

Non-perturbative Analysis of Field Theories by Renormalization Group

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1998 Fiscal Year Final Research Report Summary

Non-perturbative Analysis of Field Theories by Renormalization Group

Research Project

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08640361

Research Category

Grant-in-Aid for Scientific Research (C)

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一般

Research Field

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Research Institution

Kanazawa University

Principal Investigator

TERAO Haruhiko Kanazawa University, Faculty of Science, Assistant Professor, 理学部, 助教授 (40192653)

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Renormlization group / Non-perturbative analysis / Chiral symmetry / Phase transition / Supersymmetry

Research Abstract

Non-perturbative dynamics of held theories has been one of the most important subject in particle physics. However we cannot help but saying that the present non-perturbative analytic methods are still in a rather poor level. We tried to develop the non-perturbative (exact) renormalization group (RG) as such a general method. We studied the formulation of the RG equations and the effective scheme of approximation. Also we first have

applied the non-perturbative RG to dynamical chiral symmetry breaking, which is quite significant phenomena in particle physics to be clarified, and developed the scheme of analysis. The non-perturbative phenomena like instanton effects have also analyzed through the non-perturbative RG method by studying the quantum mechanical models. As by-products, it has been found that the RG method is able to capture the famous spontaneous supersymmetry breaking.

On the other hand we studied the non-perturbative dynamics in supersymmetric gauge theories. Especially we have clarified the several physical properties of N=2 supersymmetric QCD vacua ; symmetry breaking, CP symmetry, theta angle dependence, charges of dyons and so on.

Research Products (10 results)

All Other

All Publications (10 results)

- [Publications] K.-I.Aoki: "The Effectiveness of the Local Potential Approximation in the Wegner-Houghton Renormalization Group" Progress of Theoretical Physics. 95 No.2. 409-420 (1996) 
- [Publications] K.-I.Aoki: "Non-Perturbative Renormalization Group Analysis of the Chiral Critical Behavior in QED" Progress of Theoretical Physics. 97.No.3. 479-489 (1997) 
- [Publications] K.Konishi: "CP Charge fractionalizations and low energy effective actions in the SU(2) Seiberg-Witten theories with quarks" Nuclear Physics. B511. 264-294 (1998) 
- [Publications] K.-I.Aoki: "Rapidly Converging Truncation scheme of the Exact Renormalization Group" Progress of Theoretical Physics. 99 No.31. 451-466 (1998) 
- [Publications] G.Carlino: "Quark number fractionalization in N=2 Supersymmetric SU(2)XU(1)Nf gauge theories" Journal of High Energy Physics. 04-003. 1-12 (1998) 
- [Publications] K.-I.Aoki: "The Effectiveness of the Local Potential Approximation in the Wegner-Houghton Renormalization Group" Progress of Theoretical Physics. 95 No.2. 409-420 (1996) 
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