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CS4110
Homework 8
Due November 9

P01. Turning Machine

Trace the execution chains of the following input strings on this machine: “aba” and “ababb”.

START	3	4	4	5	6	7	1	2	
a̲ba →	#b̲a →	#ba̲ →	#baΔ →	#ba̲ →	#b̲# →	#̲b# →	#b̲# →	###̲	**CRASH**

START	3	4	4	4	4	5	6	7	7	7
a̲babb →	#b̲abb →	#ba̲bb →	#bab̲b →	#babb̲ →	#babbΔ →	#babb̲ →	#bab̲# →	#ba̲b# →	#b̲ab# →	#̲bab#

1	2	4	4	5	6	7	1	3	**HALT**
→ #b̲ab#	→ ##a̲b#	→ ##ab̲#	→ ##ab̲#	→ ##a̲b#	→ ##a̲##	→ ##̲a##	→ ##a̲##	→ #####̲	#####̲

The language accepted by this TM is all words with an odd number of letters that have a as the middle letter. Show that this is true by explaining the algorithm the machine uses and the meaning of each state

(1) From the start state it reads either a or b, replaces it with #, and moves to 2 or 3 respectively.
(2) or (3) it moves the head to the right if it reads another a or b and goes to 4
(4) it moves the head to the right until it reaches the end or a #. When it reaches the end or a # it moves the head left and goes to 5
(5) if it finds an a or b it replaces with # and moves left the head left and we are at 6.
(6) move the head to the left again when it reads a or b and goes to 7
(7) move the head left til it reaches a #
(1) repeat previous steps unless it reads an a then #. This ensures that only strings with that have a in the center and are also odd are accepted.

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P02. Turning Machine

Build a TM that accepts the language of all words that contain the substring bbb