



*Lexical Analysis:
DFA Minimization & Wrap Up*



Automating Scanner Construction

PREVIOUSLY

RE \rightarrow NFA (*Thompson's construction*)

- Build an NFA for each term
- Combine them with ϵ -moves

NFA \rightarrow DFA (*subset construction*)

- Build the simulation

TODAY

DFA \rightarrow Minimal DFA

- Hopcroft's algorithm

DFA \rightarrow RE (*not really part of scanner construction*)

- All pairs, all paths problem
- Union together paths from s_0 to a final state

The Cycle of Constructions





DFA Minimization

Details of the algorithm

- Group states into maximal size sets, *optimistically*
- Iteratively subdivide those sets, as needed
- States that remain grouped together are equivalent

Initial partition, P_0 , has two sets: $\{D_F\}$ & $\{D-D_F\}$

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

Splitting a set (“partitioning a set by \underline{a} ”)

- Assume $q_i, \& q_j \in s$, and $\delta(q_i, \underline{a}) = q_x, \& \delta(q_j, \underline{a}) = q_y$
- If $q_x \& q_y$ are not in the same set, then s must be split
 - q_i has transition on a , q_j does not $\Rightarrow \underline{a}$ splits s
- One state in the final DFA cannot have two transitions on \underline{a}