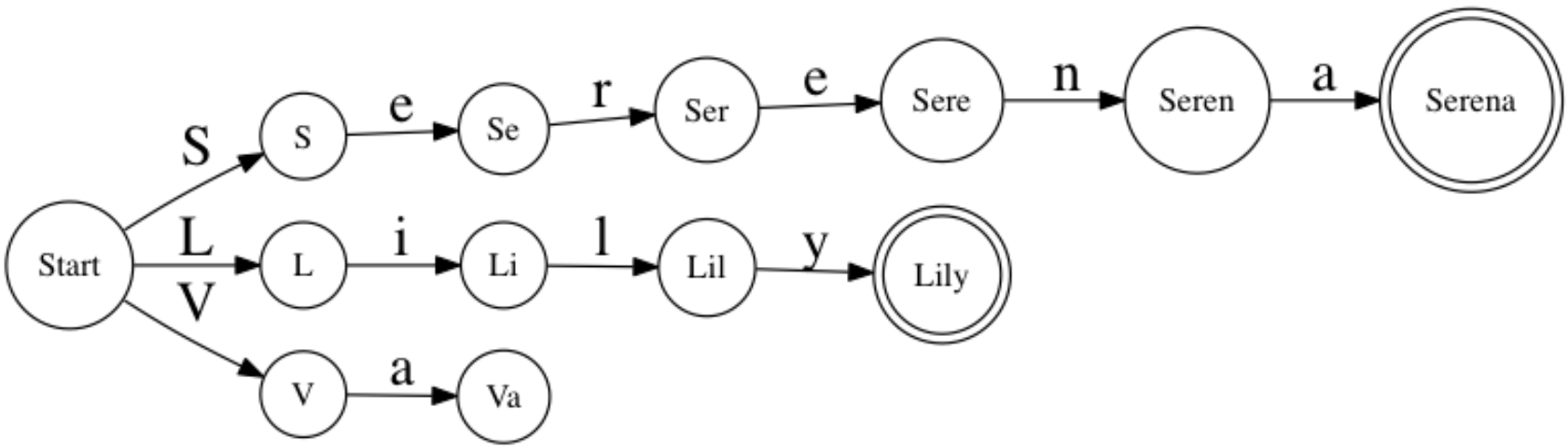

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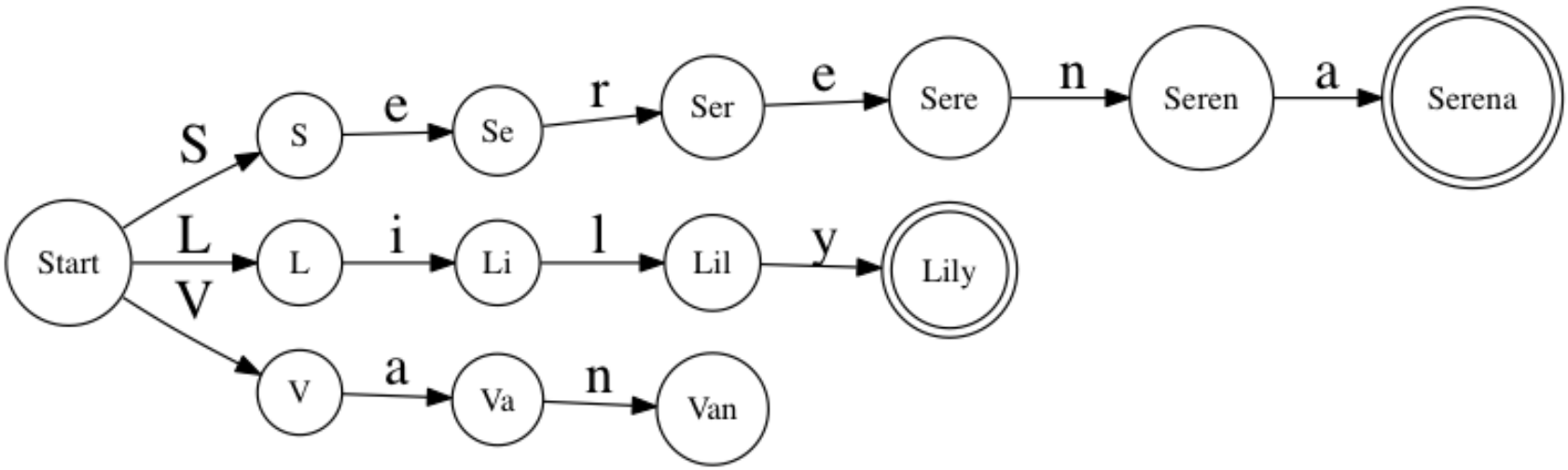

