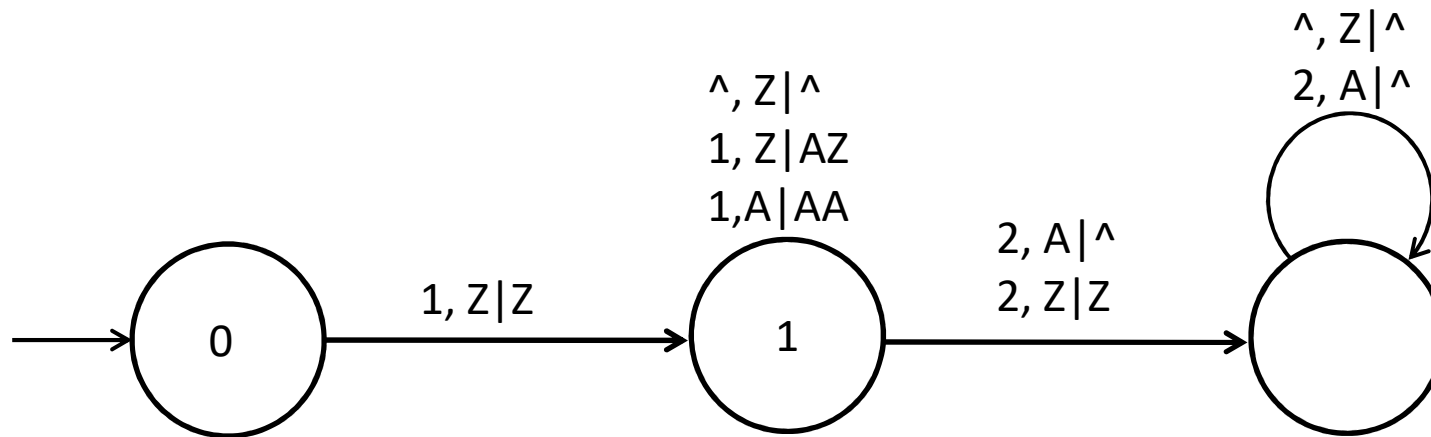


# Cornerstones of Computer Science

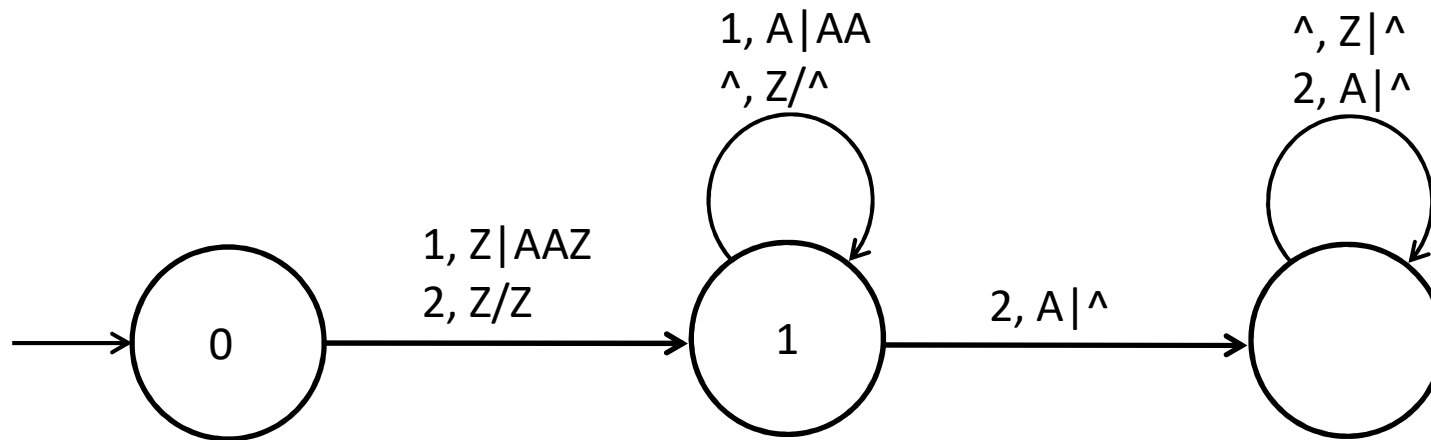
DPDA Exercise State Diagram Solutions

by Richard Born

