

CS 334 – Fall 2004: Answer to Opportunity 6

If  $L(G)$  is the language of a regular grammar  $G = (V, \Sigma, R, S)$ , then  $\exists M$ , a finite state automaton for which  $L(M) = L(G)$ .

Proof: Define  $M = (V, \Sigma, \delta, S, F)$  where  $V$  is the collection of non-terminals of  $G$ ,  $S$  is the start symbol of  $G$ ,  $F$  is the set of non-terminals that appear on the left side of a rule that sends them to  $\Lambda$ , and  $\delta$  consists of transitions of the form  $\delta(P, x) = Q$ , where  $G$  contains a rewrite rule of the form  $P \rightarrow xQ$ .

Conversely, given  $M = (V, \Sigma, \delta, S, F)$ , define the grammar over  $\Sigma$  for which the nonterminals are the states in  $V$ , the start symbol is  $S$ , and the rewrite rules are of the form  $P \rightarrow xQ$  where  $\delta(P, x) = Q$  and for states in  $F$ , say  $Q$ ,  $Q \rightarrow \Lambda$ .