Deterministic Finite Automata (DFAs)

Lecture 3
Tuesday, September 1, 2020
3.1
DFA Introduction
DFA\text{s} also called Finite State Machines (FSMs)

- The “simplest” model for computers?
- State machines that are common in practice.
  - Vending machines
  - Elevators
  - Digital watches
  - Simple network protocols
- Programs with fixed memory
A simple program

Program to check if a given input string \( w \) has odd length

\[
\text{int } n = 0 \\
\text{While input is not finished} \\
\quad \text{read next character } c \\
\quad n \leftarrow n + 1 \\
\text{endWhile} \\
\text{If (} n \text{ is odd) output YES} \\
\text{Else output NO}
\]

\[
\text{bit } x = 0 \\
\text{While input is not finished} \\
\quad \text{read next character } c \\
\quad x \leftarrow \text{flip}(x) \\
\text{endWhile} \\
\text{If (} x = 1 \text{) output YES} \\
\text{Else output NO}
\]
A simple program

Program to check if a given input string $w$ has odd length

```cpp
int n = 0
While input is not finished
    read next character $c$
    $n \leftarrow n + 1$
endWhile
If ($n$ is odd) output YES
Else output NO
```

```cpp
bit $x = 0$
While input is not finished
    read next character $c$
    $x \leftarrow \text{flip}(x)$
endWhile
If ($x = 1$) output YES
Else output NO
```
- Machine has input written on a read-only tape
- Start in specified start state
- Start at left, scan symbol, change state and move right
- Circled states are accepting
- Machine accepts input string if it is in an accepting state after scanning the last symbol.
Draw me a DFA to check if a given input string has odd length.
THE END

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(for now)