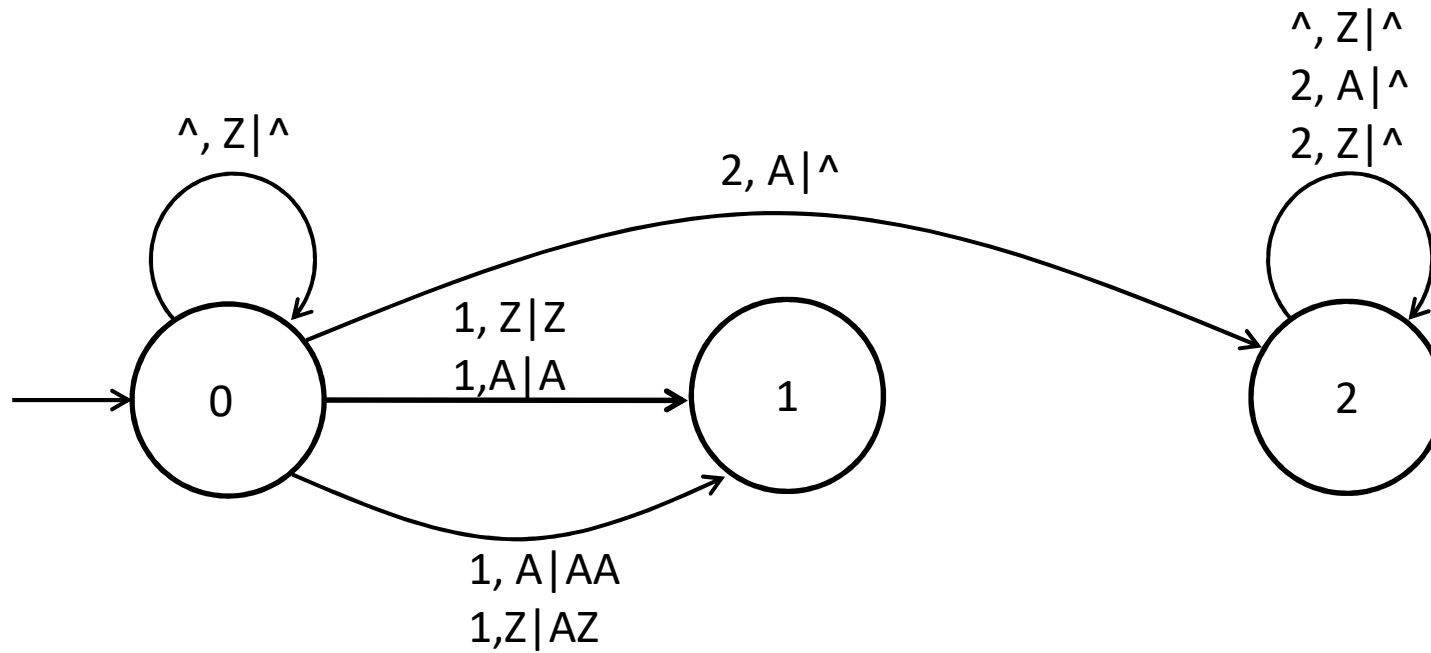
**Exercise 1**  
**DPDA Recognizing  $1^{n+1}2^n, n \geq 0$**



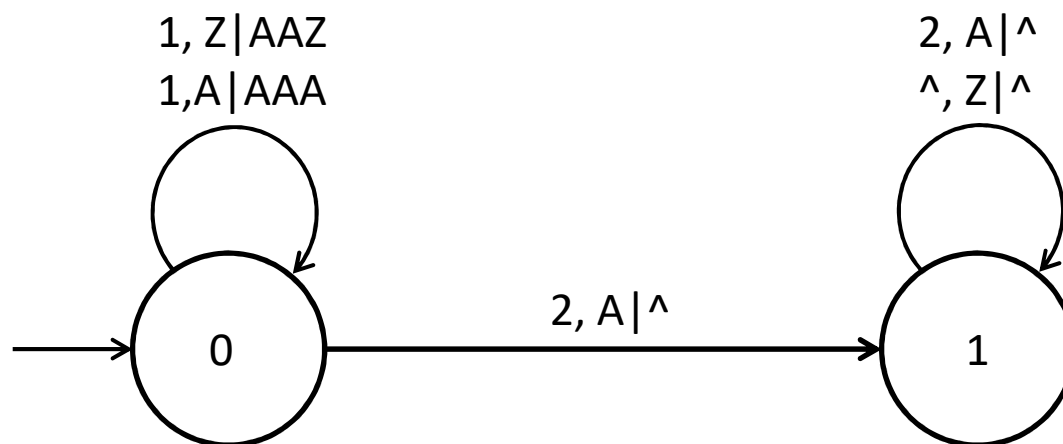
**Exercise 2**  
**DPDA Recognizing  $1^n 2^{n+1}$ ,  $n \geq 0$**



