Computer Models
For
Fire and Smoke

Model Name: Generalized Social Distances

Version: 2.3

Date: 11.02.2014

Model Actively Supported?: Yes

Classification: Egress model->Agent-based model/Cellular Automata

Very Short Description: Computes movement times of evacuation from large facilities like stadiums, multi-storey buildings on the base of microscopic, Agent-based simulation using Cellular Automata (CA).

Modeler(s), Organization(s): Dr Jarosław Wąs, Mr Robert Lubaś - AGH University of Science and Technology, Poland


Technical References:


Validation References:


Availability: n/a - please contact authors

Price: n/a

Necessary Hardware: PC/Workstation running Windows XP, Windows 7 or Windows 8

Computer Language: C++
Generalized Social Distances Model
The model is developed in order to calculate parameters of egress using microscopic, Agent based approach. The model uses Cellular Automata (CA), based on a detailed representation of space. Instead of the classical representation of a pedestrian in CA crowd models, as a state of 40cm x 40cm square cell, the authors use an idea of local configurations of neighboring cells sized 25cm x 25cm as a pedestrian representation Fig 1 (Social Distances representation was proposed by J.Wąs, B Gudowski and P.J. Matuszyk).

Fig. 1. Physical representation of pedestrians is based on Social Distances Model by J.Wąs, B Gudowski and P.J. Matuszyk 2006

The model was adapted for mass evacuation scenarios in 2012 by using a concept of static and dynamic floor field, as well as a cost function of pedestrian movement, developed according to specific representation of pedestrians.

Fig. 2. Configured and discretized simulation environment – simulation grid is superimposed on AutoCAD plans of a facility (Krakow football stadium)
Simulation grid is superimposed on AutoCad plans of simulated facility in pre-processing stage of simulation (Fig 2). Next the simulation is executed (Fig 3) and finally, some statistics are generated for instance Trajectories (Fig 4) and Frequency matrices (Fig 5) etc.

Fig. 3. Egress simulation - pedestrians are represented as ellipses.

Fig. 4. Statistics of simulation - trajectories of pedestrians

Fig. 5. Statistics of simulation - Frequency matrix.

The proposed model was implemented for several case studies ranging from test cases (in order to compare with empirical data and other simulations) to complex simulations of large facilities evacuation like:

- Municipal Stadium in Cracow, Poland,
- GKS Tychy Stadium Poland
- Integrated scenario of Allianz Arena Munich, Germany evacuation (as a part of 7th Framework Programme of European Union – project “Socionical”).