AKSOE 9 Traffic Dynamics, Urban and Regional Systems

Time: Wednesday 14:00–16:00 Room: BAR 205

AKSOE 9.1 Wed 14:00 BAR 205

An evolutionary approach of pedestrians/cars interactions — •arnaud banos[1], Abhimanyu Godara[2], and Sylvain Lassarre[3] — [1]arnaud.banos@univ-pau.fr — [2]abhimanyu_godara@rediffmail.com — [3]lassarre@inrets.fr

Despite the central and fundamental role pedestrian walking plays within the urban transport system, it still remains a badly known transportation mode. The SAMU prototype has been precisely designed to explore the behaviour of pedestrians in interaction with the motorized traffic, in a virtual city where most of the phenomenon can be mastered and studied. Developed in Netlogo, SAMU integrates both cellular Automata and Agent-Based Modelling approaches to generate a new model of cars behaviours by appropriately modifying earlier NaSch-ChSch rules (Nagel and Schreckenberg, 1992) to take into account pedestrian and also turning movements. While being a work in progress, SAMU already provides an ergonomic platform useful to test the behaviour of the system under different configurations of parameters. Anyway, the number of parameters* combinations is so huge that it doesn't make sense to test them in a very systematic way. Therefore, we propose to explore the possibilities of adding an evolutionary component to our model, based on genetic algorithms, allowing agents (and mainly pedestrians) adapting to given traffic conditions, and finding by themselves the best combinations of their internal parameters that would increase their chance of survival.

AKSOE 9.2 Wed 14:30 BAR 205

Scaling Laws in the Spatial Structure of Urban Road Networks — •Stefan Lämmer — Technische Universität Dresden

The urban road networks of the 20 largest German cities have been analysed, based on a detailed database providing the geographical positions as well as the travel-times for network sizes up to 37,000 nodes and 87,000 links. As the human driver recognises travel-times rather than distances, faster roads appear to be 'shorter' than slower ones. The resulting metric space has an effective dimension d>2, which is a significant measure of the heterogeneity of road speeds. We found that traffic strongly concentrates on only a small fraction of the roads. The distribution of vehicular flows over the roads obeys a power-law, indicating a clear hierarchical order of the roads. Studying the cellular structure of the areas enclosed by the roads, the distribution of cell sizes is scale invariant as well.

AKSOE 9.3 Wed 15:00 BAR 205

Probabilistic Description of Traffic Breakdown — •Reinhard Mahnke[1] and Reinhart Kuehne[2] — [1]Rostock University, Institute of Physics, D-18051 Rostock — [2]German Aerospace Center, Transportation Research, D-12489 Berlin

Traffic breakdowns are described by a balance equation that models the dynamics of jam formation by the following two contributions. There are discharge rate depending on the length of the congestion and an adhesion rate mainly depending on the traffic volume of the considered road section. With this balance equation it is feasible to calculate the dynamics of traffic pattern formation especially the first passage time for a transition from free flow condition to congested traffic including the influence of the parameters affecting the discharge and adhesion rates. As a simple approximation we consider constant attachment rate as well as constant detachment rate.

Starting with the probability density and furtheron with the cumulative probability for breakdowns the change in the incident duration distribution is calculated and qualitatively given. The paper concludes with recommendations for a comprehensive operation improvement and provides necessary steps for a long lasting stabilization of traffic for a given vehicular flow time series pattern.

AKSOE 9.4 Wed 15:30 BAR 205

Traffic on pre-existing ant trails: Comparison with empirical results — •Alexander John[1], Andreas Schadschneider[1], Debashish Chowdhury[2], Katsuhiro Nishinari[3], Thresiamma Varghese[4], and Raghavendra Gadagkar[4] — [1]Institut für Theoretische Physik, Universität zu Köln, 50937 Köln — [2]Department of Physics, Indian Institute of Technology, Kanpur, India — [3]Department of Aeronautics and Astronautics, University of Tokyo, Japan — [4]Centre for Ecological Sciences, Indian Institute of Science, Bangalore, India

We have developed a minimal cellular automaton model for traffic on pre-existing ant trails. The model makes explicit qualitative as well as quantitative predictions. These predictions are compared to empirical data for traffic on existing trails. We will describe an experimental setup including the choice of an appropriate species (Leptogenys Processionalis), as well as the methods of measurement. As we assume some kind of evolutionary generated optimization, measurements were carried out under natural conditions for different scenarios like foraging or migration.

The discussion of results is mainly divided into two parts. First we start comparing on a qualitative level, which includes the spatial distribution of workers on the trail. Clustering phenomena predicted by the theoretical approach seem to play an important role in the empirically observed behaviour. Also certain patterns like the dominance of one direction (e.g. foodbound) over the other one (e.g. nestbound) can be found, which are directly linked to the current task the colony has to perform. On a quantitative level, also the variation of the current is considered.