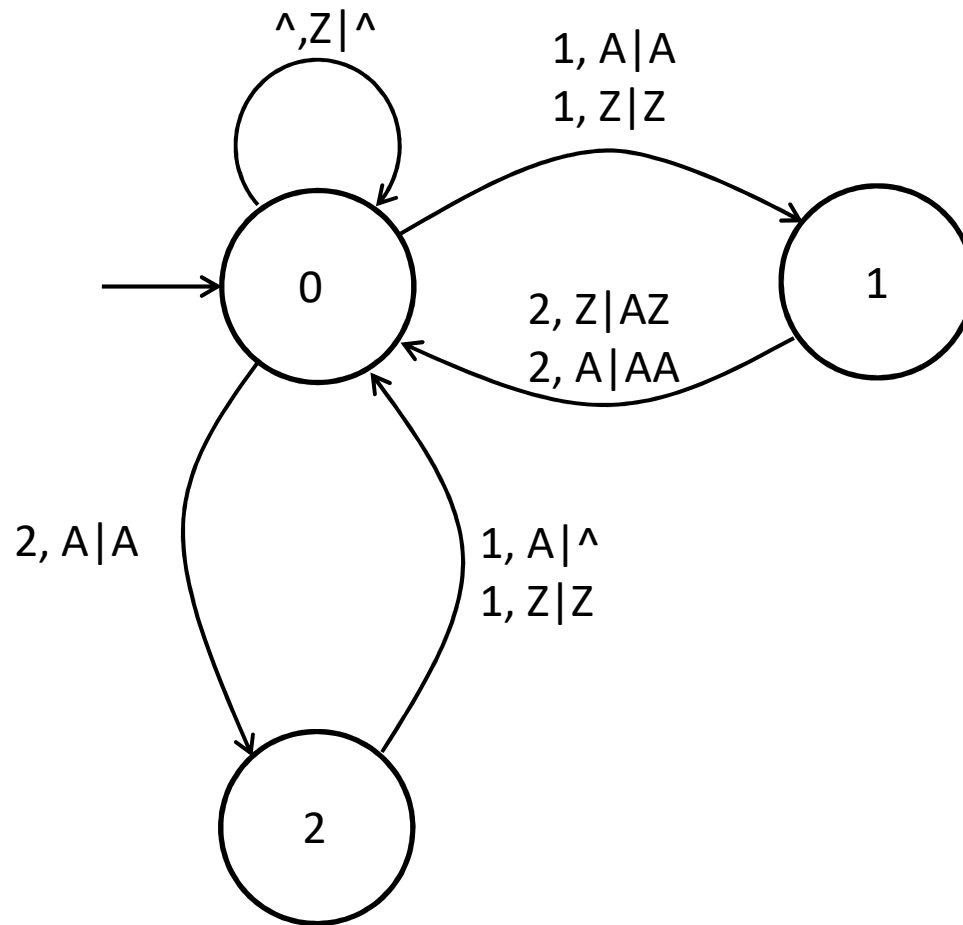
**Exercise 3**  
**DPDA Recognizing  $1^{2n}2^n$ ,  $n \geq 0$**



