G52MAL
Machines and Their Languages
Lecture 5
Regular Expressions

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Recap: DFAs and NFAs (1)

We have so far encountered two ways of describing formal languages:

- Deterministic Finite Automata (DFA)

$$(Q, \Sigma, \delta, q_0, F)$$

- Non-deterministic Finite Automata (NFA)

$$(Q, \Sigma, \delta, S, F)$$

Recap: DFAs and NFAs (2)

Key difference: the type of the transition function:

- ***DFA:*** $\delta \in Q \times \Sigma \to Q$
- ***NFA:*** $\delta \in Q \times \Sigma \to \mathcal{P}(Q)$

Language of an automaton: the set of all words it accepts.

As DFAs and NFAs are ***interconvertible***, these two kinds of automata defines the same ***class*** of languages.

Regular Expressions

- Automata describe languages in a somewhat indirect way: not always obvious what the defined language is.
- ***Regular Expressions*** offer a different, more direct way to describe languages.
- We will see (later) that the class of languages that can be described by regular expressions again is the same as those describable by DFAs and NFAs.
- This class is called the ***regular*** languages. Hence the name regular expressions.