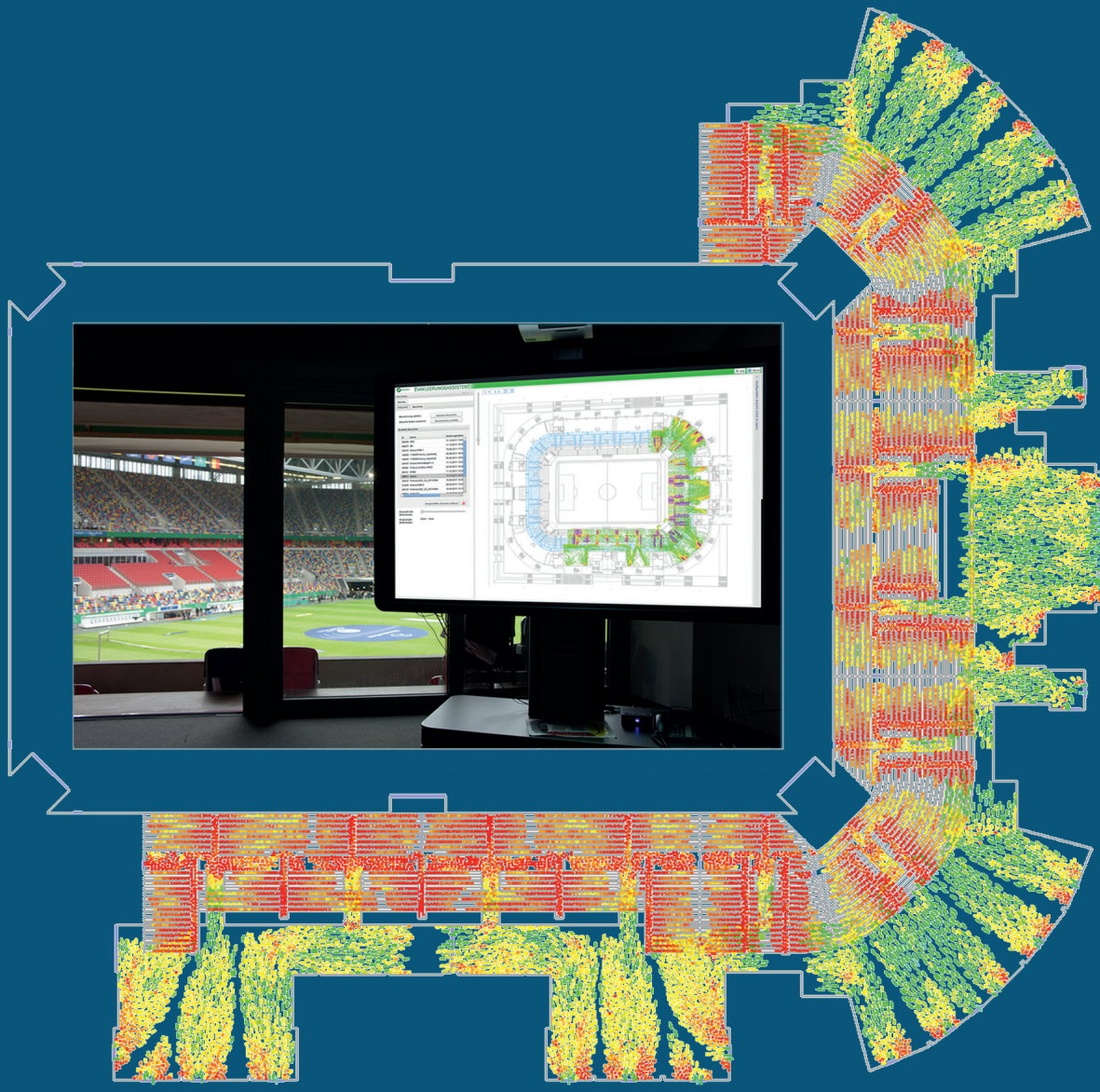

Route Choice Modelling and Runtime Optimisation for Simulation of Building Evacuation

Armel Ulrich Kemloh Wagoum

Mitglied der Helmholtz-Gemeinschaft

JÜLICH
FORSCHUNGSZENTRUM

Forschungszentrum Jülich GmbH
Institute for Advanced Simulation (IAS)
Jülich Supercomputing Centre (JSC)

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Schriften des Forschungszentrums Jülich

IAS Series Volume 17

ISSN 1868-8489 ISBN 978-3-89336-865-5

Contents

Increasing number of visitors at large-scale events combined with the increasing complexity of modern buildings set a major challenge for planners, operators and emergency services. Examples include multi-purpose arenas, large railway stations and airports. In this dissertation the use of modern parallel hardware in combination with optimised algorithms are for the first time used on site to speed up the simulation of large crowds. The aim is to perform real-time forecasts of pedestrian traffic. For this purpose, special neighbourhood lists and a two-stage hybrid parallelisation are used. The second part of this dissertation deals with route choice in complex structures, which plays an important role in achieving realistic computer simulations of pedestrian flows. The developed route choice process is based on visibility and perception of the local environment by the simulated agents. It has as basis a navigation graph. The generation of the graph, especially in complex structures, has also been performed within the framework of this thesis. The work is closed with an empirical study in which the route choice profiles of spectators during various football games and concert performances are analysed and compared with the proposed model.The runtime optimisation strategies and route choice algorithms have been successfully tested in the ESPRIT arena in Düsseldorf (Germany), where they have been integrated in an evacuation assistant.

This publication was edited at the Jülich Supercomputing Centre (JSC) which is an integral part of the Institute for Advanced Simulation (IAS). The IAS combines the Jülich simulation sciences and the supercomputer facility in one organizational unit. It includes those parts of the scientific institutes at Forschungszentrum Jülich which use simulation on supercomputers as their main research methodology.

IAS Series
Volume 17
ISBN 978-3-89336-865-5

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