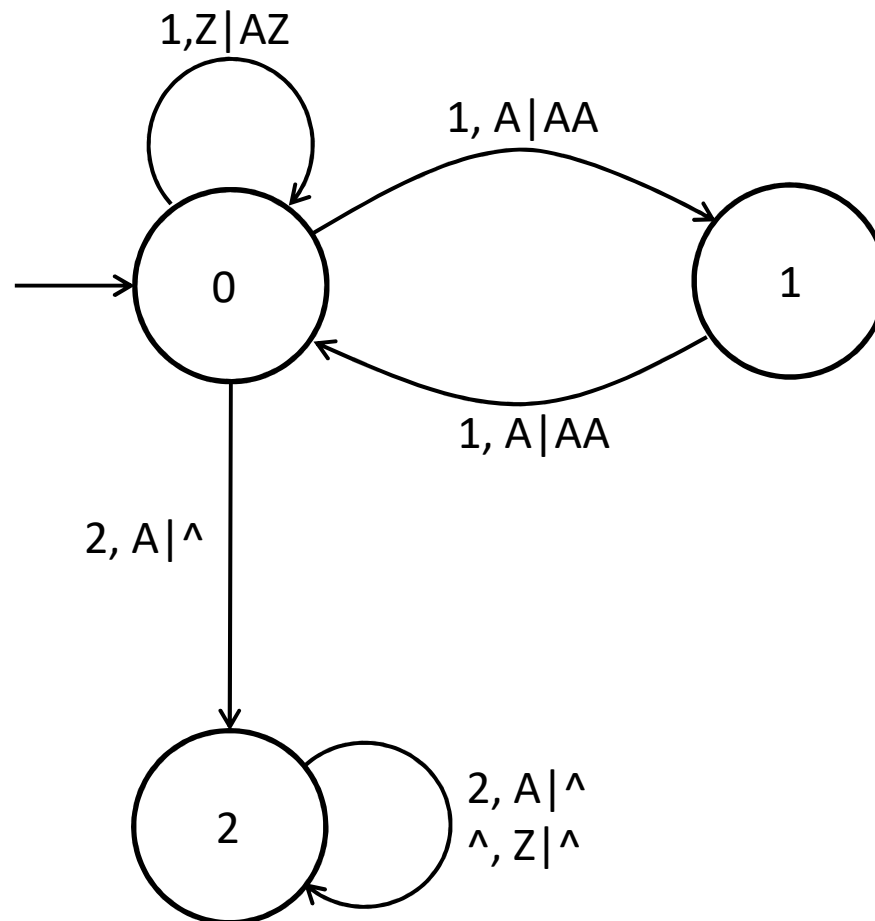
**Exercise 4**  
**DPDA Recognizing  $1^n 2^{2n}$ ,  $n > 0$**



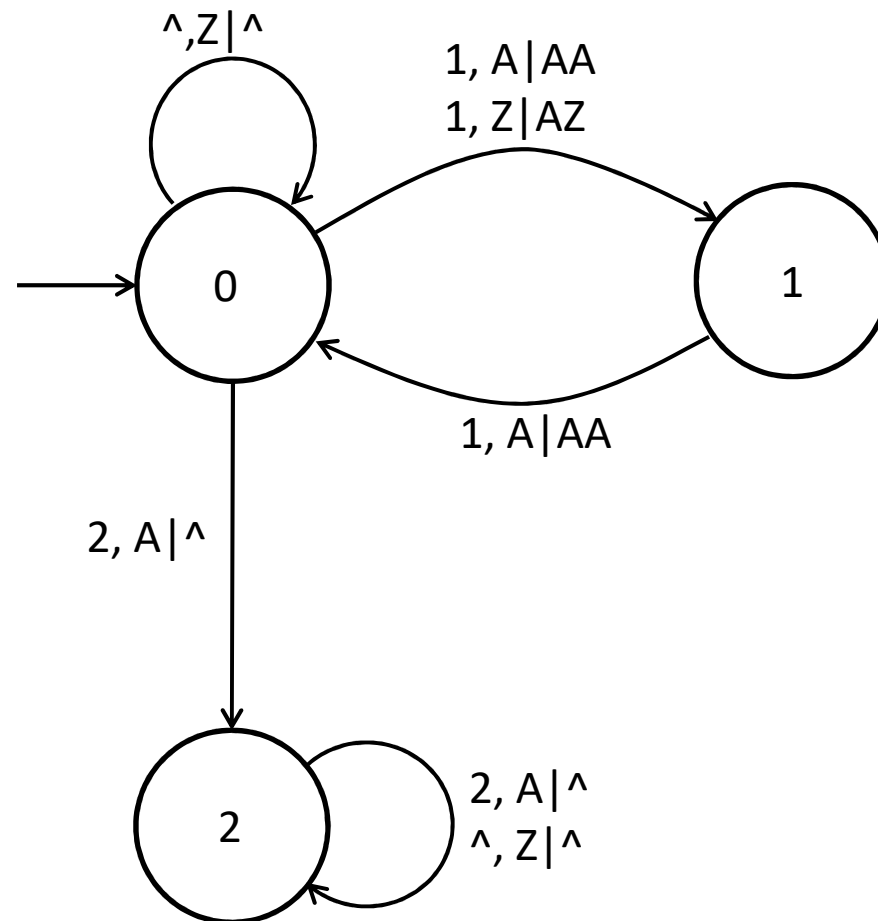
**Exercise 5**  
**DPDA Recognizing  $(12)^n(21)^n, n \geq 0$**