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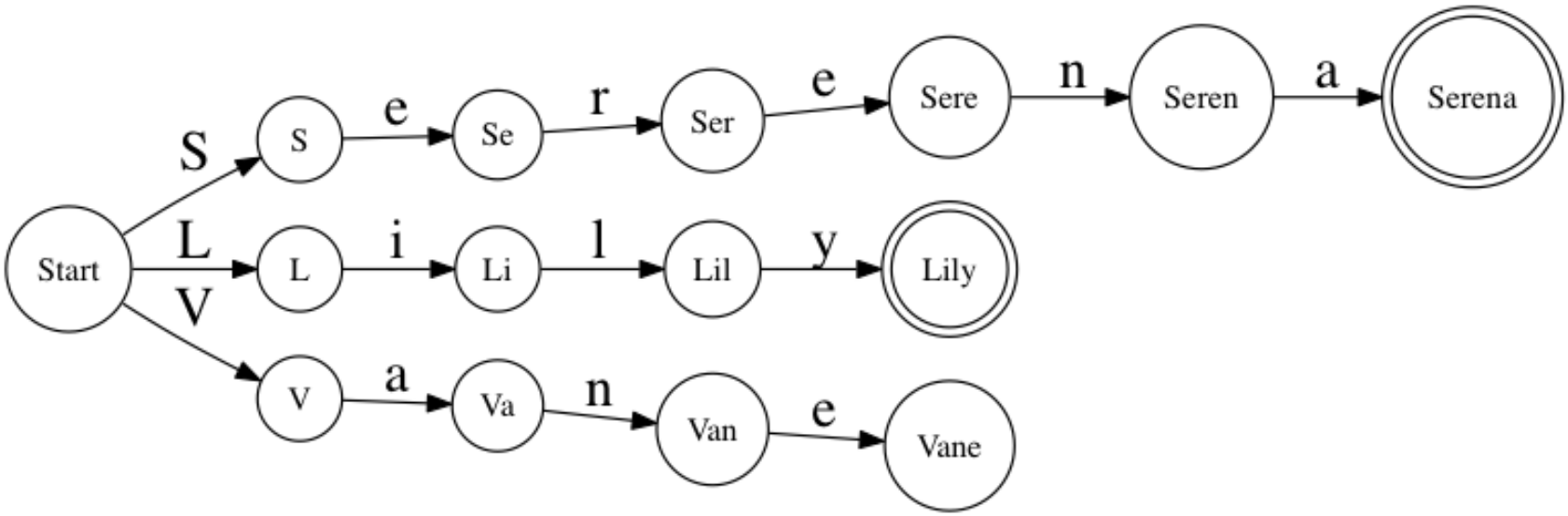

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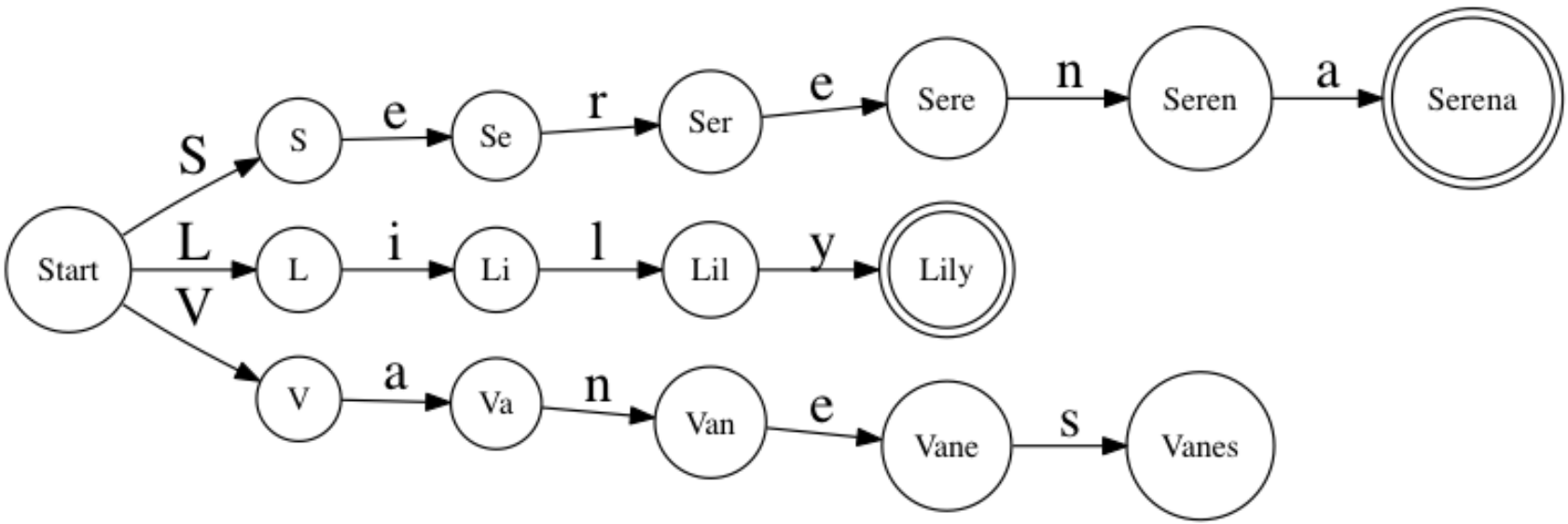

