Errata and Updates for Algorithms Sequential and Parallel: A Unified Approach

Russ Miller
Laurence Boxer

Prentice-Hall, Inc., New Jersey, 2000
(Posted 7/4/00 9:41 AM)
Overview


Please note that the PowerPoint slides containing the algorithms, figures, and examples for the book are presented in the order they appear in the book. Prentice-Hall only provided the authors with images, some of which do not correspond exactly to what is in the book. Therefore, the instructor might want to look carefully over individual slides before displaying to the class. We apologize for the inconvenience.

Also note that the lecture notes have been used in classes at the State University of New York at Buffalo. Surely, there are errors in these slides. We would appreciate any feedback and will immediately correct any problems that surface.

A solutions manual is available from the publisher on CD ROM.

Please feel free to forward any comments, questions, and criticism to the authors via www.prenhall.com/millerboxer/

Russ Miller & Laurence Boxer, July 2000
Chapter 1

p. 11, last paragraph: bad line break in symbol $a \neq b$

p. 14, Example, bottom half of page: Change equation

$$f(n) = \sum_{k=1}^{n} \frac{1}{k}$$

to

$$g(n) = \sum_{k=1}^{n} \frac{1}{k}$$
Chapter 2

p. 33, 8: Change

and the right … equation is is

to:

and the right … equation is

p. 43, 14: Change indentation so “If” aligns with “Else” 3 lines later:

If head1.sortkey ≤ head2.sortkey then
   {Start merged list with 1st element of 1st list}
      headMerge = head1; head1 = head1.next
   Else

p. 48: Each of exercises 3 through 6 has a “recurrence” (a pair of equations/inequalities) of the form

\[ T(1) = 1 \]
\[ T(n) \ldots \]

These should have the same indentation across all of these exercises. The same indentation should also be used for the equations of exercise 8, p. 49.
Chapter 3

p. 53, item 3: Change
3. … and there are constants $c < 1$ and $N > 0$ such…

to
3. … and there are constants $c$ and $N$, $0 < c < 1$ and $N > 0$, such …

p. 55, item 3: Change
If there is a positive constant $c < 1$ such that $n \geq b \Rightarrow af(n / b) \leq cf(n)$, then …

to
If there are constants $c$ and $N$, $0 < c < 1$ and $N > 0$, such that $n / b > N \Rightarrow af(n / b) \leq cf(n)$, then …

p. 55, bottom quarter of page:
Replace
For case 3, …. The hypothesis of the case, that there is a constant $c < 1$ such that

$af(n / b) \leq cf(n)$,

implies (by an easy induction argument that is left to the reader) that $n \geq b^k \Rightarrow a^k f(n / b^k) \leq c^k f(n)$. When we substitute the latter into (3.2), we get

$$g(n) = \sum_{k=0}^{\log_b n-1} a^k f(\frac{n}{b^k}) \leq \sum_{k=0}^{\log_b n-1} c^k f(n) = f(n) \sum_{k=0}^{\log_b n-1} c^k.$$  

Since the latter summation is a geometric series with decreasing terms, it follows that

$$g(n) \leq f(n) \left( \frac{1}{1 - c} \right) \Rightarrow g(n) = O(f(n)).$$

Since we previously showed….

by

For case 3, …. The hypothesis of the case, that there are constants $c$ and $N$, $0 < c < 1$ and $N > 0$, such that $n / b > N \Rightarrow af(n / b) \leq cf(n)$, implies (by an easy induction argument that is left to the reader) that

$n / b^k > N \Rightarrow a^k f(n / b^k) \leq c^k f(n)$.

When we substitute the latter into (3.2), we get

$$g(n) = \sum_{k=0}^{\log_b n-1} a^k f(\frac{n}{b^k}) =$$

$$\sum_{k \in \{0,1,\ldots,\log_b n-1\}, n / b^k \leq N} a^k f(\frac{n}{b^k}) + \sum_{k \in \{0,1,\ldots,\log_b n-1\}, n / b^k > N} a^k f(\frac{n}{b^k}).$$

In the latter expression, the former summation

$$\sum_{k \in \{0,1,\ldots,\log_b n-1\}, n / b^k \leq N} a^k f(\frac{n}{b^k}) = \Theta(1)$$

since at most a constant number of terms satisfy $n / b^k \leq N$; and the latter summation

$$\sum_{k \in \{0,1,\ldots,\log_b n-1\}, n / b^k > N} a^k f(\frac{n}{b^k}) \leq \sum_{k=0}^{\log_b n-1} c^k f(n) = f(n) \sum_{k=0}^{\log_b n-1} c^k.$$
The latter summation is a geometric series with decreasing terms. It follows that
\[ g(n) \leq \Theta(1) + f(n) \left( \frac{1}{1-c} \right) \Rightarrow g(n) = O(f(n)). \]

Since we previously showed…. 
p. 68: The commented chain of inequalities has incorrect capitalization and periods in the comments. We have requested that most comments be treated as sentences. These, however, should be regarded as mid-sentence phrases. Thus:

\[ a_i \geq a_{k-n+1} \quad \text{(since} \quad k-n+1 \leq i \leq n \leq j \text{)} \]
\[ \geq a_{k+1} \quad \text{(by choice of} \quad k) \]
\[ \geq a_{i+n} \quad \text{(since} \quad j < k+1 \leq i+n \text{)} \].
Chapter 6

p. 95, -2: Change “minimum of ... minima are computed” to “minimum of ... minima is computed”

p. 131, -2: Change “row I of I’ to “row i of I’”

p. 133, First paragraph, last 3 sentences. Change

... that is, the outer For j loop may be ... and the inner For k loop parallelizes. As ... the outer For j loop ... requires \( \Theta(n \log n) \) time ....

