

Transport in physical space: the example of pedestrians

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Abstract

Transport in physical space is strongly constrained by conservation laws and balance between in- and out-fluxes. Furthermore, individuals have to share the physical space, and thus interact.

However, some mechanisms involved in this type of transport may have analogies with econo-socio phenomena. We shall present an overview of several of such mechanisms.

The interactions between individuals can lead to unexpected patterns at large scales. We shall take our examples from pedestrian dynamics, and illustrate them by recent experiments performed in Rennes (France). Patterns occur in particular at the crossing of pedestrian flows, where interactions are particularly important [1].

A change in the individual characteristics can have a strong impact on the overall dynamics. As an example, we will show how the reaction time of individuals can affect both pedestrian and car traffic [2, 3]. Reaction times can even make the system metastable, and induce some hysteresis in the appearance of traffic jams.

We shall also learn from some molecular pedestrians inside our cells that the most efficient transport strategy is not always the most intuitive one [4, 5]. In particular, while it could seem rather inefficient to have two different teams pulling in opposite directions, this actually allows to control the directionality of transport - a feature which could have its counterparts in socio- or econo-systems.

References

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