University of Massachusetts Boston

Title

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April 24, 2012

Problem 1

Why should you use this template?

1. Latex makes it easier to have great looking homeworks
2. Latex "tex" files work great with revision control systems such as *svn* and *git*
3. Math is much easier to write $\sum_{i=0}^{\infty} i(1-p^+)^{i-1}p^+ = \frac{p^+}{(1-(1-p^+))^2}$

- Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean et condimentum nunc. Nulla a mattis quam. Nullam vitae eros dui, sit amet fringilla quam. Nulla facilisi. Nulla aliquam ipsum eget turpis porttitor luctus. Proin sem ante, $\sum_{i=0}^{\infty} i(1-p^+)^{i-1}p^+ = \frac{p^+}{(1-(1-p^+))^2}$ lobortis nec euismod id, imperdiet quis eros. Donec sit amet diam at leo pretium dignissim. Donec molestie velit eget orci adipiscing euismod ut sit amet lorem. Pellentesque elementum faucibus diam sit amet aliquam. Nullam augue massa, ullamcorper vel rhoncus sit amet, posuere ac mauris. Nulla commodo dapibus leo quis condimentum.

- 1. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean et condimentum nunc. Nulla a mattis quam. Nullam vitae eros dui, sit amet fringilla quam.
  2. Nulla facilisi. Nulla aliquam ipsum eget turpis porttitor luctus. Proin sem ante, lobortis nec euismod id, imperdiet quis eros. Donec sit amet diam at leo pretium dignissim.
  3. Donec molestie velit eget orci adipiscing euismod ut sit amet lorem. Pellentesque elementum faucibus diam sit amet aliquam.
  4. Nullam augue massa, ullamcorper vel rhoncus sit amet, posuere ac mauris. Nulla commodo dapibus leo quis condimentum.

Sometimes we want a fixed width font:

```
#!/bin/bash
tar -cZf /var/my-backup.tgz /home/me/
echo Hello World
```

Problem 2

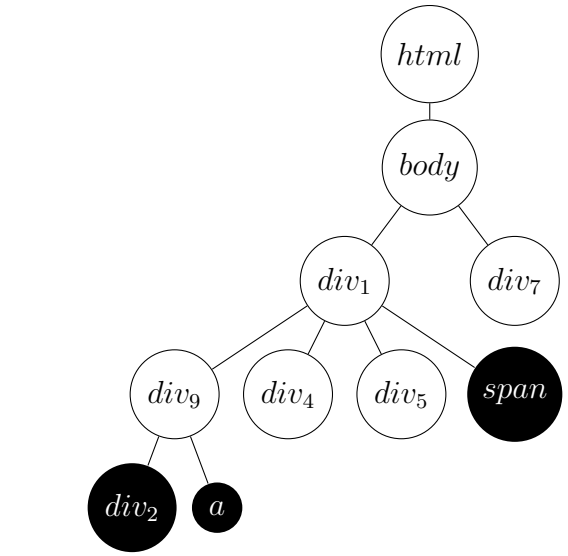
You want to include images? Check out Figures 1 and 2.

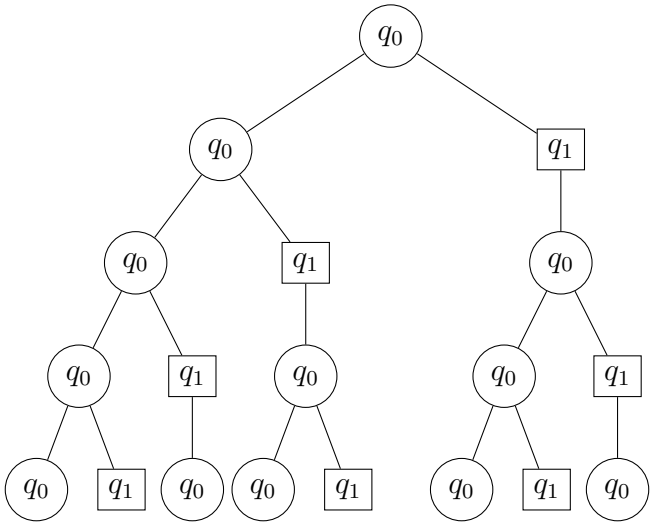
Figure 1: The UMASS Boston Logo

Figure 2: The UMASS Boston Logo

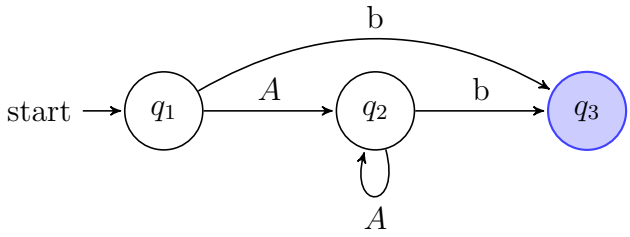
Problem 3

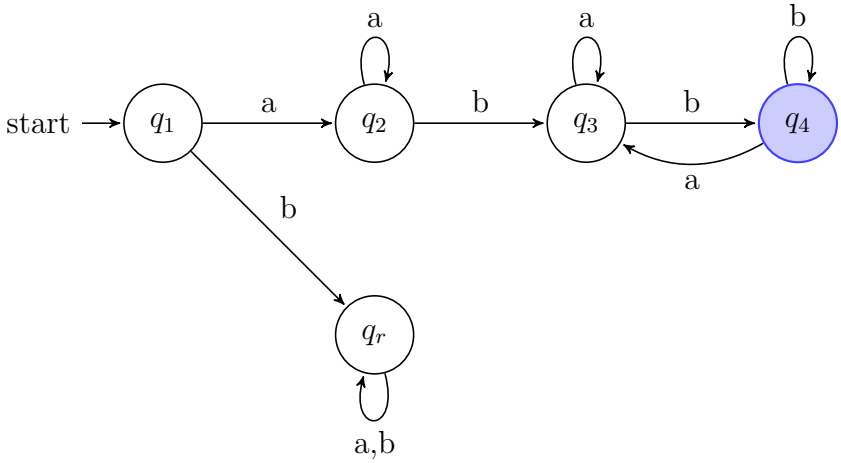
You want to draw a tree? You can use the Tikz library. This library is amazing. You can check out examples here at `http://www.texample.net/tikz/`

