

Lecture Notes
in Control and Information Sciences

176

Editors: M. Thoma and W. Wyner



B.L. Rozovskii, R.B. Sowers (Eds.)

Stochastic Partial Differential Equations and Their Applications

Proceedings of IFIP WG 7/1 International Conference
University of North Carolina at Charlotte, NC
June 6 - 8, 1991

Springer-Verlag
Berlin Heidelberg New York
London Paris Tokyo
HongKong Barcelona Budapest

Advisory Board

L.D. Davisson · A.G.J. MacFarlane · H. Kwakernaak
J.L. Massey · Ya Z. Tsyarkin · A. J. Viterbi

Editors

Boris L. Rozovskii
Richard Sowers

University of Southern California
Center for Applied Mathematical Sciences
DRB-155
Los Angeles, CA 90089-1113
USA

ISBN 3-540-55292-8 Springer-Verlag Berlin Heidelberg New York
ISBN 0-387-55292-8 Springer-Verlag New York Berlin Heidelberg

This Work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in other ways, and storage in data banks. Duplication of this publication or parts thereof is only permitted under the provisions of the German Copyright Law of September 9, 1965, in its current version and a copyright fee must always be paid. Violations fall under the prosecution act of the German Copyright Law.

© International Federation for Information Processing, Geneva, Switzerland, 1992
Printed in Germany

The use of registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Typesetting: Camera ready by authors
Offsetprinting: Mercedes-Druck, Berlin; Bookbinding: B. Helm, Berlin
60/3020 5 4 3 2 1 0 Printed on acid-free paper

PREFACE

The International Conference on Stochastic Partial Differential Equations and their Applications was held in Charlotte, North Carolina, from June 6th to June 8th, 1991 at the University of North Carolina at Charlotte. It was preceded by the School in SPDE's (June 3rd to June 5th, 1991). Both the Conference and the School were attended by more than a hundred scholars from all over the world.

The purpose of the conference was to bring together researchers who are working on different theoretical and applied aspects of SPDE's and to promote research in this field. The main topics of the conference were

- Modern stochastic calculus for SPDE's
- Asymptotic problems for SPDE's
- Non-linear parabolic SPDE's
- Numerical methods for SPDE's
- Martingale measures
- Applications of SPDE's, such as in stochastic hydrodynamics and non-linear filtering theory.

Coupling the Conference with the School in SPDE's served another important goal of the organizers, namely to provide the opportunity for young researchers and scientists working in other areas to meet and have informal discussions with outstanding experts in SPDE's.

The Conference and School were held under the joint auspices of the U.S. Army Research Office (Grant DAAL03-91-G-0098), the National Science Foundation (Grant DMS-9015507), the Office of Naval Research (Grant N00014-91-J-1225), and the International Federation for Information Processing. We would like to thank all of them for their generous support and encouragement. We would also like to thank all of the members of the International Program Committee and the Organizing Committee for their invaluable assistance. The devoted efforts of the faculty and staff of the Department of Mathematics of the University of North Carolina and especially of Professors R. Anderson and J. Quinn contributed greatly to the success of the conference.

B. L. Rozovskii, R. Sowers

University of Southern California
Los Angeles
December, 1991

TABLE OF CONTENTS

H. S. AHN, R. CARMONA, S. A. MOLCHANOV. Nonstationary Anderson model with Lévy potential	1
A. V. BALAKRISHNAN. Stochastic partial differential equations in control of structures	12
A. BENSOUSSAN. Splitting up method in the context of stochastic PDE	22
D. BETOUNES. Generalized stochastic differential equations on (\mathcal{D}^*)	32
G. DA PRATO. On invariant measure for semilinear equations with dissipative nonlinearities	38
M. H. A. DAVIS, G. BURSTEIN. Random conservation laws and global solutions of nonlinear SPDE—Application to the HJB SPDE of anticipative control	43
O. ENCHEV. Stochastic calculus with anticipation and shift transformations of Wiener’s measure	54
X. FERNIQUE. A propos d’un exemple d’équation différentielle stochastique en dimension infinie	62
F. FLANDOLI. Stochastic evolution equations with non-coercive monotone operators	70
P. FLORCHINGER. Existence of a smooth density for the filter in nonlinear filtering on manifolds	81
N. FRANGOS, D. NUALART, M. SANZ. On the Ito formula for two-parameter martingales	92
M. I. FREIDLIN, R. SOWERS. Central limit theorem results for a reaction-diffusion equation with random boundary perturbations	101
T. FUNAKI. On the stochastic partial differential equations of Ginsburg-Landau type	113
T. HIDA. Stochastic variational calculus	123
G. KALLIANPUR, J. XIONG. An nuclear space-valued stochastic differential equation driven by Poisson random measures	135
P. KOTELLENZ. Random vortex models and stochastic partial differential equations	144
N. V. KRYLOV. On explicit formulas for solutions of evolutionary SPDE’s	153
H. H. KUO. Convolution and Fourier transform of Hida distributions	165
F. LEGLAND. Splitting-up approximation for SPDE’s and SDE’s with applications to nonlinear filtering	177
S. MELEARD. Representation and approximation of martingale measures	188

VIII

E. PARDOUX. Backward stochastic differential equations and quasilinear parabolic partial differential equations	200
M. A. PINSKY. Lyapunov exponent of a stochastic wave equation	218
L. PITT, D. WANG. On stochastic elliptic boundary problems associated with Gaussian Markov random fields	222
J. POTTHOFF. White noise methods for stochastic partial differential equations	238