**Exercise 6**  
**DPDA Recognizing  $1^{2n+1}2^{2n+1}$ ,  $n \geq 0$**

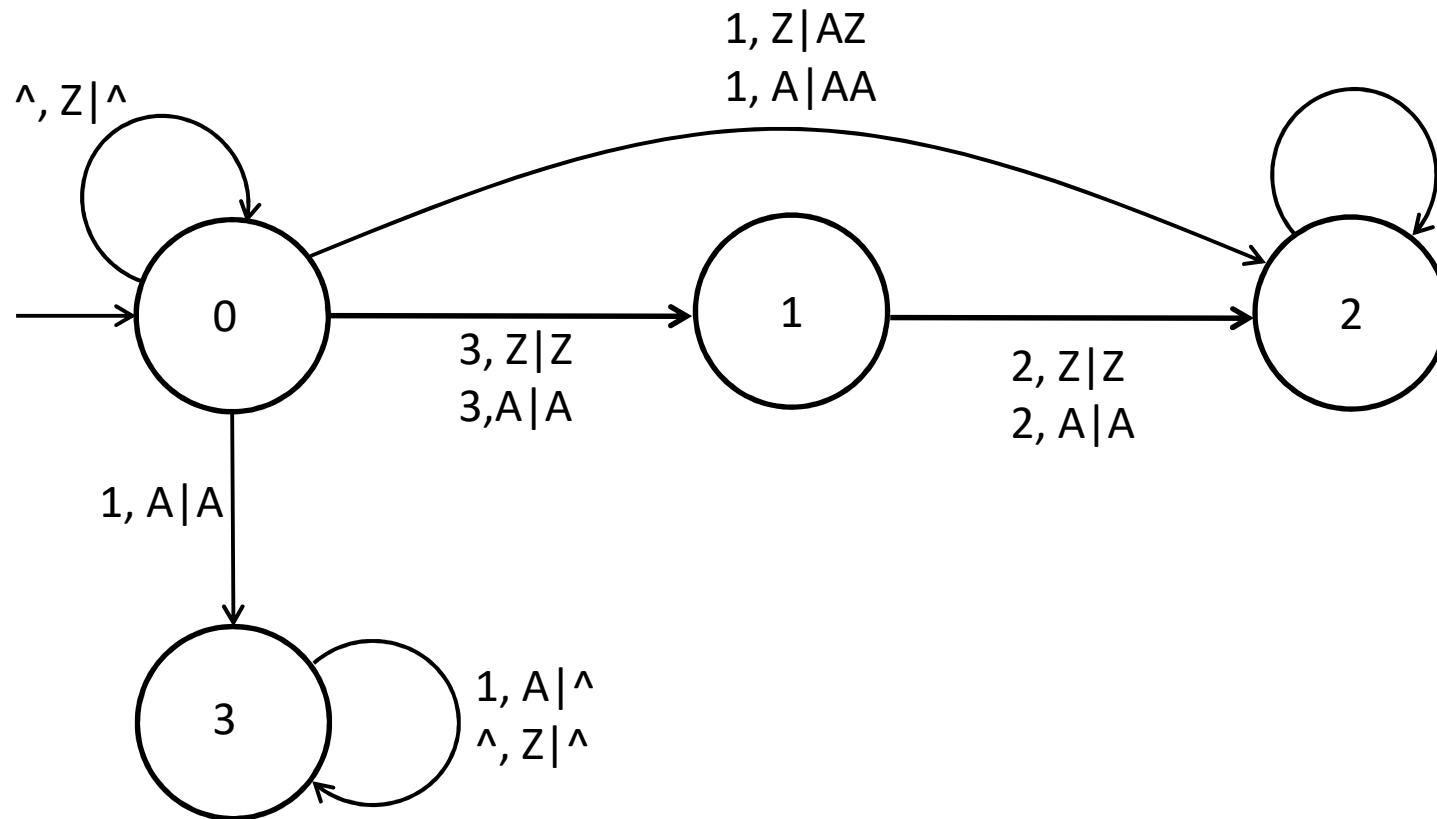


**Exercise 7**  
**DPDA Recognizing  $1^{2n}2^{2n}$ ,  $n \geq 0$**

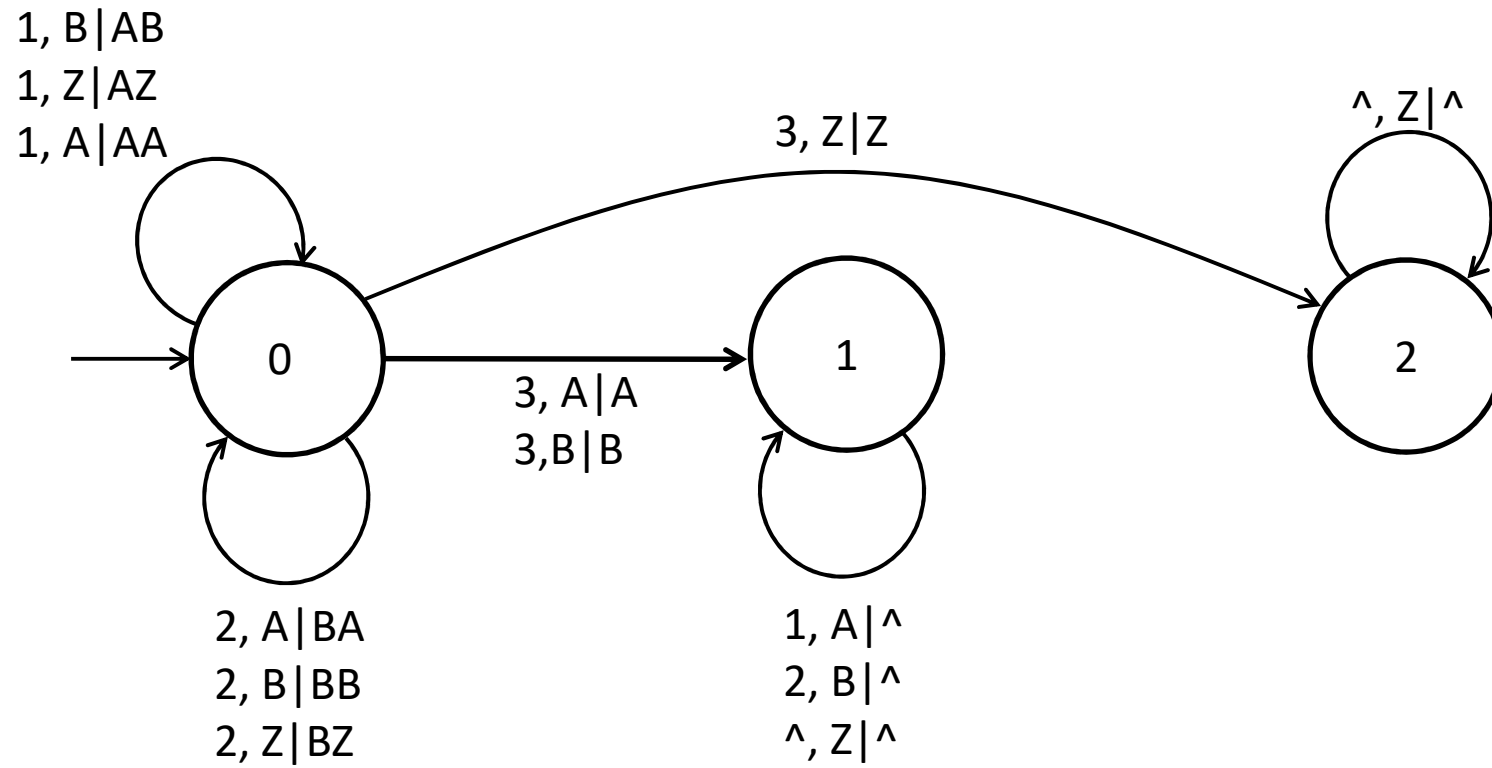




**Exercise 8**  
**DPDA Recognizing  $(321)^n 1^n$ ,  $n \geq 0$**