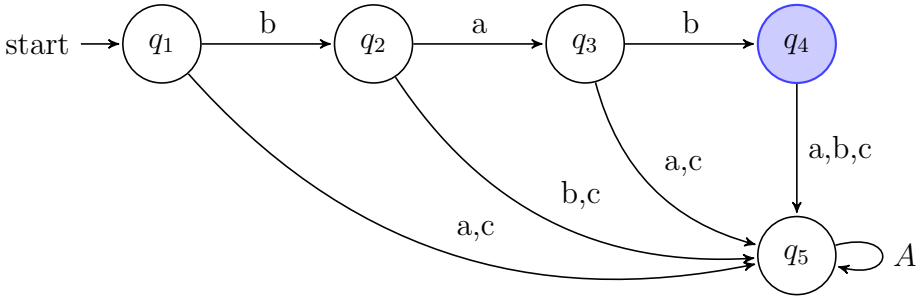




Automata


start
q_1
q_2
q_3
A
b
A
b


start
q_1
q_2
q_3
q_4
q_r
a
b
a
b
a
b
a
b
a,b


start
q_1
q_2
q_3
q_4
q_5
b
a
b
a,c
a,b,c
b,c
a,c
A

Problem 4

You want to do some linear algebra?

$$V = \begin{pmatrix} v_{1,1} & \dots & v_{1,n} \\ \vdots & \ddots & \\ v_{2,1} & \dots & v_{2,n} \\ \vdots & \ddots & \\ v_{m,1} & \dots & v_{m,n} \end{pmatrix}$$

$$\underbrace{rank(AB)}_{n} = \underbrace{rank(B)}_{\leq n} - dim(\underbrace{null(A)}_{0} \cap \underbrace{range(B)}_{n})$$

$$M_f = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

$$M_f M_g = \begin{pmatrix} ae + bg & af + bh \\ ce + dg & cf + dh \end{pmatrix} \tag{1}$$

$$\sum_{i=1}^{n} \sum_{j=1}^{n} b_{ij} = 0$$

$$\begin{cases} y_1 u_{1,1} + y_2 u_{1,2}, \dots, y_n u_{1,n} = 0 \\ y_1 u_{2,1} + y_2 u_{2,2}, \dots, y_n u_{2,n} = 0 \\ \dots \\ y_1 u_{m,1} + y_2 u_{m,2}, \dots, y_n u_{m,n} = 0 \end{cases}$$

Problem 5

So you want to write an algorithm?

Algorithm 1: Simple Tree Matching

Input: Tree a
Tree b
Output: Integer *match*

```
1  if a and b contain distinct symbols then
2      return 0
3  else
4      m ← the number of first-level sub-trees of a
5      n ← the number of first-level sub-trees of b
6      M[i, 0] ← 0 for i = 0, ..., m
7      M[0, j] ← 0 for j = 0, ..., n
8      for i = 1 to m do
9          for i = 1 to n do
10             x ← M[i, j − 1]
11             y ← M[i − 1, j]
12             z ← M[i − 1, j − 1] + SimpleTreeMatch(a_i, b_j)
13             M[i, j] ← max(x, y, z)
14     return M[m, n] + 1
```

Problem 6

Want to make tables?

Set	$a^{-1}(Set)$	$b^{-1}(Set)$
aA^*bA^*b	$A^*bA^*b \cup bA^*b$	$\emptyset$
$A^*bA^*b \cup bA^*b$	$A^*bA^*b \cup bA^*b$	$A^*bA^*b \cup bA^*b \cup A^*b \cup b$
$A^*bA^*b \cup bA^*b \cup A^*b \cup b$	$A^*bA^*b \cup bA^*b \cup A^*b \cup b$	$A^*bA^*b \cup bA^*b \cup A^*b \cup b \cup \lambda$
$A^*bA^*b \cup bA^*b \cup A^*b \cup b \cup \lambda$	$A^*bA^*b \cup bA^*b \cup A^*b \cup b$	$A^*bA^*b \cup bA^*b \cup A^*b \cup b \cup \lambda$

Δ	0	1
q_0	q_1	q_1
q_1	q_1	q_1

Name	Lang	Clean	Rep.	Query
JSoup	Java	⋆	⋆	⋆
NokoGiri	Ruby	⋆	⋆	⋆
TagSoup	Java	⋆	⋆	⋆
Taggle	C++	⋆	⋆	⋆
Rubyful Soup [1]	Ruby	⋆	⋆	⋆
Beautiful Soup [2]	Python	⋆	⋆	⋆
NekoHtml [3]	Java	⋆	⋆	⋆
Xom [4]	Java		⋆	⋆
Saxon [5]	Java		⋆	⋆
Xerces [6]	Java		⋆	⋆
HTMLParser [7]	Java		⋆	⋆
XStream [8]	Java		⋆	⋆
Dom4j [9]	Java		⋆	⋆
HTML Tidy [10]	C	⋆		
JTidy [11]	Java	⋆		
Tika [12]	Java	⋆		
HTMLCleaner [13]	Java	⋆		
Jaxen [14]	Java			⋆
Xalan [15]	Java			⋆

Problem 7

Sometimes we want to do things for a math class: