

# REPORT DOCUMENTATION PAGE

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**13. ABSTRACT (Maximum 200 words)**

A study was made of the emerging research area of algorithmic fault tolerance. This topic is attracting lots of attention due to its low implementation overhead and to its suitability for VLSI multiprocessor arrays. A fundamental contribution was made in the area by providing a novel linear algebraic model for the technique. In addition, a new fault tolerance scheme was developed for recursive least squares minimization. Other results include new ways for generating weights for the checksum method.

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6. AUTHORS OF REPORT: Franklin T. Luk
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1. "A linear algebraic model of algorithm-based fault tolerance," C.J. Anfinson and F.T. Luk, IEEE Transactions on Computers, Special Issue on Parallel and Distributed Algorithms, vol. 37 (Dec. 1988), 1599-1604.
2. "A novel fault tolerance technique for recursive least squares minimization," F.T. Luk, E.K. Torng and C.J. Anfinson, Journal of VLSI Signal Processing, vol. 1 (1989), 181-188.

**CONFERENCE PROCEEDINGS:**

1. "A linear algebraic model of algorithm-based fault tolerance," C.J. Anfinson and F.T. Luk, Proceedings of the International Conference on Systolic Arrays, San Diego, Calif. (1988), 483-493.
2. "A theoretical foundation for weighted checksum methods," C.J. Anfinson, R.P. Brent and F.T. Luk, Proceedings of SPIE Vol. 975, Advanced Algorithms and Architectures for Signal Processing III, (1988), 10-18.
3. "A novel fault tolerance technique for recursive least squares minimization," C.J. Anfinson, F.T. Luk and E.K. Torng, Proceedings of SPIE Vol. 975, Advanced Algorithms and Architectures for Signal Processing III, (1988), 268-276.

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4. "Choosing small weights for multiple error detection," R.P. Brent, F.T. Luk and C.J. Anfinson, Proceedings of SPIE Vol. 1058, IS&T High Speed Computing II (1989), 130-136 .
  5. "Algorithm-based fault tolerant techniques for MVDR beamforming," C.J. Anfinson, A.W. Bojanczyk, F.T. Luk and E.K. Torng, Proceedings of ICASSP 89, International Conference on Acoustics, Speech and Signal Processing, Glasgow, Scotland (1989), 2417-2420.
8. SCIENTIFIC PERSONNEL SUPPORTED BY THIS PROJECT AND DEGREES AWARDED DURING THIS REPORTING PERIOD:

This project supported one student, Cynthia J. Anfinson.

Students supervised by Professor Luk:

Cynthia J. Anfinson, "A Theory of Algorithm-Based Fault Tolerance,"  
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### BRIEF OUTLINE OF RESEARCH FINDINGS

We studied the emerging research area of algorithmic fault tolerance. This topic is attracting lots of attention due to its low implementation overhead and to its suitability for VLSI multiprocessor arrays. We have made a fundamental contribution in the area by providing a novel linear algebraic model for the technique. In addition, we developed a new fault tolerance scheme for recursive least squares minimization. Our other results include new ways for generating weights for the checksum method.

### FINAL REMARKS

When I wrote the proposal five years ago, I said that I would use the fellowship to support a female or a minority. After I won the fellowship, I used it to attract a first year PhD student, Cynthia Anfinson, to work with me. The student just graduated from the University of California at San Diego, and was recommended by two well known numerical analysts as the best student whom they have taught in their careers. Anfinson turned out to be a very productive student, as evidenced by our two joint journal publications and five joint conference papers. It is unfortunate that, due to an unexpected pregnancy, she decided to leave Cornell so as to raise a family in San Diego.

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