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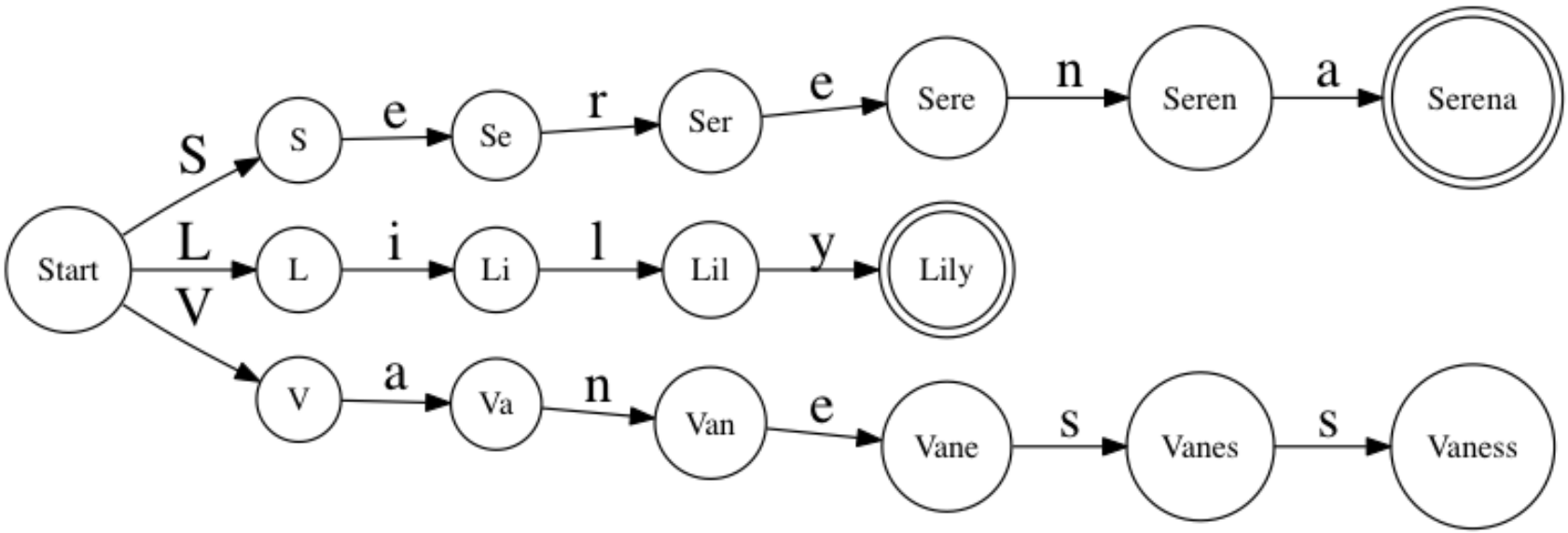

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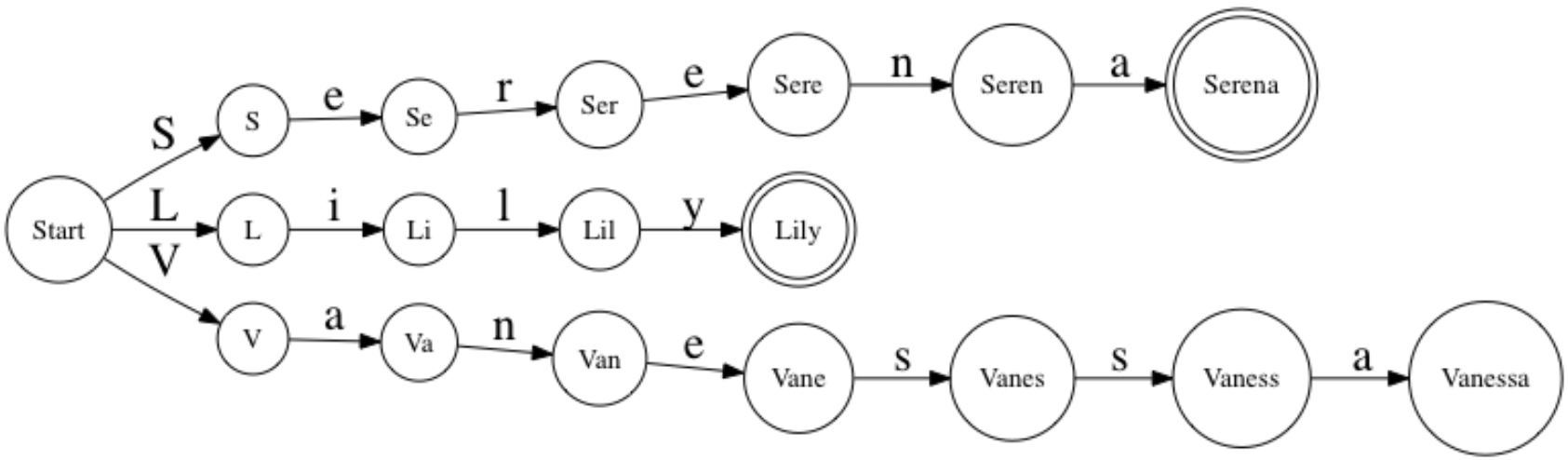