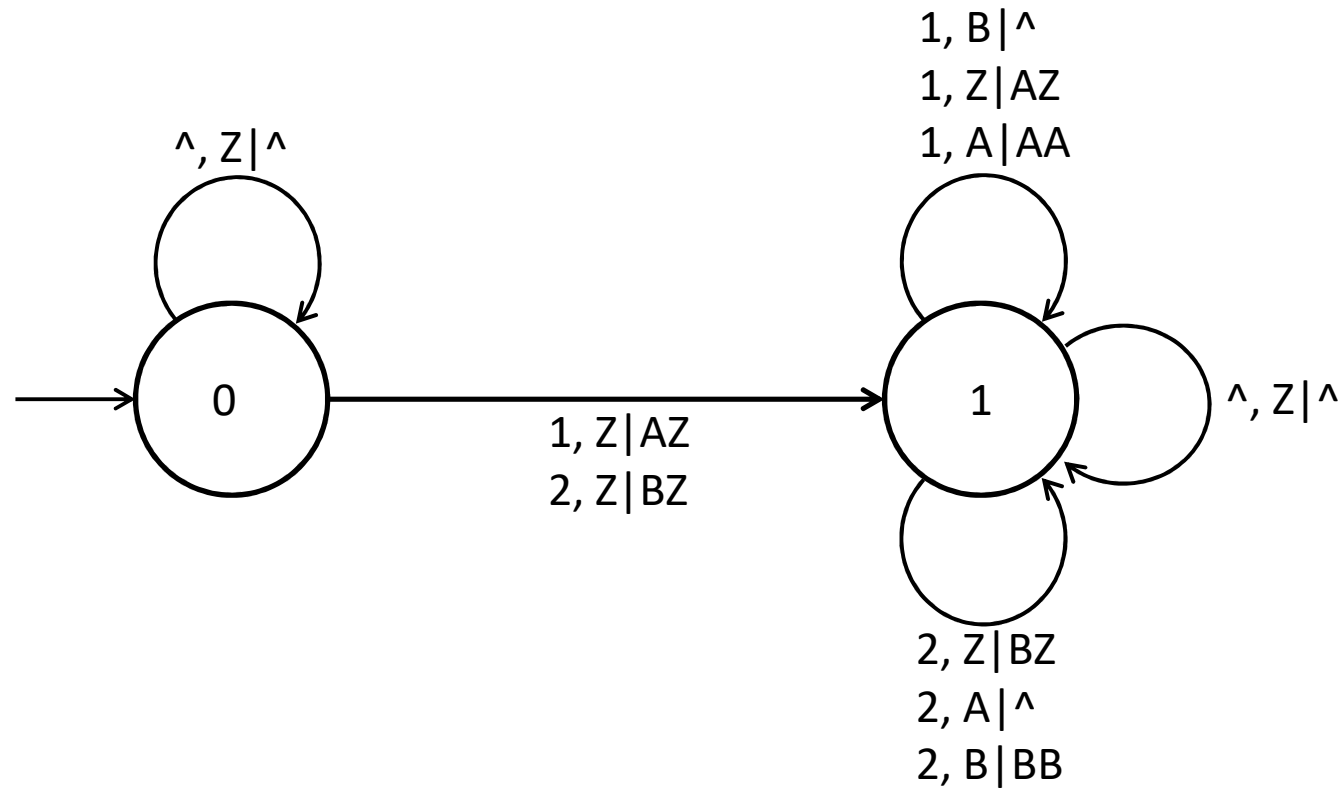
**Exercise 9**  
**DPDA Recognizing  $w3w'$ ,  $w$  of 1's and 2's,**  
**and  $w'$  is  $w$  spelled backwards**



