CISC 341 - Spring 2017

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Assignment #7 -Chapter 7

You must provide detailed answers to receive full credit (show your work)!

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2. Calculate the overall speedup of a system that spends 40% of its time in calculations with a processor upgrade that provides for 100% greater throughput.
It should spend 20% of its time on calculations.

3. Suppose your company has decided that it needs to make certain busy servers 50% faster. Processes in the workload spend 60% of their time using the CPU and 40% on I/O. In order to achieve an overall system speedup of 25%:

a) How much faster does the CPU need to be?   the CPU and the disk must each be 25% faster.
b) How much faster does the disk need to be?

8. Suppose the daytime processing load consists of 60% CPU activity and 40% disk activity. Your customers are complaining that the system is slow. After doing some research, you have learned that you can upgrade your disks for $8,000 to make them 2.5 times as fast as they are currently. You have also learned that you can upgrade your CPU to make it 1.4 as fast for $5,000.

a) Which would you choose to yield the best performance improvement for the least amount of money?   for the least amount of money, i would upgrade my cpu since then i would spent the least amount of money.
b) Which option would you choose if you don't care about the money, but want a faster system?
otherwise, i would choose to upgrade both the cpu and the disk system.
c)   What is the break-even point for the upgrades? That is, what price would we need to charge for the CPU (or the disk – change only one) so the result was the same cost per 1% increase for both?
[60/2.5=8000/a],[40/1.4=5000/b]. [24=8000/a],[28.6=5000/b]. [8000/24=333.33],[5000/28.6=175]
[333.33/175=1.9],[a:=(333.33-(333.33/1.9)/2), b:=(175+(175*1.9)/2)].:[a:=245.6, b:=341.25].

10. Amdahl's Law is as applicable to software as it is to hardware. An oft-cited programming truism states that a program spends 90% of its time executing 10% of its code. Thus, tuning a small amount of program code can often time have an enormous affect on the overall performance of a software product. Determine the overall system speedup if:

a) 90% of a program is made to run 10 times as fast (900% faster).   810%,116%
b) 80% of a program is made to run 20% faster.

29. Suppose a disk drive has the following characteristics: • 5 surfaces • 1024 tracks per surface • 256 sectors per track • 512 bytes/sector • Track-to-track seek time of 8 milliseconds • Rotational speed of 7500 RPM.

a) What is the capacity of the drive?   5*1024*256*512=671088640 bytes
b) What is the access time?   8+(256/2)/7500*1024 = 25.463ms.
c) Is this disk faster than the one described in question 17? Explain.
5+ (128/2)/5000)*1024=18.1ms, no.

40. The disk drives connected to the servers in your company's server farm are nearing the end of their useful life. Management is considering replacing 8TB of disk capacity with SSDs. Someone is making the argument that the difference in the cost between the SSDs and traditional magnetic disks will be offset by the cost of electricity saved by the SSDs. The 800GB SSDs cost $900. The 800GB server-grade HDDs cost $300. Use the disk specifications in Figures 7.15 and 7.16 to confirm or refute this claim. Assume that both the HDD and SSD are active 25% of the time and that the cost of electricity is $0.10 per kilowatt hour. Hint: Use the "Read/Write" and "Idle" power requirements in Figure 7.15. SSD is a good purchase only if they will last and perform long enough to cover the difference in cost.

Chapter 7A: Focus On Data Compression

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5. Compute the compression factors for each of the JPEG images in Figure 7A.4.
63.227%, 72.045%, 79.1745%, 88%, 89.5685%

6. Create a Huffman tree and assign Huffman codes for the "Star Bright" rhyme used in Section 7A.3. Use <ws> for whitespace instead of underscores.

7. Complete the LZ77 data compression illustrated in section 7A.3

9. a) The LZ77 compression algorithm falls into which class of data compression algorithms? arithmetic compression

b) Name an advantage of Huffman coding over LZ77. huffman coding is specific to every letter.

c) Name an advantage of LZ77 over Huffman coding. LZ77 is much easier to do and requires less resources.

d) Which is better? LZ77 IS BETTER.

STAR_LIGHT_STAR_BRIGHT_
FIRST_STAR_I_SEE_TONIGHT_
I_WISH_I_MAY_I_WISH_I_MIGHT_
GET_THE_WISH_I_WISH_TONIGHT

A4 B1 C0 D0 E2 F1 G6 H9 I15 J0 K0 L1 M2
N2 O2 P0 Q0 R3 S8 T12 U0 V0 W4 X0 Y1 Z0

1 1 1 1 2 2 2 2 3 4 6 8 9 12 15 22
B F L Y E M N O R A G S H T I <ws>

69 total
            32
12   20   37
4   8   12   18   15 22
BFLY EMNO RH AGS I<ws>//6

I do not understand LZ77.
I thought that every repetition of a letter would get its coordinates in the sentence recorded onto its coodinates on the grid.
Like this:
S:1.1.1.1.1;T:2.1.2.1.1;A3.1.3.1.1;R:4.1.4.1.1
…
G:1.4.19.3.5;E:2.4.19.4.2;etc.   //7