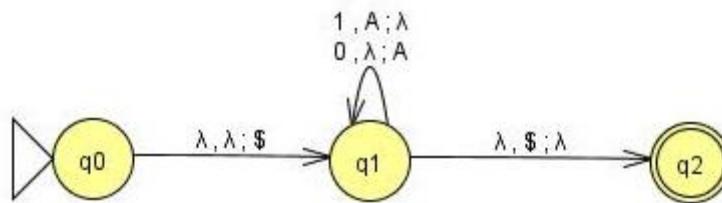


PDA to CFG conversion: example



1. First, observe that the given PDA meets the three requirements for simplicity:
 - (a) It has one final state.
 - (b) It empties its stack before accepting.
 - (c) Each transition either consists of a single push or a single pop.
2. The start variable of the grammar is A_{02} , which indicates that our PDA must begin in q_0 and end up in q_2 .
3. Introduce grammar rules corresponding to moves of the PDA of the form “push, compute, pop”:

$$A_{02} \rightarrow A_{11}$$

$$A_{11} \rightarrow 0A_{11}1$$

4. Introduce grammar rules corresponding to moves of the PDA which drive it from states p to r and then from r to q :

$$A_{00} \rightarrow A_{00}A_{00} | A_{01}A_{10} | A_{02}A_{20}$$

$$A_{01} \rightarrow A_{00}A_{01} | A_{01}A_{11} | A_{02}A_{21}$$

$$A_{02} \rightarrow A_{00}A_{02} | A_{01}A_{12} | A_{02}A_{22}$$

$$A_{10} \rightarrow A_{10}A_{00} | A_{11}A_{10} | A_{12}A_{20}$$

$$A_{11} \rightarrow A_{10}A_{01} | A_{11}A_{11} | A_{12}A_{21}$$

$$A_{12} \rightarrow A_{10}A_{02} | A_{11}A_{12} | A_{12}A_{22}$$

$$A_{20} \rightarrow A_{20}A_{00} | A_{21}A_{10} | A_{22}A_{20}$$

$$A_{21} \rightarrow A_{20}A_{01} | A_{21}A_{12} | A_{22}A_{22}$$

$$A_{22} \rightarrow A_{20}A_{02} | A_{21}A_{12} | A_{22}A_{22}$$

5. Introduce grammar rules for ε :

$$A_{00} \rightarrow \varepsilon$$

$$A_{11} \rightarrow \varepsilon$$

$$A_{22} \rightarrow \varepsilon$$