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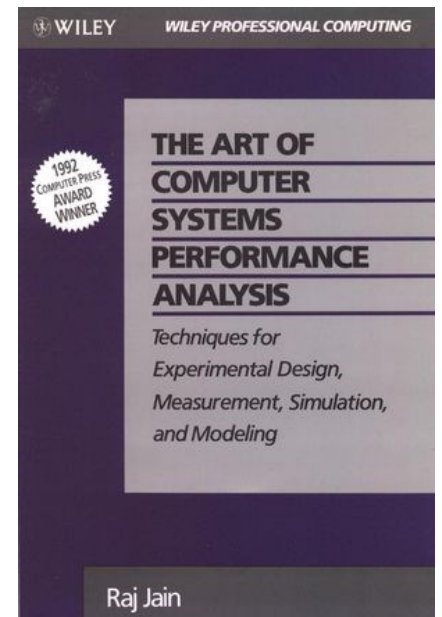


Ratio Games

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References

- Raj Jain, **The Art of Computer Systems Performance Analysis**, Wiley, 1991.
 - Part I: An Overview of Performance Evaluation
 - Part II: Measurement Techniques and Tools
 - Part III: Probability Theory and Statistics
 - Part IV: Experimental Design and Analysis
 - Part V: Simulation



Outline

- Ratio Games Examples
 1. Relative Performance
 2. Picking a Suitable Ratio Metric
 3. Relative Performance Enhancement
 4. Ratio Games with Percentages
- Ratio Games Guidelines

1. Relative Performance

- **Execution Time Example**
- **Comparing ratio of totals**
 - 6502 is worse.
 - It takes 4.8% more time than 8080.

Bench- mark	System	
	6502	8080
Block	41.16	51.50
Sieve	63.17	48.08
Sum	104.33	99.58
Avg	52.17	49.79

1. Relative Performance (cont.)

- **With 6502 as a base**
 - 6502 is better.
 - It takes 1% less time than 8080.
- **With 8080 as a base**
 - 6502 is worse.
 - It takes 6% more time than 8080.

System	
6502	8080
1.00	1.25
1.00	0.76
2.00	2.01
1.00	1.01

System	
6502	8080
0.80	1.00
1.31	1.00
2.11	2.00
1.06	1.00

2. Picking a Suitable Ratio Metric

- **Example**
- **Throughput**: A is better
- **Response Time**: A is worse

Network	Throughput	Response
A	10	2
B	4	1

- **Power = Throughput / Time**
- A is better

System	Throughput	Response	Power
A	10	2	5
B	4	1	4

3. Relative Performance Enhancement

- **Example:** Two floating point accelerators A and B on Benchmarks X and Y

Alternative	Without	With
A on X	2	4
B on Y	3	5

Alternative	Without	With	Ratio
A on X	2	4	2.00
B on Y	3	5	1.66

- **Problem:** Incomparable bases. Must try both on the same benchmark

4. Ratio Games with Percentages

- **Tests on System A**

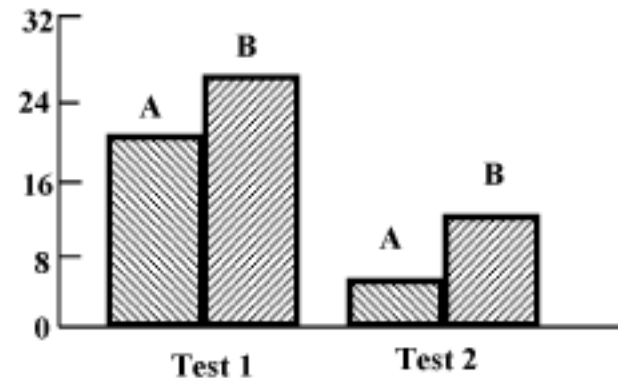
Test	Total	Pass	% Pass
1	300	60	20%
2	50	2	4%
Total	350	62	20.6%

- **Tests on System B**

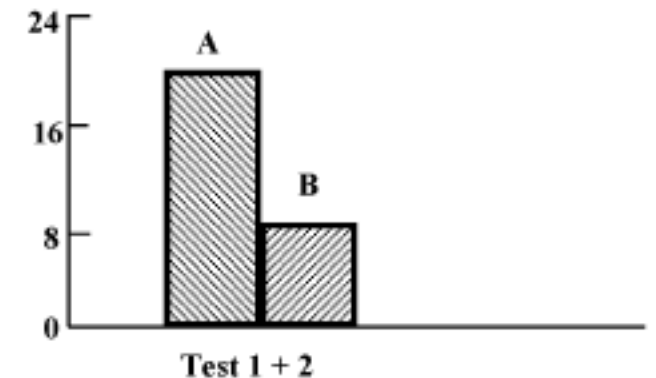
Test	Total	Pass	% Pass
1	32	8	25%
2	500	40	8%
Total	532	48	9%

- System B is better on both systems.
- System A is better overall.

(a) Percent of tests passed



(b) Percent of total tests passed



4. Ratio Games with Percentages (cont.)

- **Other Misuses of Percentages**

- **Using percentages to impress**, *e.g.*, for improvement from 0.1 to 1.1, quote 1000% improvement. Particularly if the performance before and after the improvement are both small.
- **Using percentages to disguise small sample sizes**, *e.g.*, 75% respondents agree with the government decision.
- **Using Final as Base** (Initial should be Base), *e.g.*, sales claim 400% reduction in prices when price fall from \$100 to \$25.

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Ratio Games Guidelines

1. If one system is **better on all** benchmarks, **contradicting conclusions can not be drawn** by any ratio game technique.

Bench- mark	System	
	A	B
I	0.50	1.00
J	1.00	1.50
Average	0.75	1.25

Bench- mark	System	
	A	B
I	1.00	2.00
J	1.00	1.50
Average	1.00	1.75

Bench- mark	System	
	A	B
I	0.50	1.00
J	0.67	1.00
Average	0.58	1.00

2. Even if one system is better than the other on all benchmarks, **a better relative performance can be shown by selecting appropriate base.**

System A is 40% better than System B using raw data, 43% better using system A as a base, and 42% better using System B as a base.

Ratio Games Guidelines

3. If a system is **better on some benchmarks** and worse on others, **contracting conclusions can be drawn** in some cases. Not in all cases.
4. If the performance metric is an **LB metric**, it is better to **use your system as the base**.
5. If the performance metric is an **HB metric**, it is better to **use your opponent as the base**.
6. Those **benchmarks that perform better on your system** should be **elongated** and those that **perform worse** should be **shortened**.

Summary

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