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Should be 1 page for MS 2 pages for PhD

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ABSTRACT

**ADAPTIVE SPACE-TIME PROCESSING
FOR WIRELESS COMMUNICATIONS**

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by

Xiao Cheng Bernstein

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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.

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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.

**ADAPTIVE SPACE-TIME PROCESSING
FOR WIRELESS COMMUNICATIONS**

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**by
Xiao Cheng Bernstein**

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**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

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APPROVAL PAGE

**ADAPTIVE SPACE-TIME PROCESSING
FOR WIRELESS COMMUNICATIONS**

Xiao Cheng Bernstein

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The required qualification for dissertation or thesis advisers and for committee members can be found in the on-line graduate catalog under Academic Policies and Procedures or consult with the Graduate Studies Office.

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Use the Tab key for alignment (activate "show ¶" to double-check).

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Use hanging indent under Format → Paragraph → Special

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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ACKNOWLEDGMENT

The order for this section is as follows: Thesis or Dissertation Advisor, Committee members, Funding source and Technical support. Many students include peers (by name please) who were key to their success and some also finish with family members.

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

LIST OF SYMBOLS

X

ε

Å

SAR

Π

♀

Y

Arabic letter for...

Angstrom (10^{-10} meters)

Specific Absorption Rate

3.4159...

Female