to

... that is, the outer For row loop may be ... and the inner For col loop parallelizes. As ... the outer For row loop ... requires \( O(n \log n) \) time ....
Chapter 7

p. 137, last sentence of 2nd paragraph: Change

require \( x_i \otimes x_j = x_j \otimes x_i \) to be true

to

require \( x_i \otimes x_j \) to be equal to \( x_j \otimes x_i \)

p. 140, caption for Figure 7-4: Change

\[ \log_2 11 \]

to

\[ \lfloor \log_2 11 \rfloor \]

p. 153, middle paragraph: Change

The first … of \( y \)-coordinates.

to

The first … of \( x \)-coordinates.

p. 155, -7 - -6: Change

The input to this problem consists of the set \( S \) of \( n \) line segments along with \( A \) and \( B \), which represent the range on the \( x \)-axis under consideration.

to:

The input to this problem consists of an ordered set of \( 2n \) endpoint records, as discussed above.
Chapter 8

p. 161, 6: Change

Since the cost for a PRAM …

to

Since the time for a PRAM …

p. 161, last line of caption: change

five iterations are required ($\lceil \log_2 10 \rceil + 1 = 5$)

to

four iterations are required ($\lceil \log_2 10 \rceil = 4$)

p. 163, last row of figure 8-2: Change

$x_1 \otimes x_2 \ x_1 \otimes x_2 \otimes x_3 \ x_1 \otimes x_2 \otimes x_3 \otimes x_4 \ x_1 \otimes x_2 \otimes x_3 \otimes x_4 \otimes x_5 \ x_1 \otimes x_2 \otimes x_3 \otimes x_4 \otimes x_5 \otimes x_6$

to

$x_1 \ x_1 \otimes x_2 \ x_1 \otimes x_2 \otimes x_3 \ x_1 \otimes x_2 \otimes x_3 \otimes x_4 \ x_1 \otimes x_2 \otimes x_3 \otimes x_4 \otimes x_5 \ x_1 \otimes x_2 \otimes x_3 \otimes x_4 \otimes x_5 \otimes x_6$

(if necessary, shrink the figure)

p. 163, caption: Change

prefix computation, plus an additional iteration to determine that the process should terminate ($\lceil \log_2 6 \rceil + 1 = 4$).

to

prefix computation ($\lceil \log_2 6 \rceil = 3$).
Chapter 9

p. 183, 8: change “elementof” to “element of”

p. 187, 2nd bulleted item: the phrase

\[ \text{to partition } n \text{ data items,} \]

should not be repeated

p. 188, -6:

\[ \{ \text{A constant.} \} \]

should be

\[ \{ \text{a constant} \} \]

p. 190, -8: “and let R” should be “and let U”

p. 199, -2: “fast algorithm sorting algorithm” should be “fast sorting algorithm”
Chapter 11

p. 234, -11: “positive integer $c > 0$” should be “positive integer $c$”

p. 240, last paragraph:
should be
adjacent elements are stored
elements with the same label are stored

p. 241, 1-2:
Notice that all of … processors. Therefore, we can
should be
Since all of … processors, we can

p. 241, 2nd line of item c): Change

triangle formed … two.

to

angle formed by $X$ and the other two, with $X$ as the vertex of the angle.
Chapter 12

p. 260, first paragraph of Fundamental Algorithms section: rewrite the last sentence as follows:

In particular, we discuss an Euler tour technique for the RAM; list ranking via pointer jumping, and tree contraction, for the PRAM; and the transitive closure of a Boolean matrix for the RAM, PRAM, and mesh.

p. 269, Figure 12-17(b): In the left column of the figure, the right box for each entry should have a (horizontal) pointer to the corresponding box in the second column of the figure.

p. 271, 13: Change

\[ \text{For } [\log_2 (n + 1)] \]

to

\[ \text{For } [\log_2 (n - 1) - 1] \]

p. 271: In the For … End For structure of the algorithm, the three statements in the body of the structure should have the same indentation formatting. Thus, including the correction given above:

\[ \text{For } [\log_2 (n - 1) - 1] \text{ iterations, do} \]
\[ \text{Apply the collapse operation to all leaf nodes with odd indexed entries in Active that are left children. That is, apply collapse simultaneously to nodes that are left children from the set of first, third, fifth, ..., elements in Active.} \]
\[ \text{Apply the collapse operation to the remaining leaf nodes that correspond to odd indexed entries in Active.} \]
\[ \text{Update Active by removing the indices of the odd indexed leaves that were just collapsed and then compressing the array Active.} \]

end For

p. 274, Figure 12-22(a): change

(a) The value

to

(a) At time
Index

p. 319: eliminate the entry for “common terminology”

p. 322: italicize the $k$ in the entry for “$k$-dimensional edge”

p. 323: “medium-gained hypercube” should be “medium-grained hypercube”

p. 323: under “MergeSort,” delete the entry for “unordered list”

p. 324: under “minimum-cost spanning trees,” add an entry for

Sollin’s algorithm, 282-283

p. 324: eliminate the items

$n / 5$ medians, 172-173
$n / 5$ sorting routines, 172

p. 325: under “PRAM,” eliminate the entry for “Euler tour”

p. 328: under “QuickSort,” eliminate the entry for

improving, 189-190

and change the next item to

improving running time, 189-190

p. 329: The entry for “tree machine” should be split into two entries, as follows:

tree algorithms, 269-286
contraction, 269-273
Euler tour, 268-269
graft, 276
hook, 276
tree machine, 77, 103-105
bisection width, 104
broadcast operations, 104
combine-type operations, 104
extensive data movement, 105
semigroup operations, 104

(Also don’t forget to alphabetize: tree-like algorithms between tree algorithms and tree machine)