

Partial Differential Equations: An Overview¹

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1 Summarizing Performance Numbers

Execution Time To find the system with the least execution time, we consider the execution times in the **BASE** system as reference to relativise how fast or how slow the benchmarks programs execute in the other systems. To do this, consider the execution time encountered in the **BASE** system as the reference for the corresponding benchmark program, and divide the execution numbers from the other system by the reference value. Hence, the reciprocal of the execution number in the **BASE** system serves as the weights as shown in Table 1. The **weighted sum**(Wsum) is evaluated as:

$$Wsum = \frac{1}{n} \sum_{i=1}^{n=4} w_i x_i$$

Thus the system **NEW3** has the least execution time, considering they are equally probable to be executed. Note that the **Wsum** values do not have any unit and is a relative quantity with respect to that of **BASE**.

Execution Times(S)					
System	A	B	C	D	WSum
BASE	$\frac{3}{3} = 1.00$	$\frac{2.5}{2.5} = 1.0$	$\frac{1}{1} = 1.0$	$\frac{12}{12} = 1.0$	1.0
NEW1	$\frac{7}{3} = 2.33$	$\frac{3}{2.5} = 1.2$	$\frac{5}{1} = 5.0$	$\frac{1}{12} = 0.08$	2.15
NEW2	$\frac{2}{3} = 0.67$	$\frac{1}{2.5} = 0.4$	$\frac{3}{1} = 3.0$	$\frac{8}{12} = 0.67$	1.1825
NEW3	$\frac{1}{3} = 0.33$	$\frac{3}{2.5} = 1.2$	$\frac{2}{1} = 2.0$	$\frac{13}{12} = 1.08$	1.15

Table 1: Relativise execution times

Energy: Similarly, for the energy table we relativise the energy consumption values of the benchmark programs on the new system with respect to the **BASE** system by taking it as the reference. The evaluations are shown in the table 2.

System Energy(J)					
System	A	B	C	D	WSum
BASE	$\frac{20}{20} = 1.00$	$\frac{40}{40} = 1.00$	$\frac{50}{50} = 1.00$	$\frac{15}{15}$	1
NEW1	$\frac{10}{20} = 0.50$	$\frac{30}{40} = 0.75$	$\frac{15}{50} = 0.30$	$\frac{30}{15} = 2.00$	0.88
NEW2	$\frac{30}{20} = 1.50$	$\frac{60}{40} = 1.50$	$\frac{20}{50} = 0.40$	$\frac{20}{15} = 1.33$	1.18
NEW3	$\frac{70}{20} = 3.50$	$\frac{30}{40} = .875$	$\frac{30}{50} = 0.60$	$\frac{10}{15} = 0.67$	1.41

Table 2: Relativise Energy Values

Thus the system **NEW1** has the least energy consumption.

Power: From the definition of power as

$$Power = \frac{Energy}{Time}$$

we can construct the table for *power* consumption using the corresponding values of energy and execution-times from the given tables using the above equation. Table 3 shows the above construction

System Power(W)				
System	A	B	C	D
BASE	$\frac{20}{3} = 6.67$	$\frac{40}{2.5} = 16$	$\frac{50}{1} = 50$	$\frac{15}{12}$
NEW1	$\frac{10}{7} = 1.43$	$\frac{30}{3} = 10$	$\frac{15}{5} = 3$	$\frac{30}{1} = 30$
NEW2	$\frac{30}{2} = 15$	$\frac{60}{1} = 60$	$\frac{20}{3} = 6.67$	$\frac{20}{8} = 2.5$
NEW3	$\frac{70}{1} = 70$	$\frac{35}{3} = 11.67$	$\frac{30}{2} = 15$	$\frac{10}{13} = 0.77$

Table 3: System Power