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ABSTRACT

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Use all small letters followed by single space. Use the style "By Author"

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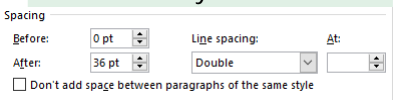

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ABSTRACT

ADAPTIVE SPACE-TIME PROCESSING FOR WIRELESS COMMUNICATIONS

by
Xiao Cheng Bernstein

Adaptive space-time processing techniques have been considered in the past to increase the capacity of two major, multiple-access wireless communication systems: Time Division Multiple Access (TDMA) and Code Division Multiple Access (CDMA). Space processing uses multiple antennas which, in turn, provide alternative signal paths in order to cancel interferences and combat multipath fading. In this investigation, the *eigencanceler* method was used to evaluate theoretical optimum combinations. The feasible *direct matrix inverse* (DMI) technique was also evaluated. An analysis of the system performance revealed that when data sets are small, the eigencanceler technique is superior to the DMI technique. A simple projection-based algorithm was proposed and its performance analyzed.

The capacity of CDMA communication systems is normally restricted by multiple-access interferences (MAI). It was shown that spatial and temporal processing can be combined to increase the capacity of CDMA-based wireless communications systems. The degrees of freedom provided by space-time processing were exploited to combat both fading and MAI. Specifically, the following methods were considered: (1) space-time diversity, (2) cascade optimum spatial-diversity temporal, (3) cascade optimum spatial-optimum temporal, and (4) joint-domain optimum processing. It was proved that, due to its interference cancellation capability, *optimum combining* provides significantly better performance than diversity techniques.

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In Partial Fulfillment of the Requirements for the Degree of
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Write in centered alignment with single space. Make sure you list the right title and department here. Use the style "NJIT Body"

Use two single spaces after department area.

Graduation Date (either December, May or August + year)

ADAPTIVE SPACE-TIME PROCESSING FOR WIRELESS COMMUNICATIONS

by
Xiao Cheng Bernstein

A Dissertation
Submitted to the Faculty of
New Jersey Institute of Technology
in Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy in Electrical Engineering

Department of Electrical and Computer Engineering

January 1996

Fall grad date is currently December; it is listed as January for documents published prior to 2018

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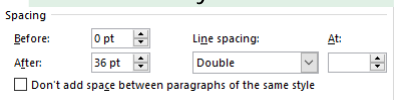

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Xiao Cheng Bernstein

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Associate Professor of Electrical and Computer Engineering, NJIT

Dr. Yeheskel Bar-Ness, Committee Member — Date
Distinguished Professor of Electrical and Computer Engineering, NJIT

Dr. Michael Porter, Committee Member — Date
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Dr. Jack H. Winters, Committee Member — Date
Member of Technical Staff, AT&T Bell Laboratories, Holmdel, NJ

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BIOGRAPHICAL SKETCH

Author: Xiao Cheng Bernstein

Degree: Doctor of Philosophy

Date: January 1996

Date of Birth: November 3, 1965

Place of Birth: Shanghai, P. R. China

Date of Birth and Place of Birth go in copy submitted to GSO **only**!

Undergraduate and Graduate Education:

- Doctor of Philosophy in Electrical Engineering,
  New Jersey Institute of Technology, Newark, NJ, 1996
- Master of Science in Electrical Engineering,
  Shanghai Jiao Tong University, Shanghai, P. R. China, 1991
- Bachelor of Science in Electrical Engineering,
  Shanghai Jiao Tong University, Shanghai, P. R. China, 1988

Major: Electrical Engineering

Presentations and Publications:

Xiao C. Wu and Alexander M. Haimovich, "Adaptive arrays for increased performance in mobile communications," The Sixth International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC'95), Toronto, Canada, September 1995.

Xiao C. Wu and Alexander M. Haimovich, "Space-time processing for CDMA communications," Proceedings of the 1995 Conference on Information Science and Systems, Baltimore, MD, pp. 371-376, March 1995.

Xiao C. Wu and Alexander M. Haimovich, "A simple projection based adaptive array with applications to mobile communications," Proceedings of the 1994 Adaptive Antenna Systems Symposium, Melville, NY, pp. 37-42, November 1994.

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ACKNOWLEDGMENTS

The first paragraph of this section is dedicated to the Thesis or Dissertation Advisor.

The second paragraph is indented and dedicated to Committee members.

The third paragraph is indented and dedicated to Funding source(s).

The fourth paragraph is indented and dedicated to Technical support.

Subsequent paragraphs are indented and may include peers who were key to the student's success.

Some also finish with family members.

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ACKNOWLEDGMENTS

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TABLE OF CONTENTS

Chapter Title appear in all CAPITALS

The table of Contents should be created automatically. Ensure that you have used the built-in Heading styles (Heading 1, Heading 2, Heading 3 etc.) to format the titles and subtitles of your document. These styles are found in the "Styles" group on the "Home" tab.

Insert Table of Contents

1. Go to the "References" tab.
2. Click on "Table of Contents" in the Table of Contents group.
3. Choose one of the built-in formats from the dropdown menu, or click on "Custom Table of Contents" to customize the appearance further.

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"Chapter" and "Page" have to be listed again on the second page of TABLE OF CONTENTS

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TABLE OF CONTENTS
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TABLE OF CONTENTS
(Continued)

Chapter **Page**

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LIST OF TABLES

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LIST OF SYMBOLS (Optional)

©	Copyright
∫	Integration
Å	Angstrom (10-10 meters)

A List of Symbols is optional – Nomenclature or List of Terms or Definitions may also be used.

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LIST OF SYMBOLS

©	Copyright
∫	Integration
Å	Angstrom (10^{-10} meters)
SAR	Specific Absorption Rate
Π	3.415
♀	Female
®	Registered
≈	Approximately
♠	Spade Suit
∂	Partial Differential
#	Number Sign
¢	Cent Sign

Use the style "List Heading" followed by two double spaces.

LIST OF DEFINITIONS (Optional)

Accuracy	How closely an instrument measures the true or actual value of the process variable being measured or sensed.
Acidic	The condition of water or soil which contains a sufficient amount of acid substances to lower the pH below 7.0.
Alkaline	The condition of water or soil which contains a sufficient amount of alkali substances to raise the pH above 7.0.
Effective range	That portion of the design range (usually upper 90 percent) in which an instrument has acceptable accuracy.

A List of Definitions is optional - Nomenclature or List of Terms may also be used.

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LIST OF DEFINITIONS

Accuracy	How closely an instrument measures the true or actual value of the process variable being measured or sensed.
Acidic	The condition of water or soil which contains a sufficient amount of acid substances to lower the pH below 7.0.
Alkaline	The condition of water or soil which contains a sufficient amount of alkali substances to raise the pH above 7.0.
Analog	The readout of an instrument by a pointer (or other indicating means) against a dial or scale.
Cohesion	Molecular attraction which holds two particles together.
Effective range	That portion of the design range (usually upper 90 percent) in which an instrument has acceptable accuracy.
Linearity	How closely an instrument measures actual values of a variable through its effective range; a measure used to determine the accuracy of an instrument.
Surfactant	Abbreviation for surface-active agent. The active agent in detergents that possesses a high cleaning ability.
Standard	A physical or chemical quantity whose value is known exactly, and is used to calibrate or standardize instruments.