# Real-time micro-modelling of a million pedestrians

**Rainald Lohner***

* George Mason University
School of Computational Sciences
Fairfax, USA
e-mail: rlohner@gmu.edu, web page: www.scs.gmu.edu/~rlohner

## ABSTRACT

A first-principles model for the simulation of pedestrian flows and crowd dynamics capable of computing the movement of millions of pedestrians in real time has been developed. The pedestrians are treated as `intelligent' particles subjected to a series of forces, such as: will forces (the desire to reach a place at a certain time), pedestrian collision avoidance forces, obstacle/wall avoidance forces; pedestrian contact forces, and obstacle/wall contact forces. In order to allow for general geometries a so-called background triangulation is used to carry all geographic information. At any given time the location of any given pedestrian is updated on this mesh. The code has been ported to shared and distributed memory parallel machines. The results obtained show that the stated aim of computing the movement of millions pedestrians in real time has been achieved. This is an important milestone, as it enables faster-than-real-time simulations of large crowds (stadiums, airports, train and bus stations, concerts) as well as evacuation simulations for whole cities. This may enable the use of validated, micro-model-based pedestrian simulation for design, operation and training within the context of large crowds.