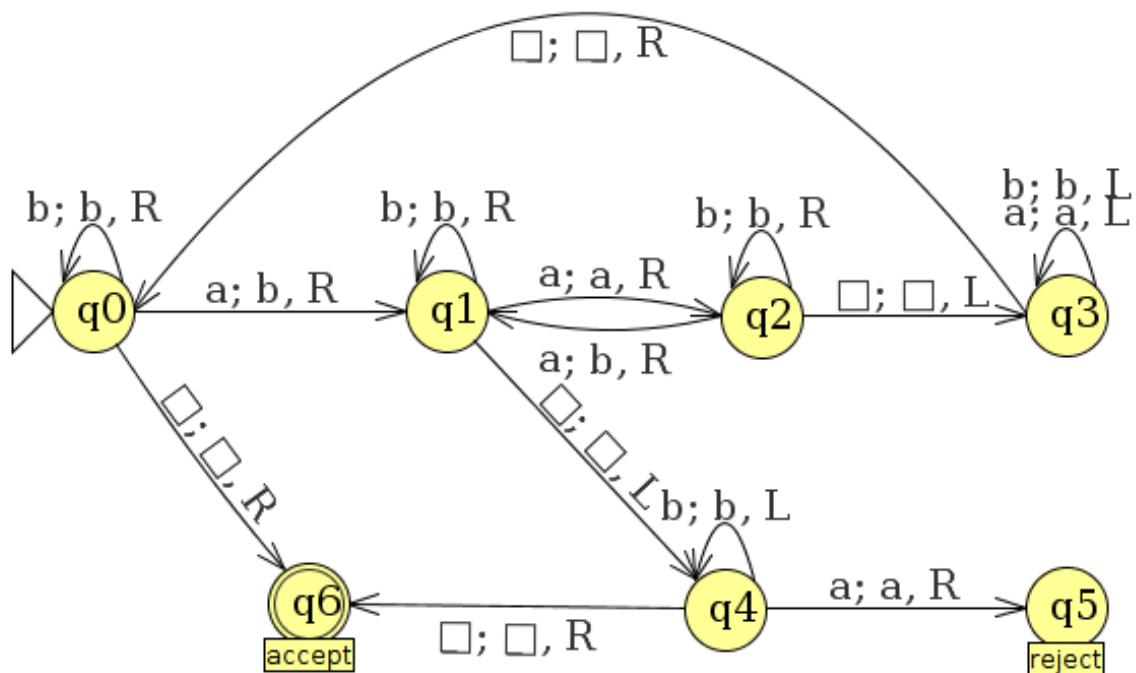


Intro to Computer Science Theory: Homework 10

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August 2017 - December 2017

Problem 1



This Turing machine works essentially by taking the length of the input and “dividing it by 2”. We start from the beginning and cross out every other a , until we reach the

end. If we've reached the end of the string and the end character was crossed out, then we scan backwards looking for uncrossed characters. If there were characters that were not crossed out, then there is a remainder from dividing by two and thus the length is not a power of 2, otherwise the length is a power of 2 and we accept. If we've reached the end of the string during the crossing process but the last character was not crossed out, then we jump back to the start of the string and repeat from the beginning. For the purpose of the following pseudocode and the diagram above, we will represent crossed out a 's as b .

Step 1:

```
if tape is on the blank character:  
    ACCEPT
```

Step 2:

```
while tape is on b:  
    move right  
replace a with b  
move right  
if tape is on the blank character:  
    go to Step 3  
while tape is on b:  
    move right  
if tape is on a:  
    move right  
if tape is on the blank character:  
    move left back to beginning  
    go to Step 1  
go to Step 2
```

Step 3:

```
while tape is on b:  
    move left  
if tape is on a:  
    REJECT  
if tape is on the blank character:  
    ACCEPT
```

If you have any questions, comments, or concerns, please contact me at
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