

# Laboratory Experiments on Crowd Dynamics

At major events, accidents are rather caused by the dynamics of the crowd than external threads. Currently there are no generally accepted standards to support the actors, which are involved in the planning and realization of such

the Jülich Supercomputing Centre at the Forschungszentrum Jülich in cooperation with the Institute for Media Research at the University of Siegen and the IBIT GmbH - International Training Centre for Crowd Safety Management.



events (organizers, authorities and organizations with security tasks, local authorities) to perform their tasks. The BMBF-funded project "Basigo – Bausteine für die Sicherheit von Großveranstaltungen" has set itself the goal of developing safety and security modules for major events, in order to fill this gap.

As part of this project the world's largest laboratory experiments on the dynamics in crowds took place on 19 - 22 June 2013. Over four days, more than 2,000 volunteers participated in the experiments in a 10,000 m<sup>2</sup> hall of Messe Düsseldorf. Responsible for the experiments was

To understand the emergence of critical conditions, in about 30 experiments with a total of 200 runs the density within the crowd was increased up to six persons per square meter. With a specially developed video technology based on a grid of 26 industrial cameras the trajectories of each person were recorded in high accuracy. The detection and distinction of individuals was carried out by Reed-Solomon codes. Each of the volunteers wore a unique cap where the cyclic, error-correcting code was printed on.

With the obtained data, e. g. the following questions will be investigated:

- When does pedestrian traffic jam occur (at narrow points, cross-ways and two-way traffic)?
- When does a jam induce a dangerous situation?
- What instruments (e. g. railings, barriers etc.) lead to an optimal use of the space?

Jülich Supercomputing Centre. With the current experiments in BaSiGo the already examined scenarios could be upgraded at conditions of high densities of people, as they occur for example during big events or at train stations. The aim is to define reliable parameters for the planning and approval of such events and facilities, and accordingly develop the models for the simulation of pedestrian flows.



- How can the crowd be optimally informed?

The department "Civil Security and Traffic" at the Jülich Supercomputing Centre has performed many smaller experiments on pedestrian dynamics in recent years. Based on these studies the evacuation assistant for a multi-functional arena was already developed in the BMBF project "Hermes". The core of this evacuation assistant is a real-time simulation of pedestrian flows; the modeling of the Generalized Centrifugal Force Model (GFCM) and its implementation on the parallel computer was carried out at the

For more information:

<http://www.basigo.de>

<http://www.fz-juelich.de/ias/jsc/cst>

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