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Department of Computer Science

LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE

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September 29, 1991

Defense Technical Information Center,
Building 5, Cameron Station,
Alexandria, Virginia 22304-6145.

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Dear Sir,

Please find enclosed 2 copies of our annual report (1990-1991) on our Grant No. N00014-91-J-1306 titled "A General Theory of Signal Integration for Fault-Tolerant Dynamic Distributed Sensor Networks".

If you need more information please do not hesitate to contact me.

Sincerely yours,

S. S. Iyengar — *Dist.*

S. S. Iyengar
Professor and Interim Dept. Chairman,
Principal Investigator.

Approved for public release:
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FIRST YEAR PROGRESS REPORT

Sept 20, 1991

GRANT NO : N00014-91-J-1306

TITLE OF THE PROJECT:

A General Theory of Signal Integration for Fault-Tolerant
Dynamic Distributed Sensor Network

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Statement of the problem:

In recent years, the increasing sophistication of surveillance systems and tracking mechanisms has generated a great deal of interest in the development of new computational structures and architectures for detecting and tracking multiple targets, using data from many sensors.

The design of spatially distributed target-detection-and-tracking systems involves the integration of solutions obtained by solving subproblems in data-association, hypothesis testing, data-fusion, etc. This must include the cooperative solution of problems by a decentralized and loosely coupled collection of processors, each of which integrates information received from a cluster of spatially distributed sensors into a manageable and reliable output for further integration at a higher level. This process requires the design of efficient architectures and computational techniques to abstractly represent and integrate sensor information.

The following issues were studied and worked upon this year:

- 1) Fault-tolerant computational model for sensor integration.
- 2) Functional characterization of sensor integration in distributed sensor networks.
- 3) Information routing and reliability issues in distributed sensor networks.
- 4) Information integration and clock synchronization issues in distributed sensor networks.
- 5) Design of fault-tolerant architectures for distributed sensor networks.

Attached to this report is a list of publications resulting from this research.

RESEARCH PUBLICATIONS

List of papers submitted to refereed journals:

1. S. S. Iyengar, M. B. Sharma, and R. L. Kashyap "Information Routing and Reliability Issues in Distributed Sensor Networks," IEEE Trans. on ASSP.
- 2) Dev Kumar and S. S. Iyengar "Correctness proof of a Distributed Depth First Search Algorithm," ACM Trans. on Programming Languages and Systems.

List of papers accepted/published in refereed journals:

- 1) S. S. Iyengar, R. L. Kashyap, and R. N. Madan "A Computational Taxonomy on Distributed Sensor Networks," IEEE Trans. on SMC, Vol. 21, No. 5, Sept-Oct 1991.
- 2) S. S. Iyengar, D. N. Jayasimha, and R. L. Kashyap "Information Integration and Clock Synchronization in Distributed Sensor Networks," IEEE Trans. on SMC, Vol. 21, No. 5, Sept-Oct 1991.
- 3) S. Rajanarayan and S. S. Iyengar "A New Optimal Distributed Algorithm for Set Intersection Problem," Information Processing Letters, Vol. 38, May 1991, pp. 143-148.
- 4) S. S. Iyengar "Distributed Sensor Networks: A Computational Perspective," Journal of Computer Science and Informatics, Vol. 21, No. 1, 1991.
- 5) L. Prasad, S. S. Iyengar, R. L. Kashyap, and R. N. Madan "Functional Characterization of Sensor Integration in Distributed Sensor Networks," IEEE Trans. on SMC, Vol. 21, No. 5, Sept-Oct 1991. (also presented at the Parallel Processing Symposium in Los Angeles)

Papers in Progress:

- 1) B. Jones and S. S. Iyengar "Information - Theoretic Component of Distributed Sensor Networks," will be submitted to International Journal of Systems Theory.

- 2) S. S. Iyengar, D. N. Jayasimha, D. Nadig, and D. K. Pradhan "A Versatile Architecture for Distributed Sensor Integration Problem," Paper in preparation.
- 3) L. Prasad and S. S. Iyengar "A General Computational Framework for Distributed Sensing and Fault-Tolerant Sensor Integration," Paper in preparation.

Technical Report:

- 1) "Functional Characterization of Fault-Tolerant Integration in Distributed Sensor Networks". School of Electrical Engineering, TR-EE-91-23 Technical Report, Purdue University, West Lafayette, IN 47907.

PUBLICATIONS/PATENTS/PRESENTATIONS/HONORS REPORT
for
1 Oct 90 through 30 Oct 1991

R&T Number: 4148120---01

Contract/Grant Number: N 00014-91 J-1306

Contract/Grant Title: A General Theory of Signal Integration for
Fault-Tolerant Dynamic Distributed Sensor Networks
Principal Investigator: S. S. Iyengar

Mailing Address: Professor and Chairman of Computer Science Dept.
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E-Mail Address: iyengar@csvax.csc.lsu.edu

- a. Number of Papers Submitted to Refereed Journal but not yet published: 2
- b. Number of Papers Published in Refereed Journals: 5
(list attached)
- c. Number of Books or Chapters Submitted but not yet Published: 1
- d. Number of Books or Chapters Published: _____
(list attached)
- e. Number of Printed Technical Reports & Non-Refereed Papers: 1
(list attached)
- f. Number of Patents Filed: none
- g. Number of Patents Granted: none
(list attached)
- h. Number of Invited Presentations at Workshops or Prof. Society Meetings: _____
- i. Number of Presentations at Workshops or Prof. Society Meetings: 1
- j. Honors/Awards/Prizes for Contract/Grant Employees:
(list attached, this might include Scientific Soc Awards/Offices,
Promotions, Faculty Awards/Offices etc)
- k. Total number of Graduate Students and Post-Docs Supported at least 25% this
year on this contract/grant: Grad Students 2 and Post-Docs _____.

How many of each are females or minorities?
(These 6 numbers are for ONR's EEO/Minority
Reports; minorities include Blacks, Aleuts
AmIndians, etc and those of Hispanic or
Asian extraction/nationality. The Asians
are singled out to facilitate meeting the
varying report semantics re "under-
represented").

[Grad Student Female _____
][Grad Student Minority _____
][Grad Stu Asian e/n 2
][Post-Doc Female _____
][Post-Doc Minority _____
[Post-Doc Asian e/n _____