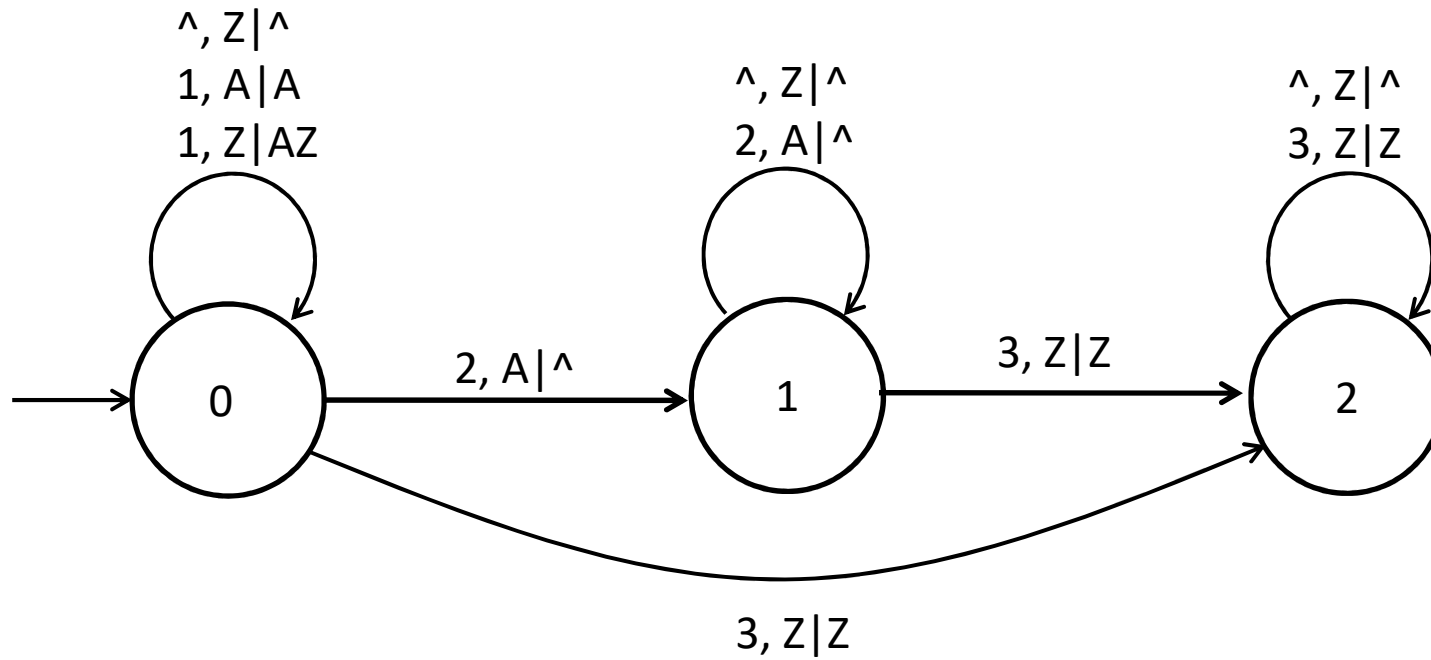
### ***Exercise 10***

#### ***DPDA Recognizing Strings with an Equal number of 1's and 2's***

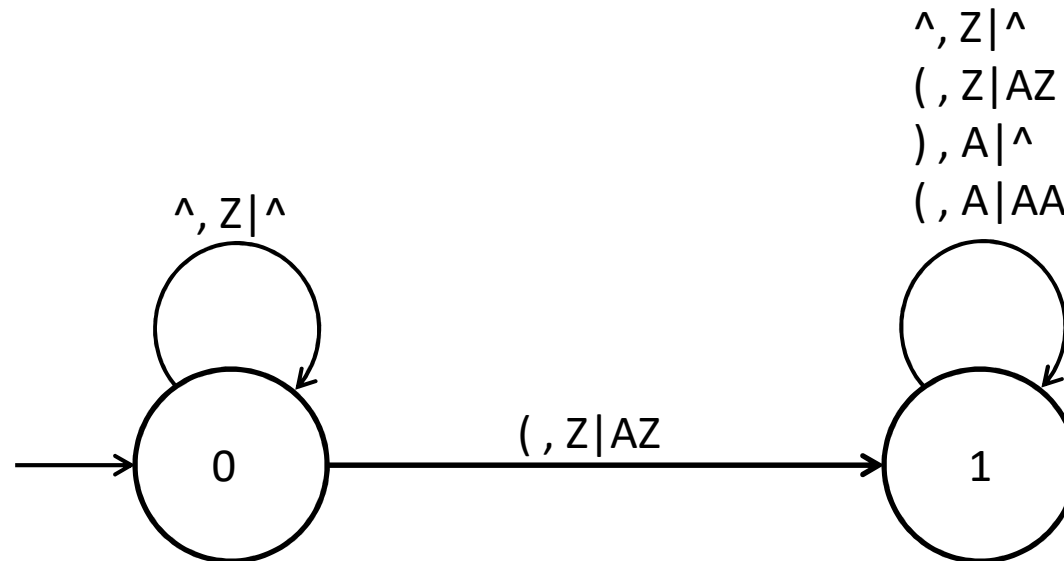
## DPDA Recognizing Strings with an Equal number of 1's and 2's



**Exercise 11**  
**DPDA Recognizing  $1^m 2^m 3^n$ ,  $n \geq 0$ ,  $m \geq 0$**



**Exercise 12**  
***DPDA Recognizing Strings with Balanced Parentheses***



**Exercise 13**  
**DPDA Recognizing  $1^n 2^n$  OR  $1^n$ ,  $n \geq 0$**

