Formal Languages and Automata (CS452) - Homework Assignment #6

Hari Amoor, NetID: hra25

March 26, 2020

Problem 4.20, Claim: The problem of determining whether a DFA and a regular expression are equivalent is decidable.

Proof. Let M be a DFA and R be a regular expression. Define the language $C = \{\langle M, R \rangle \mid M$ is a DFA and R a regular expression with $L(M) = L(R)\}$.

Sipser defines a Turing machine F that decides C. Thus, the claim holds. $\square$

Problem 4.26: Answer the following for the given functions.

(a) **Is f one-to-one?**

No, each of 6 and 7 in Y are mapped to multiple values in X.

(b) **Is f onto?**

No, each of 8, 9, and 10 in Y are not mapped to any input in X.

(c) **Is f a correspondence?**

Yes; each input maps to a single output, thus it is well-defined.

(d) **Is g one-to-one?**

Yes; g satisfies $g(a) = g(b)$ iff $a = b$, for all $a, b \in X$.

(e) **Is g onto?**

Yes; each $y \in Y$ has $x \in X$ s.t. $g(x) = y$.

(f) **Is g a correspondence?**

Yes; since g is a bijection, it must be well-defined.