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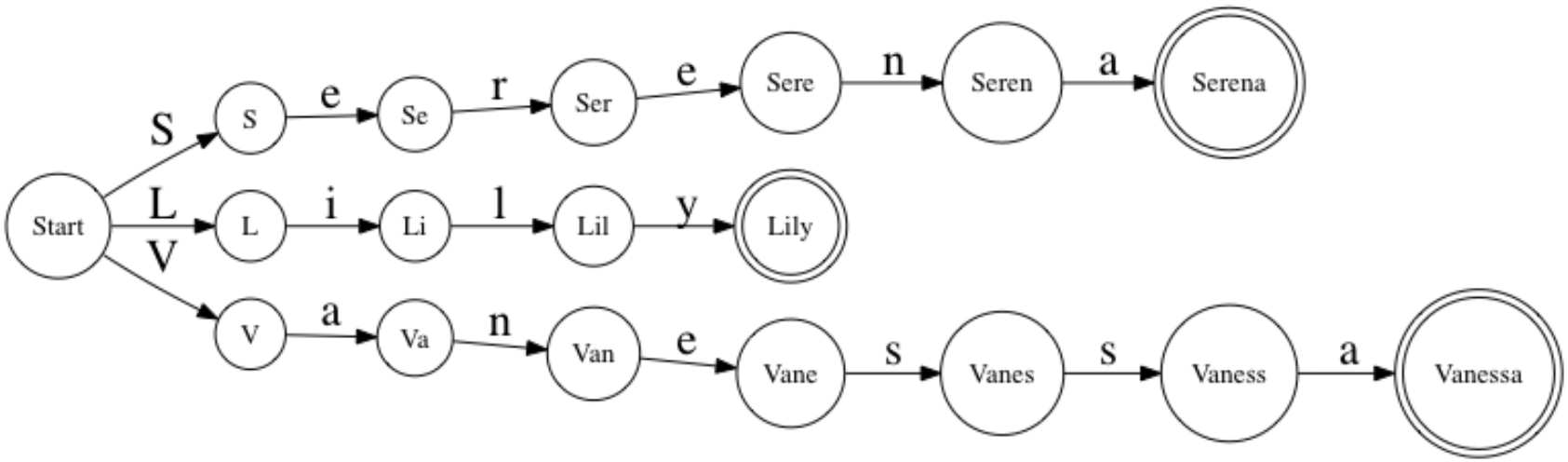

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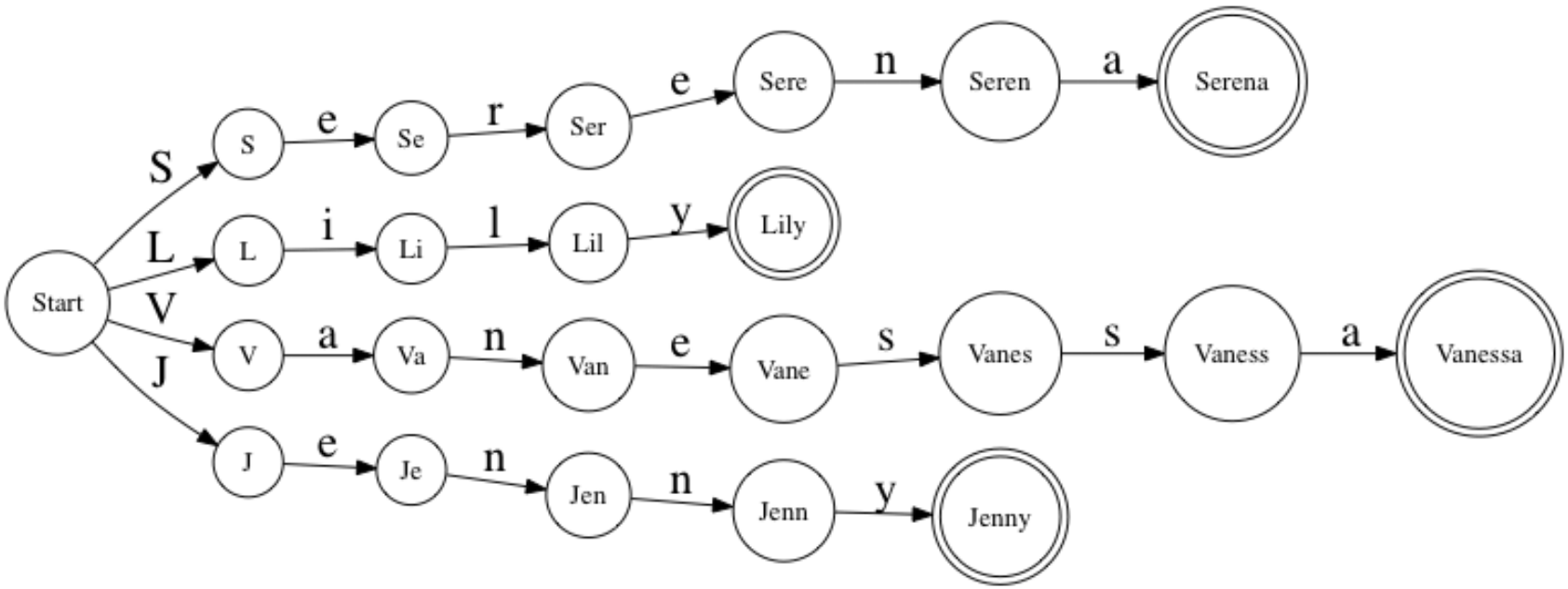

