REPORT DOCUMENTATION PAGE

1. AGENCY USE ONLY (Leave blank)  2. REPORT DATE  3. REPORT TYPE AND DATES COVERED
   26 May 1999  Annual progress, 1 Jun 98 – 1 Jun 99

4. TITLE AND SUBTITLE
   Multichannel/Multisensor Signal Processing In Uncertain Environments With Application To Multitarget Tracking

6. AUTHOR(S)
   Jitendra K. Tugnait

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(ES)
   Auburn University
   Dept. of Electrical Engineering
   Auburn, AL 36849

8. PERFORMING ORGANIZATION REPORT NUMBER
   PR-99-1

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
   Office of Naval Research
   Ballston Center Tower One
   One North Quincy Street
   Arlington, VA 22217-5660

11. SUPPLEMENTARY NOTES
   The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as
   an official Department of the Navy position, policy or decision, unless so designated by other documentation.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
   Approved for public release; distribution unlimited.

13. ABSTRACT (Maximum 200 words)
   This research project is concerned with two distinct aspects of analysis and processing of signals received at multiple sensors from multiple
   sources when the operating environment is highly uncertain and unstructured. In part I, a general approach based upon an independent
   component decomposition (ICD) is sought to be investigated involving as few assumptions as possible compared to existing literature.
   The approach is sought to be developed in conjunction with specific, useful applications such as space and time diversity multiaccess/multiuser
   digital communications and multitarget tracking using multi-platform multisensor arrays. In part II focus is on maneuvering
   target tracking using kinematic models. This report describes the progress made on the above two aspects of the project. Details are provided in
   attached copies of 16 papers – 10 journal articles (accepted/submitted) and 6 conference papers.

14. SUBJECT TERMS
   maneuvering target tracking, IMM method, source separation, multiuser interference separation, blind equalization

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OR REPORT
    UNCLASSIFIED

18. SECURITY CLASSIFICATION OF THIS PAGE
    UNCLASSIFIED

19. SECURITY CLASSIFICATION OF ABSTRACT
    UNCLASSIFIED

20. LIMITATION OF ABSTRACT
    UL
Multichannel/Multisensor Signal Processing In Uncertain Environments With Application To Multitarget Tracking

This research project is concerned with two distinct aspects of analysis and processing of signals received at multiple sensors from multiple sources when the operating environment is highly uncertain and unstructured. In part I, a general approach based upon an independent component decomposition (ICD) is sought to be investigated involving as few assumptions as possible compared to existing literature. The approach is sought to be developed in conjunction with specific, useful applications such as space and time diversity multiaccess/multiuser digital communications and multitarget tracking using multi-platform multisensor arrays. In part II focus is on maneuvering target tracking using kinematic models.

WORK COMPLETED AND IN PROGRESS ("near future") Progress has been made on the following major aspects of the project:

1 TRACKING MANEUVERING TARGETS USING MULTIPLE KINEMATIC MODELS: We have investigated a new method (interacting multiple model (IMM) fixed-lag smoothing) for tracking a single maneuvering target in a "clean" environment (no clutter). This work has been reported in [6] and [12]. We have extended this approach to tracking a single maneuvering target in clutter in [7] and [16]. Application of this technique to tracking multiple maneuvering targets in clutter is reported in [8]. In all of the above cases, the proposed approaches yield much improved performance when compared to filtering at the cost of a slight delay (one or two sampling intervals).

Currently work is in progress to exploit smoothing based results for filtering (i.e. no delay in state estimation).

2 INDEPENDENT COMPONENT DECOMPOSITION AND ITS APPLICATIONS: Here we have investigated several approaches for independent source separation, equalization, channel estimation and independent component decomposition. The results have been reported in refs. [1]-[5], [9]-[11] and [13]-[15]. The next step is to focus exclusively on multiple sources and performance analysis.

Journal Articles Submitted/Accepted


**Conference Presentations & Proceedings Papers**


