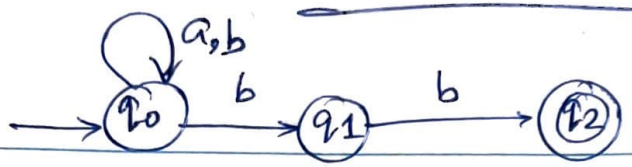
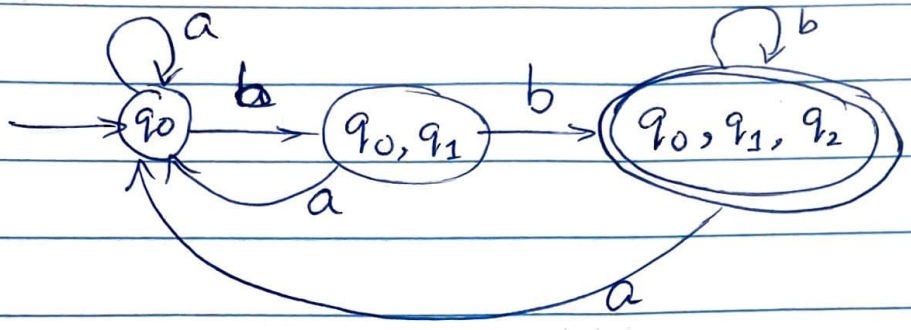
# NFA to DFA Conversion

02/13/2023

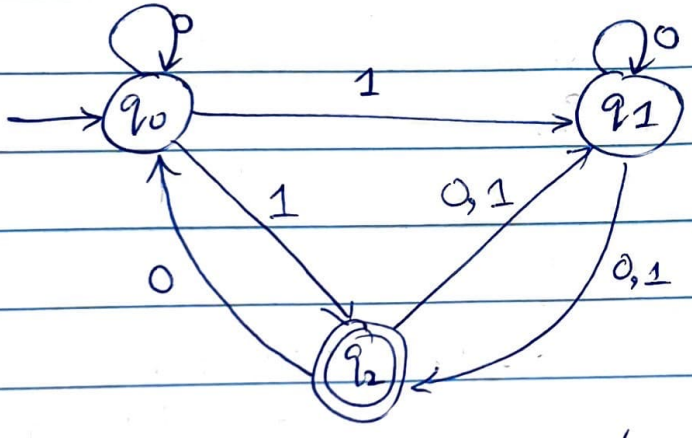



NFA

* Questions regarding
- lang (identify)
- NFA to DFA
- Reduce States




Create NFA for lang.
- Identify Σ
- Create NFA



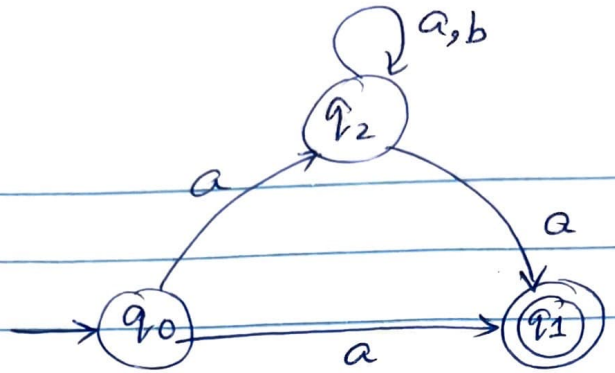

NFA

Subset Construction Method.

If $q_2$ appears in a state the complete set will be considered as the accept state.

| State/ Alphabet | 1 | 0 |
|---|---|---|
| $\rightarrow q_0$ | $q_1, {}^*q_2$ | $q_0$ |
| $q_1$ | $^*q_2$ | $q_1, {}^*q_2$ |
| $^*q_2$ | $q_1$ | $q_1, q_0$ |

