

Lecture with Computer Exercises:

Modelling and Simulating Social Systems with Python

Project Report

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| **Implementation of a Traffic Light System at the Tannenbar-Intersection** |

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Zürich,  
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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.

Nico Burger Leo Fent Jérôme Landtwig Pascal Lieberherr

.... Declaration of Originality needs to be added

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# Instructions for our group

# To make a main Title

Select "Überschrift 1" in templates

## Making a small title…

Just use "Überschrift 2"

### For an even smaller title

Use "Überschrift 3"

If you want to insert an image, insert it and then right click on it to add a description. It should look as follows:



Figure 1: This is a graph

If you'd like to insert code, past the code and then select the format "Code" this will make it look like that:

This is some code for you. It will be in this format with a neat little box around it.

Do whatever you like with it.

# Abstract

Pascal

Authors: Nico Burger, Leo Fent, Jérôme Landtwig, Pascal Lieberherr

Title: Implementation of a Traffic Light System at the Tannenbar-Intersection

In this project we want to have a closer look at the intersection between Tannenstrasse and Universitätsstrasse. Also known as the Tannenbar Intersection. We were motivated by our own experiences. During lecture breaks, early in the morning and at noon a lot of students desire to cross the street. While pedestrians just keep crossing the street cars start to line up. As a consequence congestion and traffic holdups can be observed. Due to this situation, we asked ourselves whether traffic lights might improve the waiting time for cars. At the same time the waiting time for pedestrians should not be too high. To do this, we simulate pedestrians, cars and trams by agents with Python who behave according to the swiss traffic rules.

What needs to be added to this chapter next depends on the results of our simulation. This will be added once we know our results and our discussion

This document and all mentioned data can be downloaded from <https://github.com/jerowing/gess_project> (09.12.2018)

# Individual contributions

Nico Burger: path of agents and agent interaction

Leo Fent: map, visualization, coordination

Jérôme Landtwig: visualization, graphics and pots

Pascal Lieberherr: path of agents, spawning of agents, project report, flash talk

Listed above are only the main tasks everyone of us took care of, but we shared most of the work. The github commit report is not always mirroring the work behind those uploads because we often worked together on the code, debugged, commented and worked on the documentation while swapping laptops.

Introduction and Motivation

Pascal’s JOB!!

## Motivation

The intersection between the Tannenstrasse and the Universitätsstrasse is something all ETH students are well familiar with and so we are. It is located in a traffic hotspot with pedestrians, cars and trams. All use the road simultaneously. This leads to conflict especially at peak times. As we cross this Intersection close to every day we started to think about how the occurring traffic jam during peak times could be reduced. Lecture breaks, afternoon, noon and lecture breaks are considered as peak time. What came across our mind first was a traffic light system that controls the flow of the agents (pedestrians, cars and trams). This course offers the perfect opportunity to simulate the Tannenbar-Intersection with a traffic light system. While observing the crosswalks for a while, we observed special dynamics e.g. cars that hardly stop for pedestrians waiting at the crosswalk but also cars stopping way too early for pedestrians and also pedestrians who insist on their right of way in every situation. Based on these experiences we became curios about the effects of a traffic light system controlling the agents.

Add Picture of the Tannenbar Intersection

Wir überqueren selbst die Kreuzung täglich in den Pausen.

Beobachtungen: Stau für Autos wenn Pause zwischen Lektionen

Haben uns gefragt ob, ein Ampelsystem die Situation für Fussgänger und Autofahrer verbessern könnte?

## Fundamental Questions

We pose three guiding questions for our idea: How good is the current solution? As described earlier, large traffic jams can be observed during peak times. Is this necessary for smooth pedestrian flow? What would change if pedestrians stopped once in a while to let cars pass? Could the situation be improved by adding traffic lights? Traffic lights would force either the cars of the pedestrians to let the opposite party pass. How would that affect car waiting time? How much longer would pedestrians have to wait? What would be the best possible solution for all agents? Is there an ideal solution (e.g. using traffic lights only at peak times)? What would it look like?

Do traffic light show an improvement for ped and cars

.. in terms of waiting time for both cars and ped -> shorter car queue?

## Expected Results

To answer our three fundamental question, we will run different simulations (see Table 1). Each simulation represents a certain time during the day with appropriate car and pedestrian densities. Each simulation will be performed with and without traffic lights. Furthermore, we will also vary the green time for both agents. This way we can compare the current situation with the newly implemented traffic light system. We expect the following different results for each scenario:

Scenario 1: Since we have high density for both cars and pedestrians, we first of all await an improvement in flow for cars when traffic lights are on. Whereas pedestrians face an increased waiting time. Nevertheless, we expect an overall improvement due to the fact that the waiting time for cars can be reduced significantly while pedestrians waiting time increases slightly. To find the optimum we will also vary the green time for cars and pedestrians, respectively.

Scenario 2:

|  |  |  |  |
| --- | --- | --- | --- |
| Scenario | Time of the day | Car density | Pedestrian density |
| 1 | 08:00 | High | High |
| 2 | 12:00 | High | Low |
| 3 | 17:00 | Low | High |
| 4 | 20:00 | Low | Low |

Table 1: Overview of different simulations. Each simulation will be performed once with and without traffic lights.

# Description of the Model

Kapitel das von Leo und Nico bearbeitet wird

Waiting time is classified based on the length of the queue

AGENTS

Nico

Path

ITERACTION

Nico

GRAPHICAL OUTPUT

Leo

# Implementation

Leo und Nico

# Performed simulations

Jérôme

Hinweis: Der Leitfaden für unsere Arbeit ist die Arbeit «Pedestrian Dynamics in narrow, long hallways» Link: https://github.com/ratheile/MSSSM

Welche Parameter wurden bei der Simulation verwendet?

Verschiedene Simulationen auflisten und entsprechende Diagramme einfügen

Neue Diagramme mit neuen Parmeter benennen/beschreiben-

Ziel: Es soll für uns ersichtlich sein welche Situationen simuliert wurden und was die Parameter sind.

# Simulation Results and Discussion

## Summary and Outlook

# Python source Code

Python code will be here