CSC236 winter 2020, quiz week 11_1

Question.

Recall that for a language L, the Kleene star operation can be defined as $L^* = L^0 \cup L^1 \cup L^2 \cup \ldots$. We will define a similar operation $Oddstar(L) = L^1 \cup L^3 \cup L^5 \cup \ldots$, i.e. the union of all the odd powers of L.

Describe a procedure for constructing an FSA that accepts $Oddstar(\mathcal{L}(M))$ given an arbitrary DFSA M. (You may use non-determinism.)

Solution.

Observe that, by definition, $Oddstar(L) = L(LL)^*$. We can construct a machine that accepts $\mathcal{L}(M)\mathcal{L}(M)$ using the construction for concatenation shown in figure 7.18 of the course notes (i.e. we juxtapose two copies of M, make the accepting states of the first copy non-accepting, and join them to the start state of the second copy by ε transitions). We can then apply the construction from figure 7.19 of the course notes (marking the initial state as accepting, and adding epsilon transitions from accepting states to the start state) to *that* machine, to get an NFSA that accepts the Kleene star of the concatenated language, i.e. $(LL)^*$. Finally, we can apply the concatenation procedure once more to concatenate a copy of M with the previously formed machine, to create a machine accepting $L(LL)^*$.