ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Lecture with Computer Exercises: Modelling and Simulating Social Systems with MATLAB

Project Report

Insert Title Here
...

Name 1 & Name 2

Zurich
May 2008

Agreement for free-download

We hereby agree to make our source code for this project freely available for download from the web pages of the SOMS chair. Furthermore, we assure that all source code is written by ourselves and is not violating any copyright restrictions.

Name 1 Name 2

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Declaration of Originality

This sheet must be signed and enclosed with every piece of written work submitted at ETH.

I hereby declare that the written work I have submitted entitled

_____

is original work which I alone have authored and which is written in my own words.*

Author(s)

Last name _____ First name _____

Supervising lecturer

Last name _____ First name _____

With the signature I declare that I have been informed regarding normal academic citation rules and that I have read and understood the information on 'Citation etiquette' (http://www.ethz.ch/students/exams/plagiarism_s_en.pdf). The citation conventions usual to the discipline in question here have been respected.

The above written work may be tested electronically for plagiarism.

_____ _____

Place and date Signature

*Co-authored work: The signatures of all authors are required. Each signature attests to the originality of the entire piece of written work in its final form.

Print form

Contents

1 Abstract

2 Individual contributions

3 Introduction and Motivations

4 Description of the Model

4.1 Interaction forces

4.1.1 Pedestrian interaction force

There are two interaction forces that are calculated separately for every pedestrian in every timestep.
The first one is the so called pedestrian interaction force, which is initialized as a repulsive force and and therefore allows each pedestrian to keep a certain distance to all the other pedestrians.
In our simulation, the repulsive pedestrian interaction force has been specified according to the formula

$$\vec{f}_{\alpha\beta}(t) = A^1_\alpha e^{\frac{r_{\alpha\beta}-d_{\alpha\beta}}{B^1_\alpha}} \vec{n}_{\alpha\beta} \cdot \left(\lambda_\alpha + (1-\lambda_\alpha)\frac{1+\cos\phi_{\alpha\beta}}{2}\right) + A^2_\alpha e^{\frac{r_{\alpha\beta}-d_{\alpha\beta}}{B^2_\alpha}} \vec{n}_{\alpha\beta} \qquad (1)$$

,where $d_{\alpha\beta}(t) = \|\vec{x}_\alpha(t) - \vec{x}_\beta(t)\|$ is the distance between the two pedestrians α and β, $r_{\alpha\beta} = (r_\alpha + r_\beta)$ is the sum of their radii and $\vec{n}_{\alpha\beta}(t) = [\vec{x}_\alpha(t) - \vec{x}_\beta(t)]/d_{\alpha\beta}$ is the normalized vector from β to α. $\phi_{\alpha\beta}(t)$ is the angle between $\vec{n}_{\alpha\beta}(t)$ and the direction of movement $\vec{e}_\alpha(t) = \vec{v}_\alpha(t)/\|\vec{v}_\alpha(t)\|$ of the pedestrian α.

5 Implementation

6 Simulation Results and Discussion

7 Summary and Outlook

8 References

A Research Plan

B Matlab code