Contents

Part I Experiment and Evacuation

The UK WTC9/11 Evacuation Study: An Overview of the Methodologies Employed and Some Preliminary Analysis

Evacuation Movement in Photoluminescent Stairwells
Guylène Proulx and Noureddine Bénichou 25

Automatic Extraction of Pedestrian Trajectories from Video Recordings
Maik Boltes, Armin Seyfried, Bernhard Steffen, and Andreas Schadschneider 43

Stairwell Evacuation from Buildings: What We Know We Don’t Know
Richard D. Peacock, Jason D. Averill, and Erica D. Kuligowski 55

Evacuation of a High Floor Metro Train in a Tunnel Situation: Experimental Findings
Monika Oswald, Hubert Kirchberger, and Christian Lebeda 67

Using Laser Scanner Data to Calibrate Certain Aspects of Microscopic Pedestrian Motion Models
Dietmar Bauer and Kay Kitazawa 83

Kay Kitazawa and Taku Fujiyama 95
FDS+Evac: An Agent Based Fire Evacuation Model
Timo Korhonen, Simo Hostikka, Simo Heliovaara, and Harri Ehtamo . 109

Comparisons of Evacuation Efficiency and Pre-travel Activity Times in Response to a Sounder and Two Different Voice Alarm Messages
David Purser ............................................................. 121

Design of Voice Alarms—the Benefit of Mentioning Fire and the Use of a Synthetic Voice
Daniel Nilsson and Hakon Frantzich ................................. 135

Enhanced Empirical Data for the Fundamental Diagram and the Flow Through Bottlenecks
Armin Seyfried, Maik Boltes, Jens Kähler, Wolfram Klingsch, Andrea Portz, Tobias Rupprecht, Andreas Schadschneider, Bernhard Steffen, and Andreas Winkens ............................................ 145

Parameters of Pedestrian Flow for Modeling Purposes
Valerii V. Kholshevnikov and Dmitrii A. Samoshin .................. 157

Emergency Preparedness in the Case of a Tsunami—Evacuation Analysis and Traffic Optimization for the Indonesian City of Padang
Gregor Lämmel, Marcel Rieser, Kai Nagel, Hannes Taubenböck, Günter Strunz, Nils Goseberg, Thorsten Schlurmann, Hubert Klüpfel, Neysa Setiadi, and Jörn Birkmann .................................. 171

Case Studies on Evacuation Behaviour in a Hotel Building in BART and in Real Life
Margrethe Kobes, Nancy Oberije, and Martina Duyvis ............... 183

Analysis of Empirical Trajectory Data of Pedestrians
Anders Johansson and Dirk Helbing .................................. 203

Model-Based Real-Time Estimation of Building Occupancy During Emergency Egress
Robert Tomastik, Satish Narayanan, Andrzej Banaszuk, and Sean Meyn 215

Experiments on Evacuation Dynamics for Different Classes of Situations
Jaroslaw Was .............................................................. 225

Prediction and Mitigation of Crush Conditions in Emergency Evacuations
Peter J. Harding, Martyn Amos, and Steve Gwynne .................. 233
Start Waves and Pedestrian Movement—An Experimental Study

Christian Rogsch .......................................................... 247

Clearance Time for Pedestrian Crossing

Craig R. Childs, Taku Fujiyama, and Nick Tyler ................. 249

Ship Evacuation—Guidelines, Simulation, Validation, and Acceptance Criteria

Hubert Klüpfel ............................................................. 257

Empirical Study of Pedestrians’ Characteristics at Bottlenecks

Andreas Winkens, Tobias Rupprecht, Armin Seyfried, and Wolfram Klingsch .................................................. 263

RFID Technology Applied for Validation of an Office Simulation Model

Vincent Tabak, Bauke de Vries, and Jan Dijkstra ................. 269

Study on Crowd Flow Outside a Hall via Considering Velocity Distribution of Pedestrians

Xiang Shu Liu, Jia Xiu Pan, Liang Yujuan, and Yu Xue ........... 277

Analysis on the Propagation Speed of Pedestrian Reaction: Velocity of Starting Wave and Stopping Wave

Akiyasu Tomoeda, Daichi Yanagisawa, and Katsuhiro Nishinari .... 285

Part II Simulation and Modeling

Toward Smooth Movement of Crowds

Katsuhiro Nishinari, Yushi Suma, Daichi Yanagisawa, Akiyasu Tomoeda, Ayako Kimura, and Ryousuke Nishi ..................... 293

Modeling Evacuees’ Exit Selection with Best Response Dynamics

Harri Ehtamo, Simo Heliövaara, Simo Hostikka and Timo Korhonen ................................................................. 309

