Lecture #3: DFA Design and Verification — Part One
What Will Happen During the Lecture

Review

The lecture presentation will begin with a ***brief*** review of the material in the preparatory videos and documents for this lecture — and students will have the chance to ask questions about this.

Problems To Be Solved

1. Once again, let $\Sigma = \{\mathtt{a}, \mathtt{b}\}$ and let

   $$L = \{\omega \in \Sigma^\star \mid \text{either } \omega \text{ does not include an “a” or } \omega \text{ does not include a “b”}\}.$$

   Recall that, when designing a deterministic finite automaton for L, we considered a pair of sets:

   $$S_0 = L = \{\omega \in \Sigma^\star \mid \text{either } \omega \text{ does not include an “a” or } \omega \text{ does not include a “b”}\}$$

   and

   $$S_1 = \Sigma^\star \setminus L = \{\omega \in \Sigma^\star \mid \omega \text{ includes both an “a” and a “b”}\}.$$

   We were trying to design a deterministic finite automaton $M = (Q, \Sigma, \delta, q_0, F)$, whose language is L, such that $Q = \{q_0, q_1\}$ — and such that

   $$S_0 = \{\omega \in \Sigma^\star \mid \delta^\star(q_0, \omega) = q_0\} \qquad \text{and} \qquad S_1 = \{\omega \in \Sigma^\star \mid \delta^\star(q_0, \omega) = q_1\}.$$

   Unfortunately, this attempt was not successful — because we discovered that the transition out of state q_0 for the symbol “a” was not well-defined.

   The lecture presentation will continue with an attempt to determine whether the transition out of state q_0 for the symbol “b” would be well-defined — and what this must be, if it is.

2. Once again, let $\Sigma = \{\mathtt{a}, \mathtt{b}\}$ and consider the language

$$L = \{\omega \in \Sigma^\star \mid \omega \text{ ends with } \mathtt{abb}\}.$$

We will try to use the design process, introduced in this lecture, to design a deterministic finite automaton (with alphabet Σ) whose language is this language, L.