CS 410003 Computer Architecture

Homework 1

(Due: 2015-03-23 23:59)

[102062801] [孫勤昱]

Please evaluate your computer performance by executing the following benchmarks, and fill the blanks of table. In addition, the CPU spec of your computer has to be reported too. You can download the benchmark source code from iLms, and re-compile them for your Linux system.

Compile Instructions

1) Change directories to “src” of benchmarks. (eq. SPEC2000_SS/CINT2000/164.gzip/src)

2) Make sure your gcc location in *Makefile.defaults* (eq. cc=gcc), and type "make",

3) Execute the “./run” script, and report your program elapsed time.

Benchmark	Execution time	Reference time (sec)	SPEC ratio
164.gzip	0.943	1.36	1.4 (實際 = 1.442206)
175.vpr	0.757	1.025	1.4 (實際 = 1.354029)
181.mcf	0.126	0.16	1.3 (實際 = 1.269841)
Geometric mean	$\sqrt[3]{(1.4 * 1.4 * 1.3)}$ = 1.36584 = 1.4		
Arithmetic mean	(1.4+1.4+1.3)/3 = 1.366667 = 1.4		

CPU spec	
Host: ic25	
Processor number	Xeon(R) X5570
Feq / # of core	2.93GHz/4C8Tx2
Ram	48G
OS	CentOS 5.11

What is the difference between Geometric mean and Arithmetic mean? Please show some cases to explain.

ANS:

(1).

Geometric mean : n個數，相乘後開n次方更號

Arithmetic mean : n個數，相加後除n

上課黃老師說，Geometric mean不會把某個高值，在整體表現(平均)放大很多。但是，Arithmetic mean會放大。對於計算"整體"好壞，Geometric mean比較能表示出整體。

(2)

假設今天A電腦與B電腦互相比較功能a、b、c、d之效能，兩台電腦利用相同測試軟體跑出四項的分數。分數如下：

A電腦分別為10, 10, 10, 10

B電腦分別為5, 5, 5, 25

另外，我們使用Geometric mean與Arithmetic mean的計算公式，我們可以得出分數如下：

A電腦的Arithmetic mean = 10; B電腦的Arithmetic mean = 10 (A、B分數一樣)

A電腦的Geometric mean = 10; B電腦的Geometric mean = 7.476744 (A分數比較高)

如果我們單純用Arithmetic mean的分數來比兩台電腦的效能，我們會以為兩台電腦效能是一樣的。但仔細觀察，A電腦的a、b、c、d功能表現比較平均。而B電腦的a、b、c功能較低，d功能卻高出很多。但是評估電腦的好壞不能只參考單一分數，需要用"整體"的分數來看。換句話說，如果B電腦生產者是奸商，他知道提高d功能的分數的成本相當低，所以他將a、b、c功能之成本偷工減料。今天如果消費者用Arithmetic mean來評估電腦好壞，他會以為兩台是效能是相同的。但是若消費者使用Geometric mean來比，會知道A電腦比較好(10>7.47)所以選擇用Geometric mean的分數來當作比較，會比較客觀與妥當。