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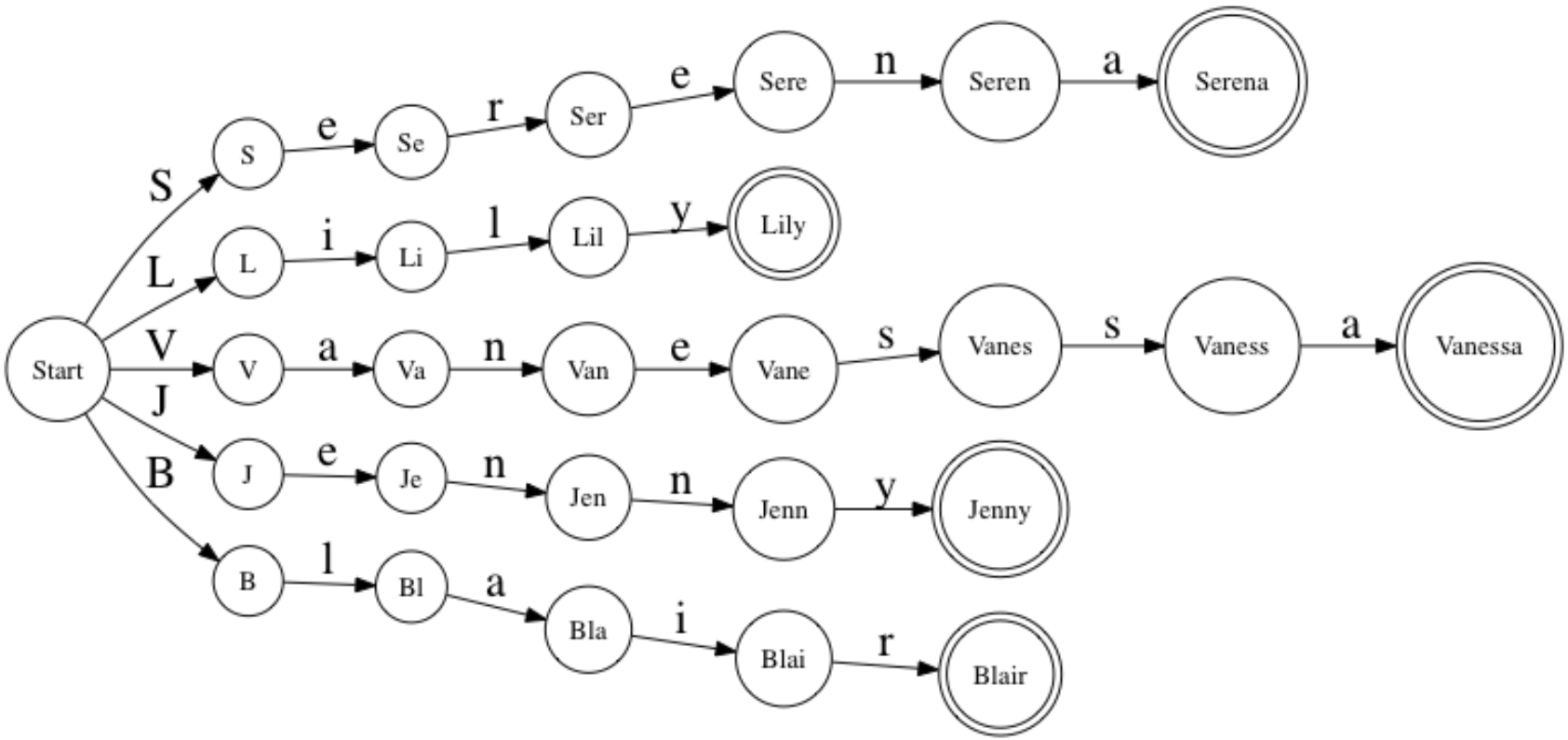

