ETHlogo

**Lecture with Computer Exercises:**

**Modelling and Simulating Social Systems with MATLAB**

Project Report

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| Newspaper Boxes: How do they influence the Pedestrian Flow? |

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Zürich

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Declaration of Originality

Hey Leute, kann das jemand öffnen, bei mir geht’s irgendwie nicht… ☹ (<http://www.soms.ethz.ch/teaching/MatlabFall2012/confirmation_en.pdf>)

Agreement for free-download

We hereby agree to make our source code of 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.

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| Dario Kneubühler | Roman Müller |
| Anja Sutter | Ueli Wechsler |

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1. Abstract

…..

In order to enhance the readability of this text, we used ‘he’ as a personal pronoun. However, male and female persons are meant equally.

1. Individual contributions

In the beginning, ideas for our projects and on how to implement the simulation were discussed together. The code was written by Dario Kneubühler, Roman Müller and Ueli Wechsler with the following general contributions: ….??? Simulations and analysis were executed by …??? The report was written by …???.

1. Introduction and Motivations

Every day many people pass through Lucerne train station and several simulation programs were implemented to study the interaction between geometry of the building and the passenger's flow (Emch+Berger AG Bern). With the emergence of free newspapers (like "20 Minuten", "Blick am Abend") about 10 years ago, this problem got a new dimension: If a commuter is heading towards the newspapers box, he often has to cross the other people's flow.

In rush hours this can strongly influence the general passenger flow when entering or leaving the platform and the station. How much can such boxes slow down pedestrians? Where are their best locations, such that all pedestrians (including those who are picking up a newspaper) can pass the train station as fluently as possible?

* 1. Fundamental Question

Based on these reflections, we phrased our research question: How do different newspaper box placements influence the time, in which the pedestrians pass a certain route.

* 1. Research Methods

We used the layout of Lucerne train station. In order to find the ideal arrangement of a newspaper box, we manipulated its location and ran several simulations.

((We will choose several different positions, run the simulations and then visually select the two most diverse options.?? Wei mer das immer no so machä??))

For the different simulations, we evaluated the time a person a person needs to get from one entry line to another exit line. We as well investigated the influence of several initial parameters (pedestrians velocity, number of pedestrians, required time to pick up a newspaper, number of paper-takers, …???)

The final output let us conclude, how strongly an unfavourable placement of newspaper boxes influences the pedestrian flow.

* 1. Expected Results

We expected to get both a significant and a relevant difference between the placement options. Furthermore, we expected that a box positioned in the middle of a corridor (compared to a box standing at the edge) will slow down the passenger's flow if the number of paper-takers is low, but might be preferred if a high ratio of passengers is taking a newspaper, because a smaller part of the pedestrian flow has to be crossed to pick up a newspaper. Also, people picking up a newspaper can form a crowd, which can lead to a bottleneck situation if the percentage of paper-takers is high.

Picture of many people arount a Paperbox

(Dario)

Figure 1:

1. Description of the Model
   1. Social Force Model (see paper, Dario)
   2. Polygon (Dario)
   3. Fast Marching Algorithm (Refinement, Dario)
2. Implementation

|  |  |
| --- | --- |
| Initialisation  Save Data  Agents Loop  Time Loop  Update | Initialisation |

Figure 2: Wele’s passt besser?

During the *Initialisation*, the station model is read (… Ueli?). There are six entries/exits (compare Figure 3). One entry and one exit (unequal to entry) are attached to each modelled pedestrian (mit welnä Wahrschinlechleitä?).

Map of Lucerne train station (simplified)

Figure 3:

Interaction between agents (Roman)

1. Simulation Results and Discussion
2. Summary and Outlook
3. References

Helbing, D., Molnar, P. (1995). Social Force Model for Pedestrians Dynamics. Physical Review E, 51(5), 4282-4286.

Emch+Berger AG Bern. Simulation Fussgängerströme SBB Bahnhof Luzern. Retrieved 21. November 2012, from Emch+Berger AG Bern Web Site: http://www.bern.emchberger.ch/referenzen/1\_13\_move/simulation\_fussgaengerstroeme\_sbb\_bahnhof\_luzern

1. Research plan
2. MATLAB program code