Public transport networks: empirical analysis and modelling

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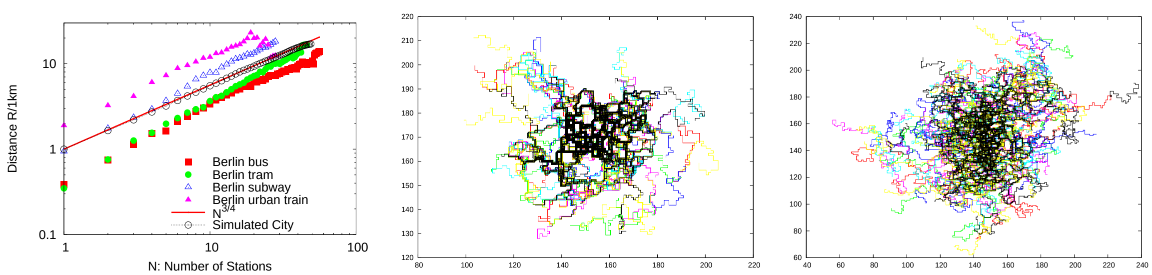
A recent survey of public transport networks [1,2] (PTNs) of selected fourteen major cities of the world with PTN sizes ranging between 2000 and 46000 stations has revealed a number of distinguishing properties of such networks at scales much larger than previously studied. Both small world and scale-free behaviour are observed. However, the PTNs of individual cities vary considerably in the expression of these properties. Moreover, specific features have been identified that are unique to PTNs and networks with similar transport functions (such as networks of neurons, cables, pipes, or vessels embedded in 2D or 3D space). Geographical data for



a **b** **c**

Figure 1: **a**. Berlin PTN: mean distance R as function of the number of stations traveled compared with the 2D SAW and a simulated city. **b, c**. PTN maps of different simulated cities with $R = 1024$ routes of $S = 64$ stations each. The growth dynamics of the simulated PTNs is described by mutally attractive SAWs.

the routes reveal surprising self-avoiding walk (SAW) properties (Fig. 1**a**). Based on these observations we propose and simulate an evolutionary growth model of interacting SAWs that reproduces many of the key features [2] (Figs. 1**b**, 1**c**).

[1] C. von Ferber, Yu. Holovatch, V. Palchykov, Condens. Matter Phys. **9**, 225, (2005), cond-mat/0501296.
[2] C. von Ferber, T. Holovatch, Yu. Holovatch, and V. Palchykov, Physica A **380**, 585 (2007); Phys. Rev. E (submitted); physics/0608125, arXiv:0709.3203.