Author's Reply[1]

ARNE A. NILSSON

Absolutely correct, I made an error in the derivation of the approximate formula. The main contribution in my correspondence [1] was, however, the derivation of the exact average failure rate for the $n - 1/n$ periodically repaired system. Now let us look at an $n - k/n$ periodically repaired system. Using similar notations as in the correspondence [1], we find that the reliability function $R_{n,k}(t)$ is given as

$$R_{n,k}(t)=\sum_{i=0}^{k}\binom{n}{i}e^{-(n-i)\lambda t}(1-e^{-\lambda t})^{i}.$$

We also find, assuming periodical repair every T time units, that the average failure rate $\lambda_A(k)$ can be expressed as

$$\lambda_A(k)=\frac{1}{T}\ln R_{n,k}(T).$$

We note that for moderate k, say $k = 1, 2$, and 3, the exact average failure rate can easily be computed, using a relatively simple calculator. It can be shown, however, that if $\lambda T \ll 1$ a simple approximation for the average failure rate is

$$\lambda_A(k) \cong \frac{n(n-1)\cdots(n-k)\lambda^{k+1}T^k}{(k+1)!}.$$

A simple check for the case $k = 1$ indicates that the approximate expression is exactly the same as given in [2] and the comment above.

Manuscript received December 14, 1984.
The author is with the Center for Communications and Signal Processing, North Carolina State University, Raleigh, NC 27695.
IEEE Log Number 8610084.

[1] This Author's Reply is in response to [3].

References

[1] A. A. Nilsson, "Comments on 'The Reliability of Periodically Repaired $n - 1/n$ Parallel Redundant Systems'," *IEEE Trans. Comput.*, vol. C-33, p. 681, July 1984.
[2] R. G. Cantarella, "The Reliability of Periodically Repaired $n - 1/n$ Parallel Redundants Systems," *IEEE Trans. Comput.*, vol. C-32, pp. 597-598, June 1983.
[3] R. H. Wensley, "Further comments on "The reliability of periodically repaired $n - 1/n$ parallel redundant systems," *IEEE Trans. Comput.*, vol. C-34, p. 1068, Nov. 1986.

Correction to "Lower Bounds for Sorting with Realistic Instruction Sets"

E. DITTERT AND M. J. O'DONNELL

The proof of Theorem 7.1 in "Lower Bounds for Sorting with Realistic Instruction Sets" [1] is erroneous. The essential problem is that the complexity of the reduction of binary rational sorting to integer sorting in Lemma 4.1 leads to a quantification error in the proof of Theorem 7.1. The example of a program that truncates each of its inputs shows that no argument involving a single path through the type of search tree used in this paper can succeed. The analysis up through Lemma 7.5 is correct, but it yields a lower bound only for sorting of bounded-complexity rationals, not of integers.

References

[1] E. Dittert and M. J. O'Donnell, "Lower bounds for sorting with realistic instruction sets," *IEEE Trans. Comput.,* vol. C-34, pp. 311-317, Apr. 1985.

Manuscript received June 26, 1986.
E. Dittert is with the Department of Computer Science, New Mexico State University, Las Cruces, NM 88003.
M J. O'Donnell is with the Department of Computer Science, the University of Chicago, Chicago, IL 60637.
IEEE Log Number 8610679.