Theory of automata and Formal languages

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Practice 2

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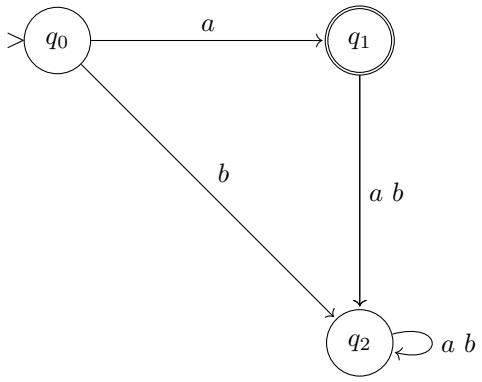
In practice 2 we are asked to build a DFA over the alphabet $\{a, b\}$ that contains only the string a. This is my proposed solution:

Part 1

We start by writing the DFA in a style similar to the one in talflecturenotes:

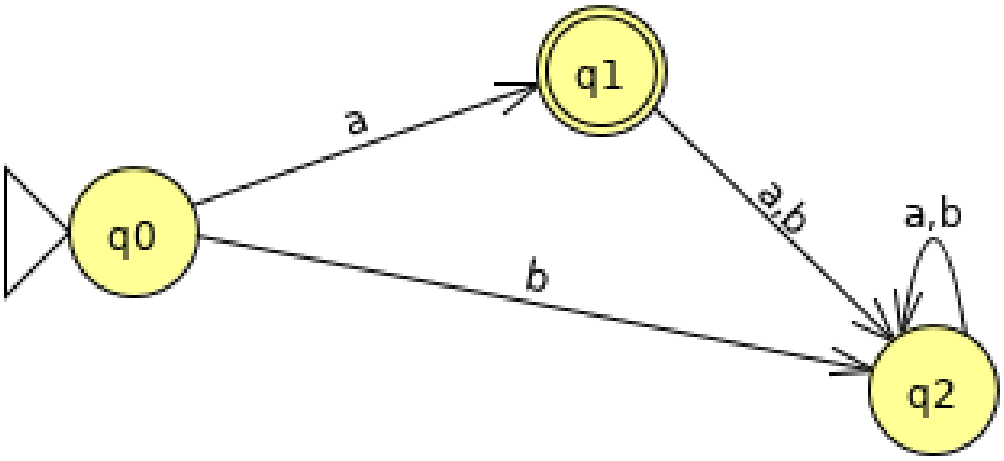
Let $M = (\{q_0, q_1, q_2\}, \{a, b\}, \delta, q_0, \{q_1\})$ be a DFA with:

$\delta(q, \sigma)$	a	b
q_0	q_1	q_2
q_1	q_2	q_2
q_2	q_2	q_2



Part 2

Now we create the same DFA using JFLAP:



If we test it with 6 random strings we can check that it works:

Input	Result
a	Accept
aa	Reject
ab	Reject
b	Reject
ba	Reject
aab	Reject

Part 3

Finally we express the DFA in a JSON file :

```
{
    "name" : "a",
    "representation" : {
        "K" : ["q0", "q1" ,"q3"],
        "A" : ["a", "b"],
        "s" : "q0",
        "F" : ["q1"],
        "t" : [["q0", "a", "q1"],
               ["q0", "b", "q2"],
               ["q1", "a", "q2"],
               ["q1", "b", "q2"],
               ["q2", "a", "q2"],
               ["q2", "b", "q2"]]
    }
```

We use Octave to test it with a few strings:

```
octave:1> finiteautomata("a", "a", "LaTeX")

$M = ( {q_0, q_1, q_2}, {a, b}, q_0, {q_1}, {(q_0, a, q_1), (q_0, b, q_2), (q_1,
 a, q_2), (q_1, b, q_2), (q_2, a, q_2), (q_2, b, q_2)} )$

$w = a$

$(q_0, a) \vdash (q_1, \varepsilon)$

x ∈ℒ(M)
```

```
octave:2> finiteautomata("a", "abb", "LaTeX")

$M = ( {q_0, q_1, q_2}, {a, b}, q_0, {q_1}, {(q_0, a, q_1), (q_0, b, q_2), (q_1,
 a, q_2), (q_1, b, q_2), (q_2, a, q_2), (q_2, b, q_2)} )$

$w = abb$

$(q_0, abb) \vdash (q_1, bb) \vdash (q_2, b) \vdash (q_2, \varepsilon)$

x ∉ ℒ(M)
```


```
octave:2> finiteautomata("a", "abb", "LaTeX")

$M = ( {q_0, q_1, q_2}, {a, b}, q_0, {q_1}, {(q_0, a, q_1), (q_0, b, q_2), (q_1,
 a, q_2), (q_1, b, q_2), (q_2, a, q_2), (q_2, b, q_2)} )$

$w = abb$

$(q_0, abb) \vdash (q_1, bb) \vdash (q_2, b) \vdash (q_2, \varepsilon)$

x ∉ ℒ(M)
```