* accept state

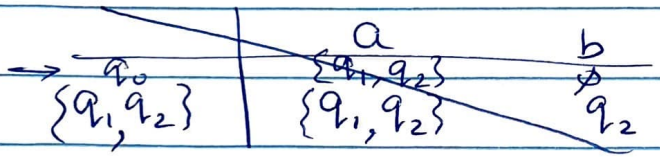


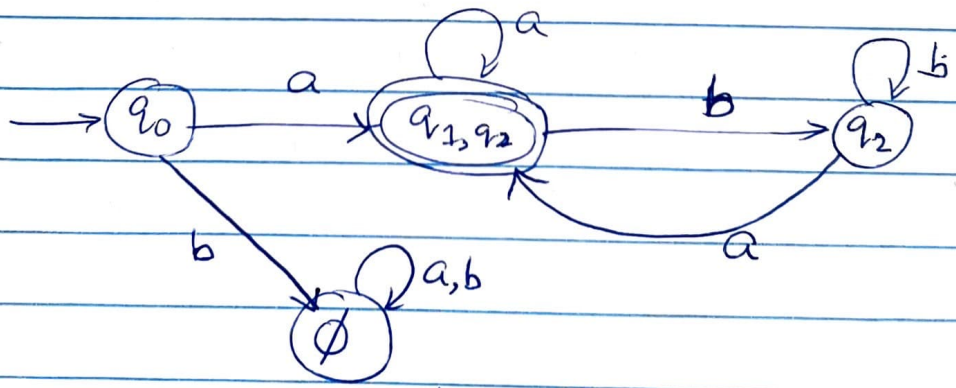

Applications →
Automation
Tracking
Creating Compiler

| | a | b |
|---|---|---|
| $\rightarrow q_0$ | $q_2, q_1$ | $\phi$ |
| $*q_1$ | $\phi$ | $\phi$ |
| $*q_2$ | $q_2, q_1$ | $q_2$ |

| | a | b |
|---|---|---|
| $\rightarrow q_0$ | $\{q_1, q_2\}$ | $\phi$ (Dead state) |

| | a | b |
|---|---|---|
| $\rightarrow q_0$ | $\{q_1, q_2\}$ | $\phi$ |
| $*\{q_1, q_2\}$ | $\{q_1, q_2\}$ | $q_2$ |
| $q_2$ | $\{q_1, q_2\}$ | $q_2$ |
| Cover all states → $\phi$ | $\phi$ | $\phi$ |

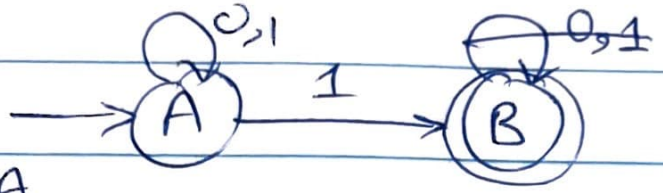



Dead state.

L = {set of all strings over (0, 1) that ends with '1'}

$\Sigma = (0, 1)$



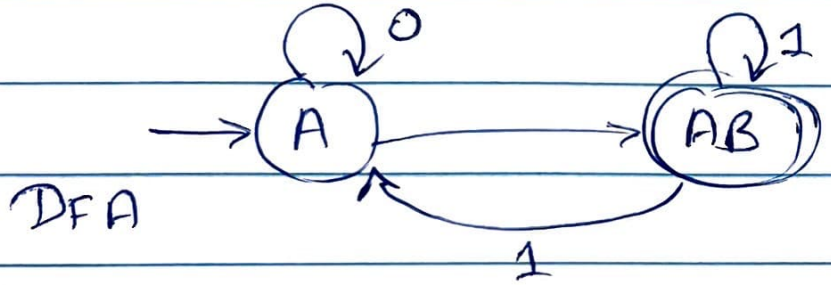

NFA

| | 0 | 1 |
|---|---|---|
| A | A | ~~A~~ B |
| B | ∅ | ∅ |

| → | 0 | 1 |
|---|---|---|
| A | ∅ | B |
| B | B | B |

| → | 0 | 1 |
|---|---|---|
| A | C | B |
| B | B | B |
| C | C | C |

goes only to one state.




DFA

DFA → very concrete (restricted)

NFA → very versatile.

(easier)

| | 0 | 1 |
|---|---|---|
| A | {A} | {AB} |
| ~~B~~ | | |
| AB | {A} | {AB} |