DataMineIt[SM]

announces

PermuteIt[TM] v2.0

The fastest, most comprehensive and robust permutation test software on the market today.

Permutation tests increasingly are the statistical method of choice for addressing business questions and research hypotheses across a broad range of industries. Their distribution-free nature maintains test validity where many parametric tests (and even other nonparametric tests), encumbered by restrictive and often inappropriate data assumptions, fail miserably. The computational demands of permutation tests, however, have severely limited other vendors' attempts at providing useable permutation test software for anything but highly stylized situations or small datasets and few tests. PermuteIt[TM] addresses this unmet need by utilizing a combination of algorithms to perform non-parametric permutation tests very quickly – often more than an order of magnitude faster than widely available commercial alternatives when one sample is large and many tests and/or multiple comparisons are being performed (which is when runtimes matter most). PermuteIt[TM] can make the difference between making deadlines, or missing them, since data inputs often need to be revised, resent, or recleaned, and one hour of runtime quickly can become 10, 20, or 30 hours.

In addition to its speed even when one sample is large, some of the unique and powerful features of PermuteIt[TM] include:

- **the availability to the user of a <u>wide range of test statistics</u> for performing permutation tests on continuous, count, & binary data, including: pooled-variance t-test; separate-variance Behrens-Fisher t-test and joint tests for scale and location coefficients using nonparametric combination methodology; permutation scale test; Brownie et al. "modified" t-test; skew-adjusted "modified" t-test; Cochran-Armitage test; exact inference; Poisson normal-approximate test; Fisher's exact test; Freeman-Tukey double arcsine test**

- **<u>extremely fast exact inference</u> (no confidence intervals – just exact p-values) for most count data and high-frequency continuous data, often several orders of magnitude faster than the most widely available commercial alternative**

- **the availability to the user of a <u>wide range of multiple testing procedures</u>, including: Bonferroni, Sidak, Stepdown Bonferroni, Stepdown Sidak, Stepdown Bonferroni and Stepdown Sidak for discrete distributions, Hochberg Stepup, FDR, Dunnett's one-step (for MCC under ANOVA assumptions), Single-step Permutation, Stepdown Permutation, Single-step and Stepdown Permutation for discrete distributions, Permutation-style adjustment of permutation p-values**

- **<u>fast, efficient, and automatic generation of all pairwise comparisons</u>**

- **<u>efficient variance-reduction</u> under conventional Monte Carlo via self-adjusting permutation sampling when confidence intervals contain the user-specified critical value of the test**

- **<u>the shortest confidence intervals</u> under conventional Monte Carlo via a new sampling optimization technique (see Opdyke, JMASM, Vol. 2, No. 1, May, 2003)**

- **<u>fast permutation-style p-value adjustments for multiple comparisons</u> (the code is designed to provide an additional speed premium for many of these resampling-based multiple testing procedures)**

- **<u>simultaneous permutation testing and permutation-style p-value adjustment</u>, although for relatively few tests at a time (this capability is not even provided as a preprogrammed option with any other software currently on the market)**

For Telecommunications, Pharmaceuticals, *f*MRI data, Financial Services, Clinical Trials, Insurance, Bioinformatics, and just about any data rich industry where large numbers of distributional null hypotheses need to be tested on samples that are not extremely small and parametric assumptions are either uncertain or inappropriate, PermuteIt[TM] is the optimal, and only, solution.

To learn more about how PermuteIt[TM] can be used for your enterprise, and to obtain a demo version, please contact its author, J.D. Opdyke, President, DataMineIt[SM], at JDOpdyke@DataMineIt.com or www.DataMineIt.com.

DataMineIt[SM] is a technical consultancy providing statistical data mining, econometric analysis, and data warehousing services and expertise to the industry, consulting, and research sectors. PermuteIt[TM] is its flagship product.