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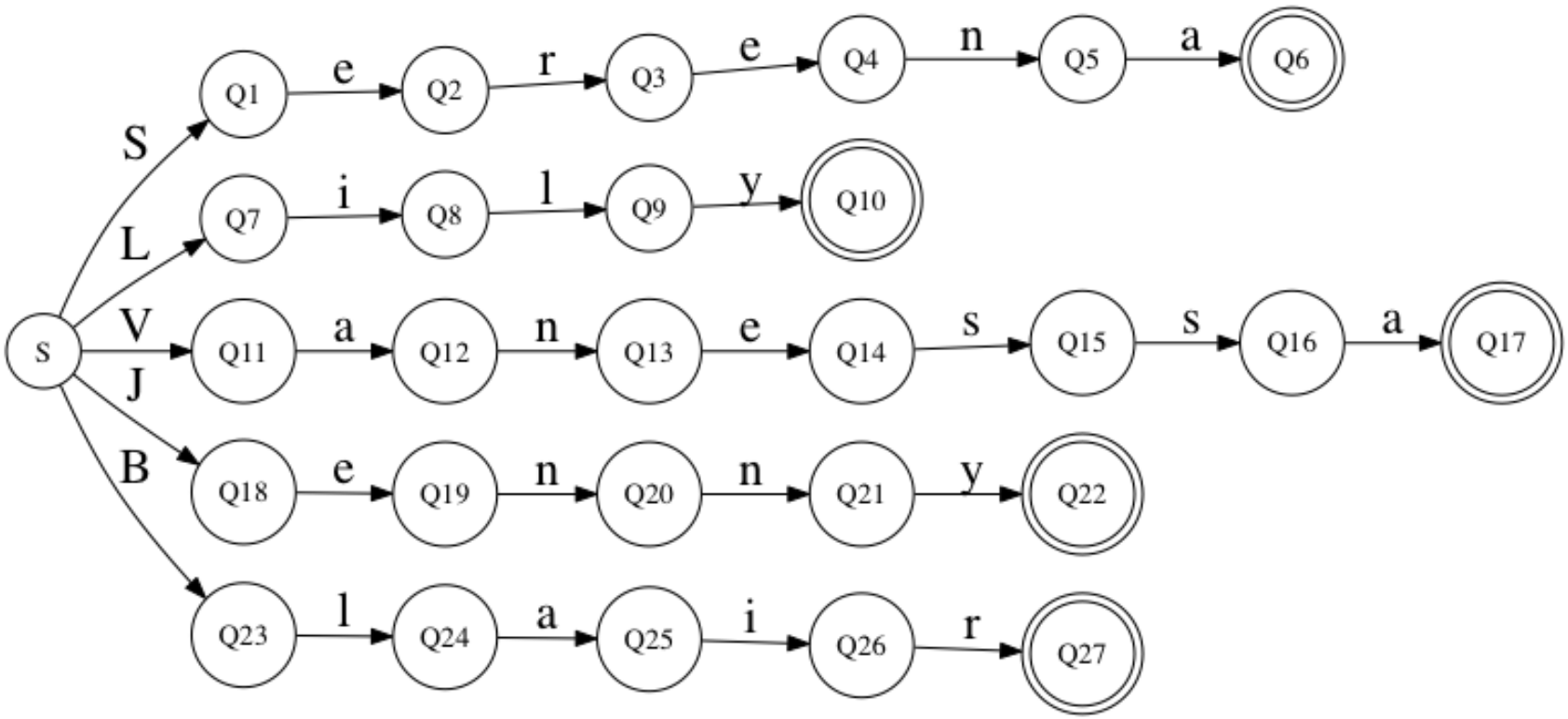

Minimization

Not enough to give the DFA...

Must give a minimal DFA!

Minimization

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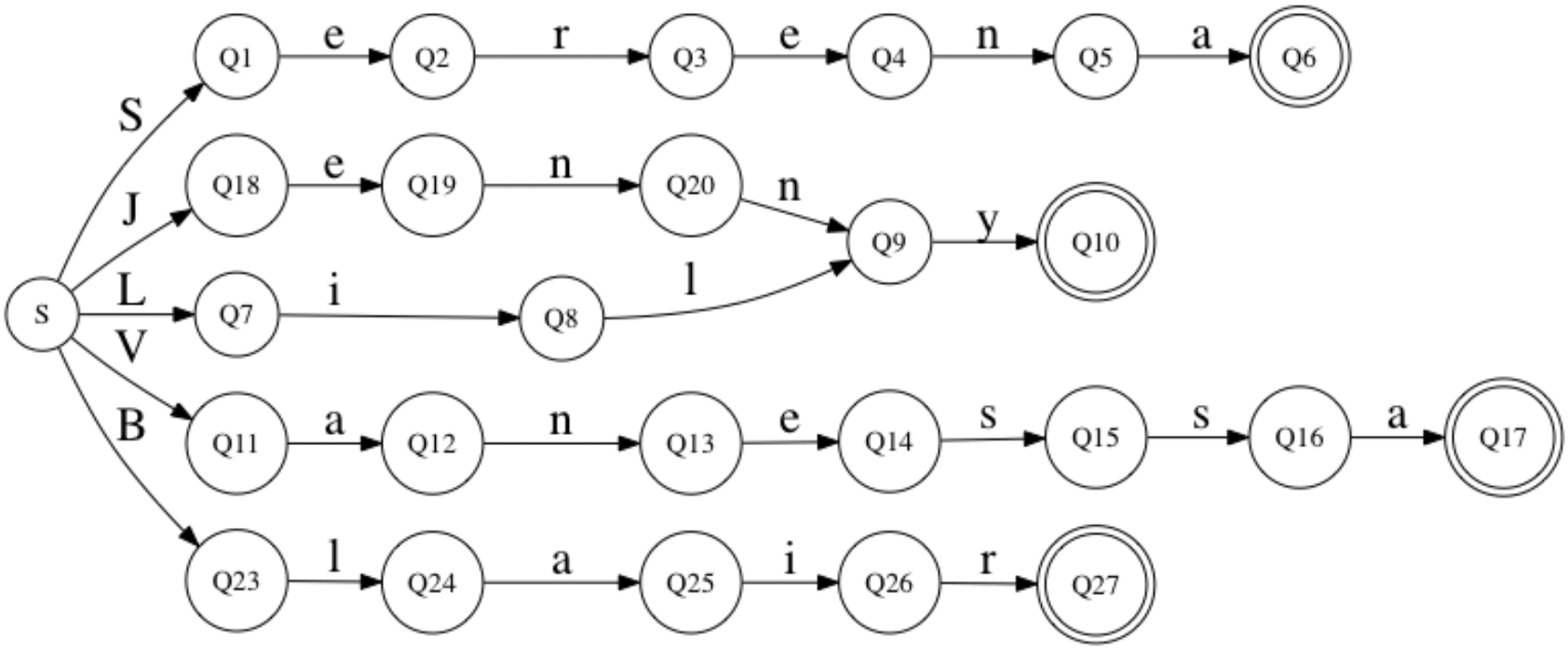