Front-to-Back Communication in a Microscopic Crowd Model

Colin Marc Henein and Tony White .................................. 321

Comparison of Various Methods for the Calculation of the Distance Potential Field

Tobias Kretz, Cornelia Bönisch, and Peter Vortisch ................ 335

Agent-Based Simulation of Evacuation: An Office Building Case Study

Yiqing Lin, Igor Fedchenia, Bob LaBarre, and Robert Tomastik .... 347
A Genetic Algorithm Module for Spatial Optimization in Pedestrian Simulation  
**Lukas Kellenberger and Ruedi Müller** .......................................................... 359

Opinion Formation and Propagation Induced by Pedestrian Flow  
**Yu Xue, Yan-fang Wei, Huan-huan Tian, and Li-juan Liang** ........... 371

Passenger Dynamics at Airport Terminal Environment  
**Michael Schultz, Christian Schulz, and Hartmut Fricke** ................... 381

Application Modes of Egress Simulation  
**Steve M.V. Gwynne and Erica D. Kuligowski** ................................. 397

Investigating the Impact of Aircraft Exit Availability on Egress Time Using Computer Simulation  
**Edwin R. Galea, Madeleine Togher, and Peter Lawrence** ................. 411

Bounded Rationality Choice Model Incorporating Attribute Threshold, Mental Effort, and Risk Attitude: Illustration to Pedestrian Walking Direction Choice Decision in Shopping Streets  
**Wei Zhu and Harry Timmermans** ............................................................. 425

A SCA-Based Model for Open Crowd Aggregation  
**Stefania Bandini, Mizar Luca Federici, Sara Manzoni, and Stefano Redaelli** .......................................................... 439

Hardware Implementation of a Crowd Evacuation Model Based on Cellular Automata  
**Ioakeim G. Georgoudas, Georgios C. Sirakoulis, and Ioannis T. Andreadis** .......................................................... 451

Applying a Discrete Event System Approach to Problems of Collective Motion in Emergency Situations  
**Paolo Lino and Guido Maione** ................................................................. 465

**SIMULEM**: Introducing Goal Oriented Behaviours in Crowd Simulation  
**Sébastien Paris, Delphine Lefebvre, and Stéphane Donikian** ............... 479

Conflicts at an Exit in Pedestrian Dynamics  
**Daichi Yanagisawa, Akiyasu Tomoeda, and Katsuhiro Nishinari** ........ 491

Improving Pedestrian Dynamics Modeling Using Fuzzy Logic  
**Phillip Tomé, François Bonzon, Bertrand Merminod, and Kamiar Aminian** .......................................................... 503
Modeling the Link Volume Counts as a Function of Temporally Dependent OD-Flows
Dietmar Bauer ................................................................. 509

Effect of Subconscious Behavior on Pedestrian Counterflow in a Lattice Gas Model Under Open Boundary Conditions
Kuang Hua, Song Tao, Li Xingli, and Dai Shiqiang ................. 517

Hand-Calculation Methods for Evacuation Calculation—Last Chance for an Old-Fashioned Approach or a Real Alternative to Microscopic Simulation Tools?
Christian Rösch, Henning Weigel, and Wolfram Klingsch ......... 523

Adding Higher Intelligent Functions to Pedestrian Agent Model
Toshiyuki Kaneda, Takumi Yoshida, Yanfeng He, Masaki Tamada, and Yasuhiro Kitakami ........................................ 529

“FlowTech” and “EvaTech”: Two Computer-Simulation Methods for Evacuation Calculation
Ilya Karkin, Vladimir Grachev, Andrey Skochilov, and Vladimir Zverev . 537

Large Scale Microscopic Evacuation Simulation
Gregor Lämmel, Marcel Rieser, and Kai Nagel ....................... 547

Numerical Optimisation Techniques Applied to Evacuation Analysis
Rodrigo Machado Tavares and Edwin R. Galea ..................... 555

A Multi-Method Approach to the Interpretation of Pedestrian Spatio-Temporal Behaviour
Alexandra Millonig and Georg Gartner .............................. 563

The Microscopic Model and the Panicking Ball-Bearing
Colin Marc Henein and Tony White .................................. 569

Design of Decision Rules for Crowd Controlling Using Macroscopic Pedestrian Flow Simulation
Stefan Seer, Norbert Brändle, and Dietmar Bauer ................. 577

3-Tier Architecture for Pedestrian Agent in Crowd Simulation
Gao Peng and Xu Ruihua ................................................. 585