J.D. Opdyke

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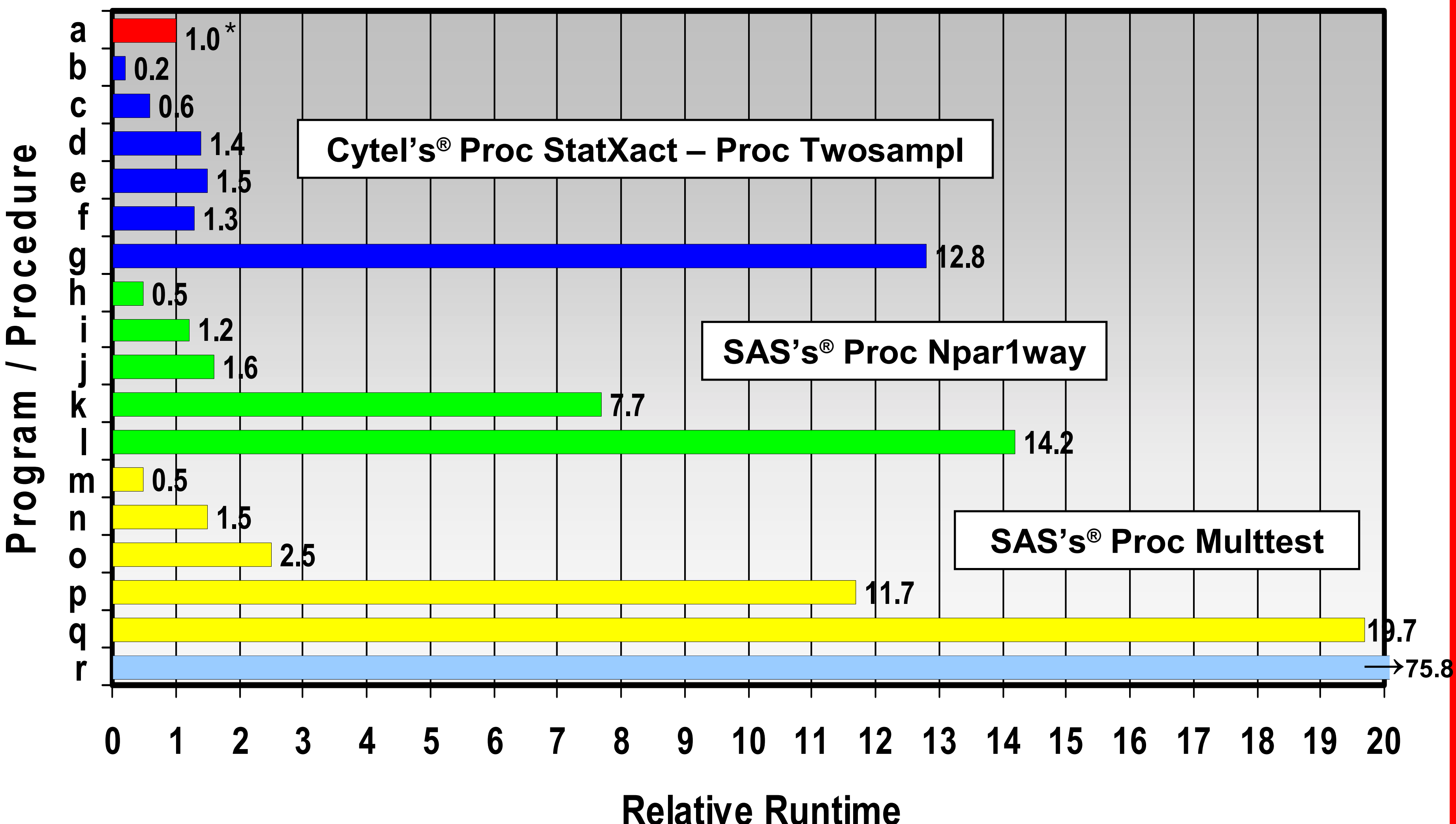
PermuteIt™ vs. Commercial Alternatives
Relative Runtime* of Permutation Tests (no adj.)



*For technical details, see Opdyke, J.D. (2003), *Journal of Modern Applied Statistical Methods, Vol. 2*, No. 1.

