

Principles of Database Systems, 5 points

TDBC86, fall 2004
Obligatory Exercise 5

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1 Specification of the Problem

This assignment primarily dealt with solving a specified problem to produce the desired result.

The entire exercise is available on the university website at:

<http://www.cs.umu.se/kurser/TDBC86/H04/Oblig/oblig5.ps>.
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2 B-trees

1.

(a) $\frac{4000-4}{180+4} = 21.72(21)$

(b) $\frac{\ln\left(\frac{4*10^9+1}{1+1}\right)}{\ln(10+1)} = 8.93(8)$

(c) $\frac{\ln(4*10^9+1)}{\ln(21+1)} - 1 = 6.15(7)$

2.

(a) $\sqrt[8]{\frac{4*10^9+1}{5+1}} - 1 = 11.68(12)$ Consistent.

$$\frac{4*10^9-5}{11.68} - 1 = 3.43 * 10^8$$

(b) $\sqrt[8]{\frac{4*10^9+1}{11+1}} - 1 = 10.62(11)$ Consistent.

$$\frac{4*10^9-11}{10.62} - 1 = 3.77 * 10^8$$

(c) $\sqrt[8]{\frac{4*10^9+1}{17+1}} - 1 = 10.05$, 17 records in the root node, consistent.

$$\frac{4*10^9-17}{10.62} - 1 = 3.98 * 10^8$$

(d) $\sqrt[7]{\frac{4*10^9+1}{5+1}} - 1 = 17.22$ Consistent.

$$\frac{4*10^9-11}{10.62} - 1 = 2.32 * 10^8$$

(e) $\sqrt[7]{\frac{4*10^9+1}{15+1}} - 1 = 14.84$ Consistent.

$$\frac{4*10^9-11}{10.62} - 1 = 2.70 * 10^8$$

3 B⁺-trees

3.

(a) $\frac{4000-4}{16+4} = 199.8(199)$

(b) $\frac{4000-42}{180} = 21.99(21)$

(c) $\log_{100+1} \left(\frac{4 \cdot 10^9}{(1+1) \cdot 11} \right) + 1 = 5.12(5)$

(d) $\log_{199+1} \left(\frac{4 \cdot 10^9}{(199+1) \cdot 21} \right) + 1 = 3.60(4)$

4. $R = (m + 1) * (q + 1)^{d-1} * r$

(a) ${}^{4-1}\sqrt{\frac{4 \cdot 10^9}{(1+1) \cdot 21}} - 1 = 455.67(455)$ Inconsistent!

(b) ${}^{4-1}\sqrt{\frac{4 \cdot 10^9}{(199+1) \cdot 21}} - 1 = 97.39(98)$ Inconsistent!

(c) ${}^{4-1}\sqrt{\frac{4 \cdot 10^9}{(117+1) \cdot 21}} - 1 = 116.98$, 117 indices per interior node, consistent.

$1 + \frac{(116.98+1) \cdot ((116.98+1)^{4-1} - 1)}{116.98} = 1.66 * 10^6$ interior nodes.

$\frac{4 \cdot 10^9}{21} = 1.90 * 10^8$ leaf nodes.

(d) $\frac{4 \cdot 10^9}{(100+1)^{4-1} \cdot 11} - 1 = 351.94(352)$ Inconsistent!

(e) $\frac{4 \cdot 10^9}{(199+1)^{4-1} \cdot 11} - 1 = 44.45(45)$ Inconsistent!

(f) $\frac{4 \cdot 10^9}{(149.25+1)^{4-1} \cdot 11} - 1 = 106.21(107)$ Consistent.

4 Limitations of the Solution

None that I am aware of.

5 Problems and Ponderings

The algorithms in the course literature seem to be written with the intention of confusing whomever encounters them. Luckily the overhead slides were comprehensible.