Minimization

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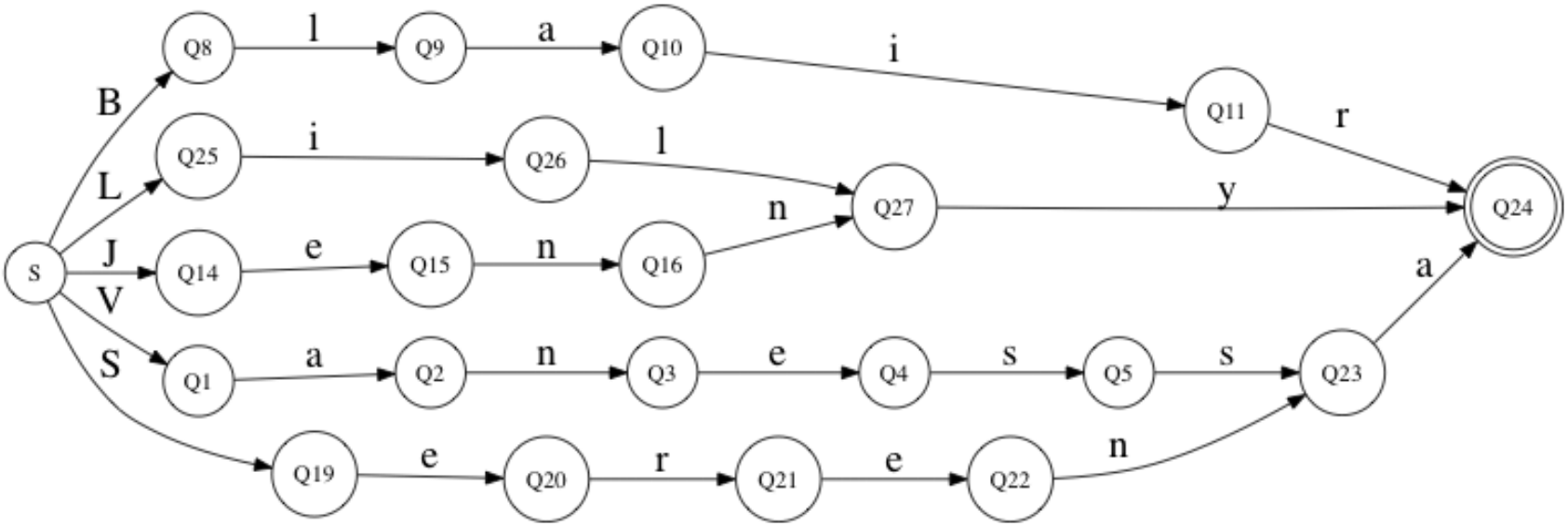

Minimization

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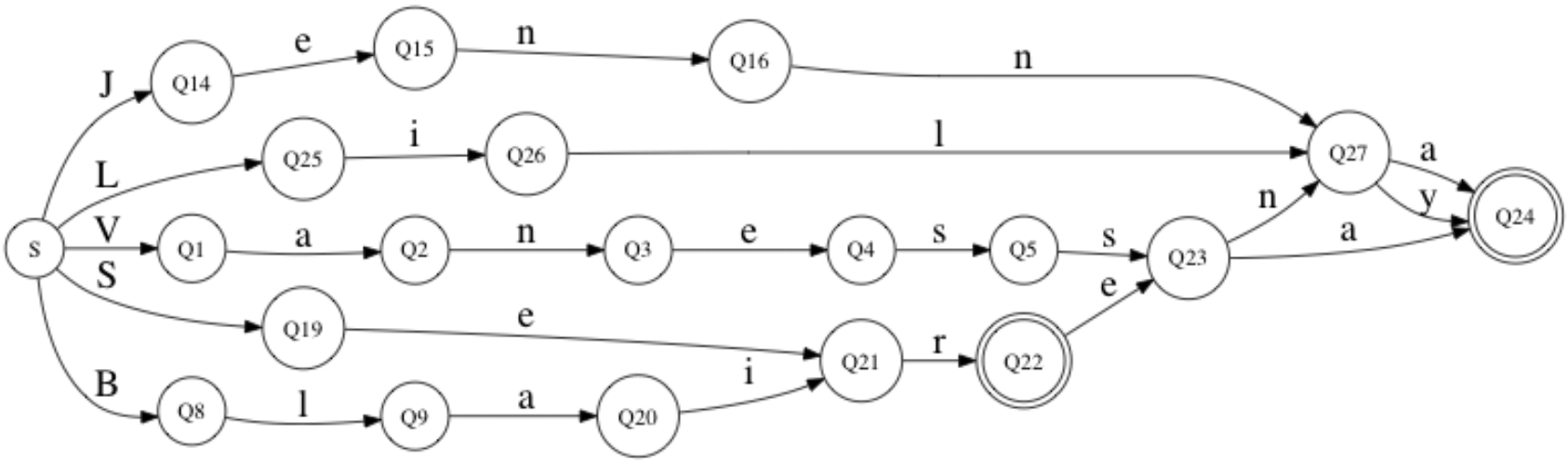

