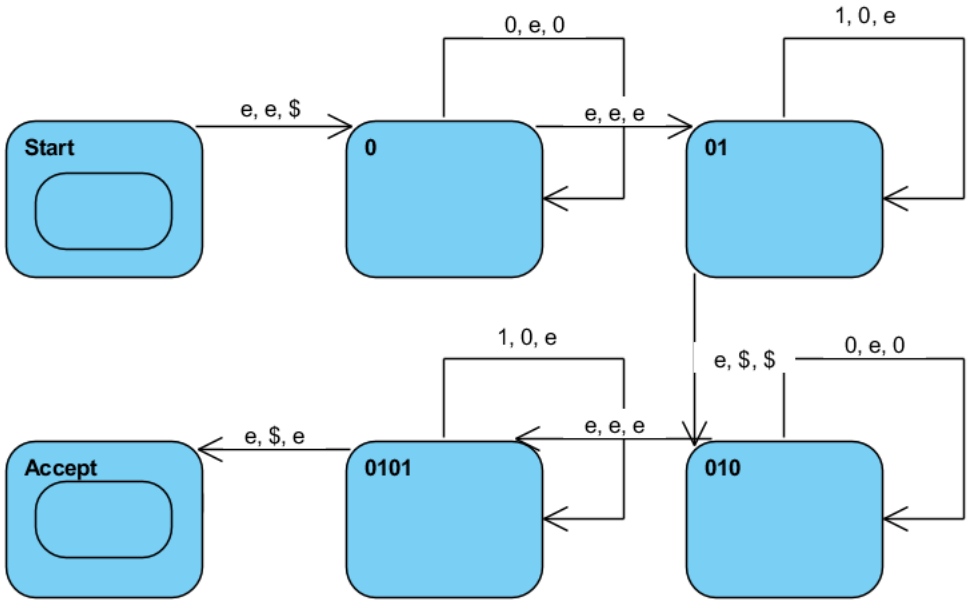
Michael Wang
CS 181 HW #6

1)



This non-deterministic PDA pushes a $ symbol, counts the number the of 0's then counts the number of 1's proceeding only if their numbers are equal. The exact same process is repeated, with the string only being excepted if the final stack is empty.

2)

Assume L2 is a CFL. Then there here exists a pumping length p. Consider string s = $b^{2p}ab^pc^p$. Since s is in L2, there must be some substring vxy such that wv^ixy^iz is in L2 for all i >= 0. There are three possible cases to consider – vxy is contained within r, vxy contains a, or vxy is contained within t. In the first and third cases, pumping clearly causes r or t to be a different size from the other and so cannot be a member of L2. If vxy contains a, neither v nor y can contain a as pumping would cause the string to have something other than exactly one a. So v must be some number of b's from r and y some number of b's from t. However, pumping y means that the number of b's and c's in t are not equal. Thus there is no way to assign v and y such that the pumping lemma is satisfied. This contradiction shows that L2 is not a CFL.