J.D. Opdyke

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PermuteIt™ v. SAS's® NPAR1WAY:

Conditional Exact Inference for Column-Ordered 2xC Contingency Tables

Ex.#	Contingency Table	Ho:	Ha:	Exact p-value	NPAR1WAY Real Time[1]	PermuteIt™ Real Time[1]	PermuteIt™ Relative Speed
1.A	0 1 2 7 0 5 8 2 5 1 8 0 5 0 3 4 3 3 3 3	$\mu_{smaller} = \mu_{larger}$	$\mu_{smaller} \neq \mu_{larger}$	0.120209	21.15s	0.84s	25x faster
2.A	0 1 2 7 0 5 8 2 5 1 8 0 5 0 3 4 3 3 3 3	$\mu_{smaller} \leq \mu_{larger}$	$\mu_{smaller} > \mu_{larger}$	0.061917	21.15s	0.42s	50x faster
3.A	5 9 2 7 3 5 0 2 0 1 8 0 5 0 6 4 3 3 3 3	$\mu_{smaller} \geq \mu_{larger}$	$\mu_{smaller} < \mu_{larger}$	0.023000	1m 7.85s	0.84s	81x faster
4.A	1 5 2 0 5 4 2 3 4 5 5 1 4 6 1 2 4 4 3 2	$\mu_{smaller} = \mu_{larger}$	$\mu_{smaller} \neq \mu_{larger}$	0.230033	3m 44.71s	2.25s	100x faster
5.A	1 5 2 0 5 4 2 3 4 5 5 1 4 6 1 2 4 4 3 2	$\mu_{smaller} \leq \mu_{larger}$	$\mu_{smaller} > \mu_{larger}$	0.117805	3m 44.71s	1.06s	212x faster
6.A	1 0 0 1 3 0 0 2 1 6 1 0 0 8 0 5 4 3 0 0 1 6 0 0 2 4 1 1 0 5	$\mu_{smaller} \leq \mu_{larger}$	$\mu_{smaller} > \mu_{larger}$	0.023217	7m 20.75s	1.16s	380x faster
7.A	2 0 1 5 3 2 2 2 1 0 0 1 0 6 1 4 7 4 0 0 0 3 0 0 2 8 0 1 0 3	$\mu_{smaller} = \mu_{larger}$	$\mu_{smaller} \neq \mu_{larger}$	0.439884	2h 41m 7s	12.49s	774x faster
8.A	2 0 1 5 3 2 2 2 1 0 0 1 0 6 1 4 7 4 0 0 0 3 0 0 2 8 0 1 0 3	$\mu_{smaller} \leq \mu_{larger}$	$\mu_{smaller} > \mu_{larger}$	0.225146	2h 41m 7s	6.48s	1,492x faster
9.A	0 3 4 2 1 0 0 3 2 1 2 2 4 1 4 4 1 0 2 3 4 4 1 2 3 2 2 0 3 0	$\mu_{smaller} \leq \mu_{larger}$	$\mu_{smaller} > \mu_{larger}$	0.091734	after 39h 30m, could not solve	54.1s	more than 2,628x faster
1.B	5 9 2 7 3 5 0 2 8 3 5 1 6 4 2 0	$\mu_{smaller} \leq \mu_{larger}$	$\mu_{smaller} > \mu_{larger}$	0.594438	Can't solve	0.10s	
2.B	5 1 2 7 3 5 0 2 8 1 8 0 5 0 6 4 3 3 3 3	$\mu_{smaller} \geq \mu_{larger}$	$\mu_{smaller} < \mu_{larger}$	0.676471	Can't solve	0.88s	
3.B	5 1 2 7 3 5 0 2 8 1 1 0 8 0 5 0 6 4 3 3 3 2 0 4	$\mu_{smaller} \leq \mu_{larger}$	$\mu_{smaller} > \mu_{larger}$	0.585325	Can't solve	5.71s	
4.B	5 4 3 0 0 1 6 0 0 2 4 1 1 0 5 1 5 0 1 3 0 0 2 1 6 0 1 0 3 0	$\mu_{smaller} \geq \mu_{larger}$	$\mu_{smaller} < \mu_{larger}$	0.522697	Can't solve	2.71s	
5.B	4 7 4 0 0 0 3 0 0 2 8 0 1 0 3 2 0 1 5 3 2 2 2 1 0 0 1 0 6 1	$\mu_{smaller} \geq \mu_{larger}$	$\mu_{smaller} < \mu_{larger}$	0.791081	Can't solve	6.36s	

[1] Runtimes are based on a desktop PC with 2GB of RAM and a 2Ghz Pentium® processor, and software versions 2.0 and 8.2, respectively.