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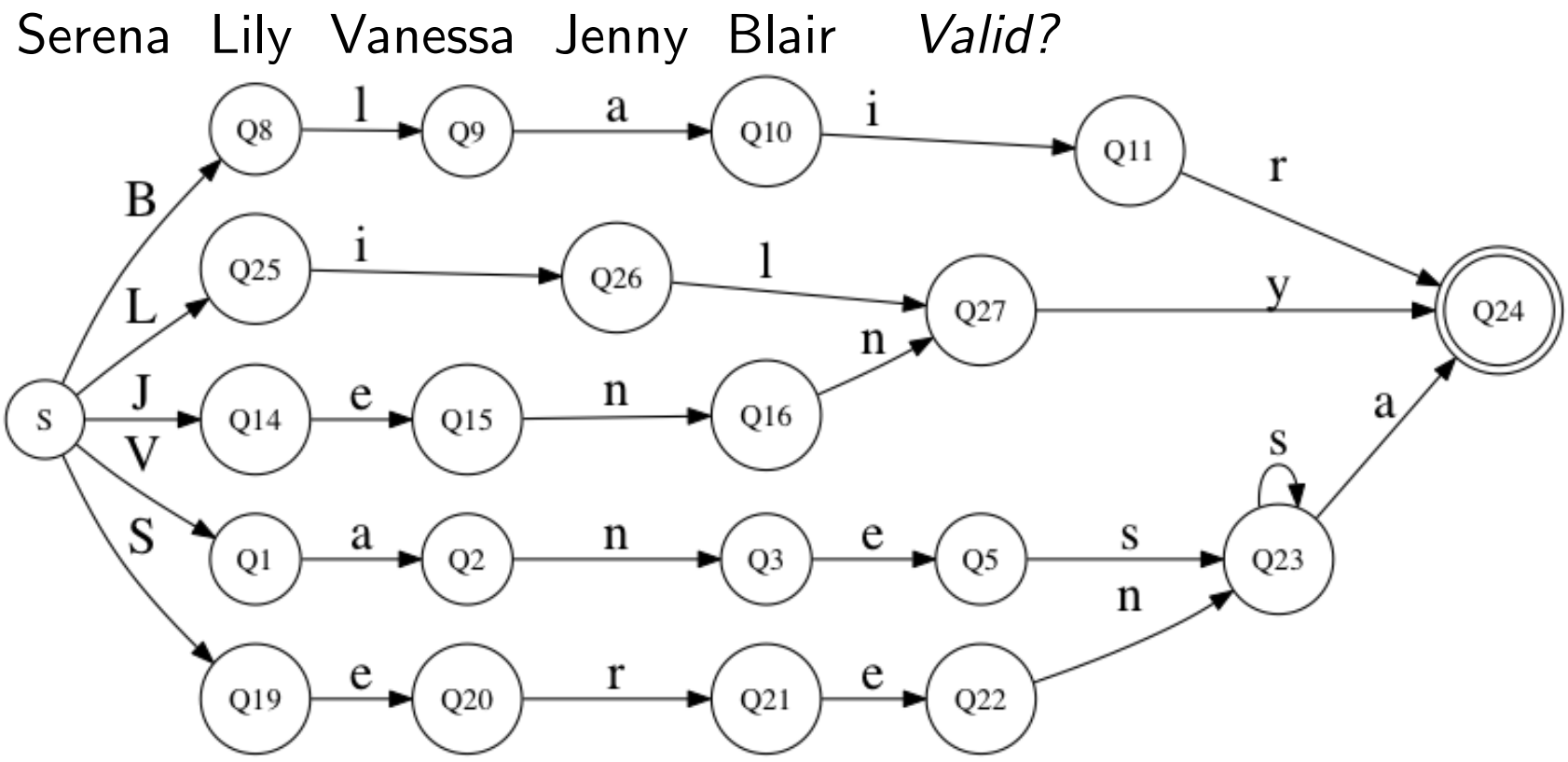

Representation

How can we represent a DFA in Java?

Well, a DFA is a graph, so...

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Well, a DFA is a graph, so...

Node class

Adjacency list

Adjacency matrix

Representation: Node Class

```
class Node {
  Map<String, Node> transitions;
  String nodeLabel;

  public Node(String label) {
    transitions = new HashMap<String, Node>();
    this.nodeLabel = label;
  }

  public void addTrans(String on, Node to) {
   transitions.put(on, to);
  }
}

Node s = new Node("S");
Node q1 = new Node("Q1");
s.addTrans("b", q1);
```

Representation: Adjacency List

```
Map<String, Map<String, String>> adjList =
    new HashMap<String, Map<String, String>>();

Map<String, String> edgesOfS =
    new HashMap<String, String>();

edgesOfS.put("b", "Q1");

adjList.put("S", edgesOfS);
```

Representation: Adjacency Matrix

```
int c = getNumberOfNodesNeeded();
String[][] m = new String[c][c];

m[0][1] = "b";
```

Representation

Method	Insert	Lookup	Space
Node	$O(1)$	$O(1)$	$O(n)$
List	$O(1)$	$O(1)$	$O(n)$
Matrix	$O(1)$	$O(1)$	$O(n^2)$

Questions?