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GROUP DYNAMICS SYSTEMS METHODS RENORMALIZATION(U)
NORTHEASTERN UNIV BOSTON MA T A BALABAN 14 SEP 87
AFOSR-TR-88-0281 AFOSR-86-0229

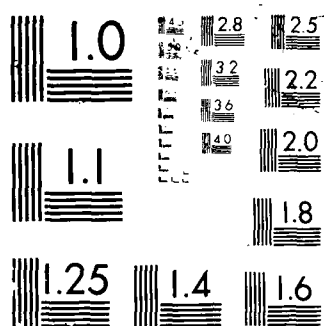
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REPORT DOCUMENTATION PAGE

AD-A192 911

2. DECLASSIFICATION/DOWNGRADING SCHEDULE UNCLASSIFIED		1b. RESTRICTIVE MARKINGS	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release, distribution unlimited	
6a. NAME OF PERFORMING ORGANIZATION Northeastern University		5. MONITORING ORGANIZATION REPORT NUMBER(S) AFOSR-TR- 88-0291	
6b. ADDRESS (City, State and ZIP Code) 360 Huntington Ave., Boston, MA 02115		7a. NAME OF MONITORING ORGANIZATION AFOSR	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION AFOSR		7b. ADDRESS (City, State and ZIP Code) BLDG #410 Bolling AFB, DC 20332-6448	
8b. OFFICE SYMBOL (If applicable) NM		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER AFOSR-86-0229	
10a. ADDRESS (City, State and ZIP Code) BLDG #410 Bolling AFB, DC 20332-6448		10. SOURCE OF FUNDING NOS.	
		PROGRAM ELEMENT NO. 61102F	
		PROJECT NO. 2304	
		TASK NO. A9	
		WORK UNIT NO.	
11. TITLE (Include Security Classification) Renormalization and Gp Dyn Sys Meth			
12. PERSONAL AUTHOR(S) Balaban, Tadeusz A.			
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM 10/1/86 TO 8/31/87	
		14. DATE OF REPORT (Yr., Mo., Day) 870914	
		15. PAGE COUNT 1	
16. SUPPLEMENTARY NOTATION			
17. COSATI CODES			
FIELD GROUP SUB. GR.			
18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) Renormalization group methods in quantum field theory			
19. ABSTRACT (Continue on reverse if necessary and identify by block number) The work done on this grant focused on the ultraviolet stability problem in the four-dimensional Yang-Mills field theories. Group Dynamics Systems Methods			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ ☐ ☐		21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL Nachman, Arje		22b. TELEPHONE NUMBER (Include Area Code) 202-767- 5025	
		22c. OFFICE SYMBOL UNCLASSIFIED	

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The work done on this project is on the ultraviolet stability problem in the four-dimensional pure Yang-Mills field theories. These theories, as all quantum field theories, are defined formally by infinite-dimensional functional integrals. To give them a mathematical meaning it is necessary to regularize them. K. Wilson has proposed a regularization replacing these integrals by well-defined finite-dimensional ones. This is a lattice regularization, replacing a gauge field theory on a continuous space by a theory on a discrete lattice with a small lattice spacing a . The ultraviolet stability problem is to prove uniform bounds for the regularized integrals. This problem was studied using the so-called "block-spin" group renormalization method, introduced also by K. Wilson. The main idea of the method is to divide the integration into a sequence of subintegrations in such a way that it is much easier to analyze each subintegral. A careful and lengthy analysis reduces the problem to a problem of constructing and investigating some finite dimensional dynamical systems, and especially its fixed points and behavior in a neighborhood of the fixed points.

The mathematical investigation of this program was initiated by the author, and the strongest results obtained previously concerned approximate four-dimensional gauge field theories, in which the functional integrals were restricted to a "small field" region by a sequence of complicated restrictions imposed on the field variables.

In this project the complete models are treated. The main obstacle in the problem, and in similar problems for other models, was a lack of understanding of properties connected with the "large field" regions. The basic technical progress of the work in this project is the creation of a systematic method to deal with these "large field" problems.

Unfortunately, it is quite involved and technical (in a mathematical sense), and cannot be described here. This method allowed the author to discuss the complete models, and to complete the proof of the ultraviolet stability for the physically important four-dimensional gauge field theories. The results of the work are published as the preprint: "Renormalization group approach to lattice gauge field theories. II. Analysis of effective densities and their expansions, in the complete models."



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