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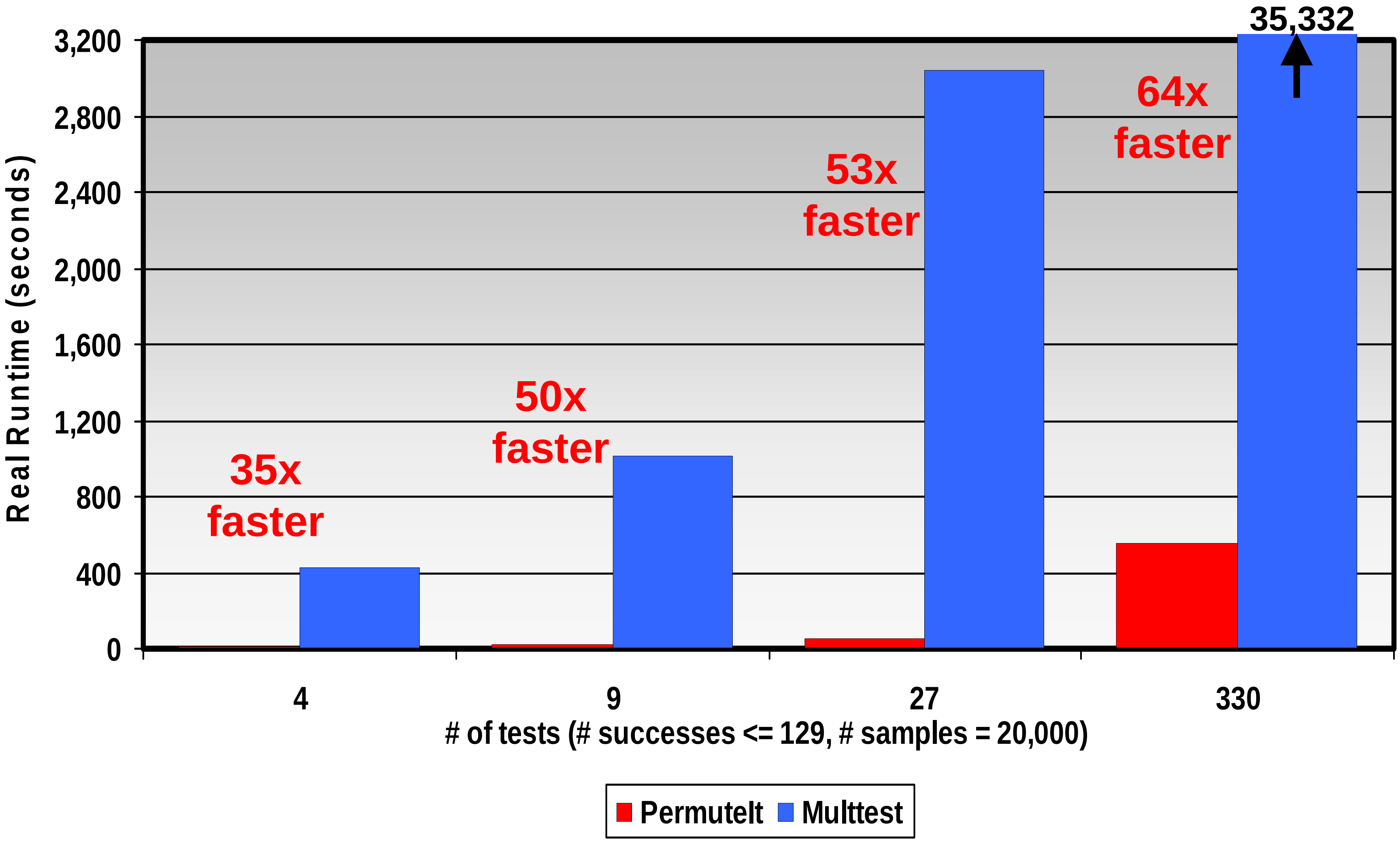
PermuteIt™ vs. SAS's® Proc Multtest

Runtime[1] of Cochran-Armitage 2-tailed tests on 2x2 Contingency Tables with Exact, Discrete Distribution Stepdown Permutation p-value adjustment



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