Optimising Vessel Layout Using Human Factors Simulation
Steven J. Deere, Edwin R. Galea, and Peter J. Lawrence .......... 597
Agent-Based Animated Simulation of Mass Egress Following an Improvised Explosive Device (IED) Attack
Douglas A. Samuelson, Matthew Parker, Austin Zimmerman, Stephen Guerin, Joshua Thorp, and Owen Densmore ......................... 605

A Novel Kinetic Model to Simulate Evacuation Dynamics
Sergei Burlatsky, Vladim Atrazhev, Nikolay Erikhman, and Satish Narayanan ................................................................. 611

Egress Route Choice Modelling—Concepts and Applications
Volker Schneider and Rainer Könnecke ............................... 619

Architectural Cue Model in Evacuation Simulation for Underground Space
Chengyu Sun, Bauke de Vries, and Qi Zhao ......................... 627

Integrating Strategies in Numerical Modelling of Crowd Motion
Juliette Venel ................................................................. 641

Small-Grid Analysis of Evacuation Processes with a Lattice Gas Model for Mixed Pedestrian Dynamics
Yan-fang Wei, Yu Xue, and Shi-qiang Dai ............................... 647

Evacuation Simulation and Human Behaviour Models in Tall Buildings
Marja-Liisa Siikonen and Janne S. Sorsa ............................. 653

Proof of Evacuation Routes and Safety Exits: Time Data as the Main Criteria for the Evaluation of Escape Routes and Safety Exits?
Nathalie Waldau, Marita Kersken-Bradley, and Thilo Hoffmann .... 659

Dependence of Modelled Evacuation Times on Key Parameters and Interactions
David Purser ................................................................. 667

A Modification of the Social Force Model by Foresight
Bernhard Steffen ............................................................. 677

Models for Crowd Movement and Egress Simulation
Hubert Klüpfel ............................................................... 683

Modelling Pedestrian Escalator Behaviour
<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introducing a Coupled Model for Simulating Crowd Behaviour</td>
<td>Alicia Guadalupe Ortega Camarena and Dominik Jürgens</td>
<td>697</td>
</tr>
<tr>
<td>Evacuation Modelling of Fire Scenarios in Passenger Trains</td>
<td>Jorge Capote, Daniel Alvear, Orlando Abreu, Mariano Lázaro, and Arturo Cuesta</td>
<td>705</td>
</tr>
<tr>
<td>Pedestrian Dynamics with Event-Driven Simulation</td>
<td>Mohcine Chraibi and Armin Seyfried</td>
<td>713</td>
</tr>
<tr>
<td>Part III Psychology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Need for Behavioral Theory in Evacuation Modeling</td>
<td>Erica D. Kuligowski and Steve M.V. Gwynne</td>
<td>721</td>
</tr>
<tr>
<td>NO_PANIC. “Escape and Panic in Buildings”—Architectural Basic Research</td>
<td>Christa Illera, Matthias Fink, Harry Hinneberg, Karin Kath, Nathalie Waldau, Andrea Rosić, and Gabriel Wurzer</td>
<td>733</td>
</tr>
<tr>
<td>Hierarchical Structure of the Mass and Group-Level Behaviors in Urban Rail Transfer Stations</td>
<td>Xiaolei Zou, Ruikua Xu, and Peng Gao</td>
<td>757</td>
</tr>
<tr>
<td>The Use of a Structure and Its Influence on Evacuation Behavior</td>
<td>Steve M.V. Gwynne and Dave Boswell</td>
<td>773</td>
</tr>
<tr>
<td>Part IV Miscellaneous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhalation Injury of Lung and Heart After Inhalation of Toxic Substances</td>
<td>Herbert Löllgen and Dieter Leyk</td>
<td>781</td>
</tr>
<tr>
<td>Quantitative Comparison of International Design Standards of Escape Routes in Assembly Buildings</td>
<td>Burkhard Forell, Ralf Seidenspinner, and Dietmar Hosser</td>
<td>791</td>
</tr>
</tbody>
</table>
Visualizing the Human Form for Simulation and Planning
Gabriel Wurzer  ................................................ 803

A Real-Time Pedestrian Animation System
Christian Schulz, Michael Schultz, and Hartmut Fricke  .............. 811

Modeling of Escape Routes According to Occupancy, Economy, and Level of Safety in Slovak Republic
Martin Lopušniak ................................................ 819

List of Participants  .......................................................... 825
Pedestrian and Evacuation Dynamics 2008
Klingsch, W.W.F.; Rogens, C.; Schadschner, A.;
Schreckenberg, M. (Eds.)
2010, XIV, 834 p. 385 illus., Hardcover
ISBN: 978-3-642-04503-5