DYNSYSMATH

DYNamical systems and non equilibrium states of complex SYStems : MATHematical methods and physical concepts

Abstract

Our project has a twofold purpose: firstly it aims at a better understanding of fundamental properties of classical and quantum dynamical systems, with a particular prominence on unconventional transport and dynamical features (fractal spectra, weak chaos, infinite ergodic theory, almost resonant quantum systems). Secondly it addresses features that characterize the behavior of many particle systems, with a methodology that takes into account the former dynamical perspective: examples include normal and anomalous heat conduction in long chains, equilibrium and non equilibrium aspects of systems with long range interactions - with an emphasis on self-gravitating systems-, coherent transport in light harvesting systems, and statistical analysis of social and economic systems.

NETWORK

Temi generali dell'iniziativa specifica

Metodi statistici in caos classico

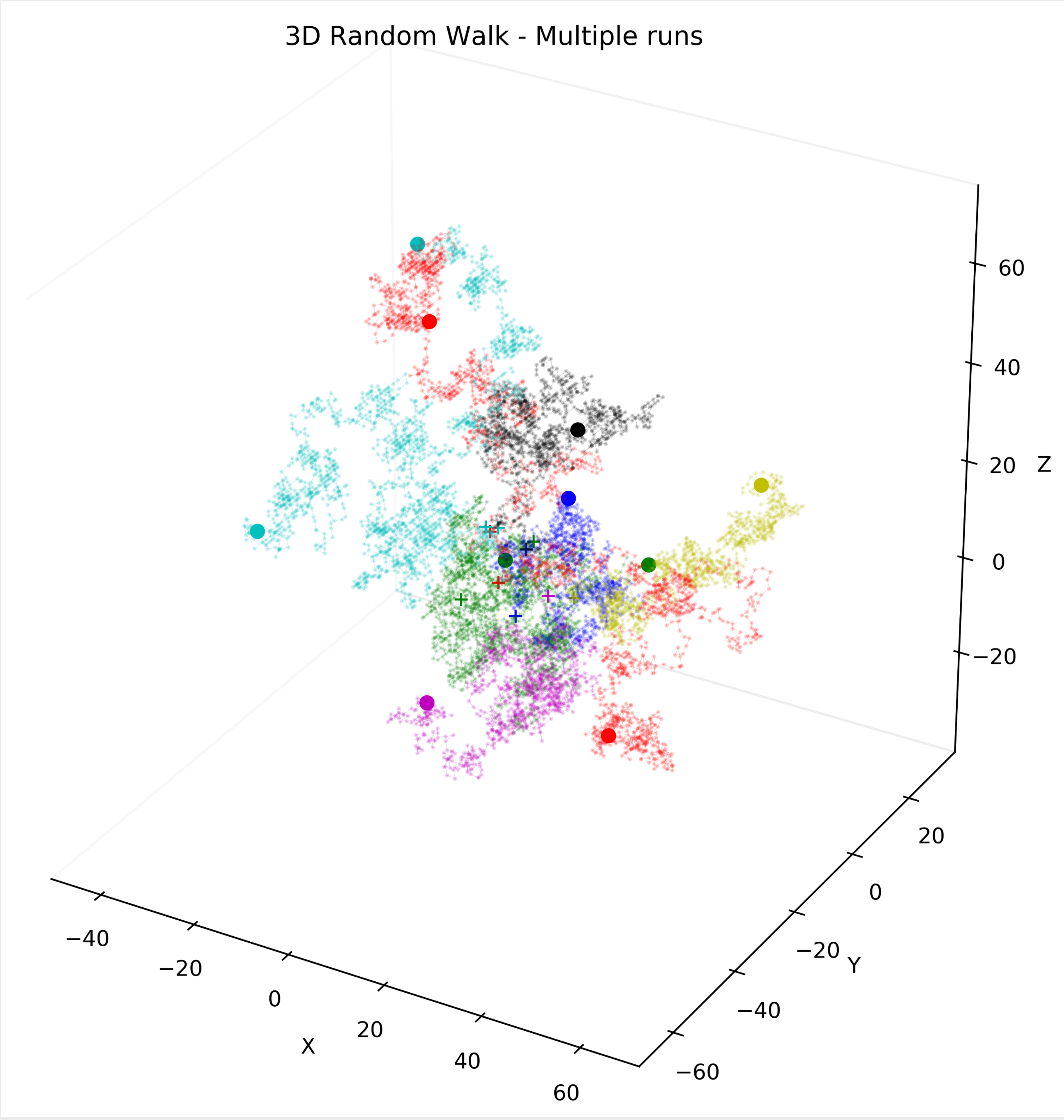
Caos quantistico e applicazioni

Trasporto anomalo deterministico e stocastico

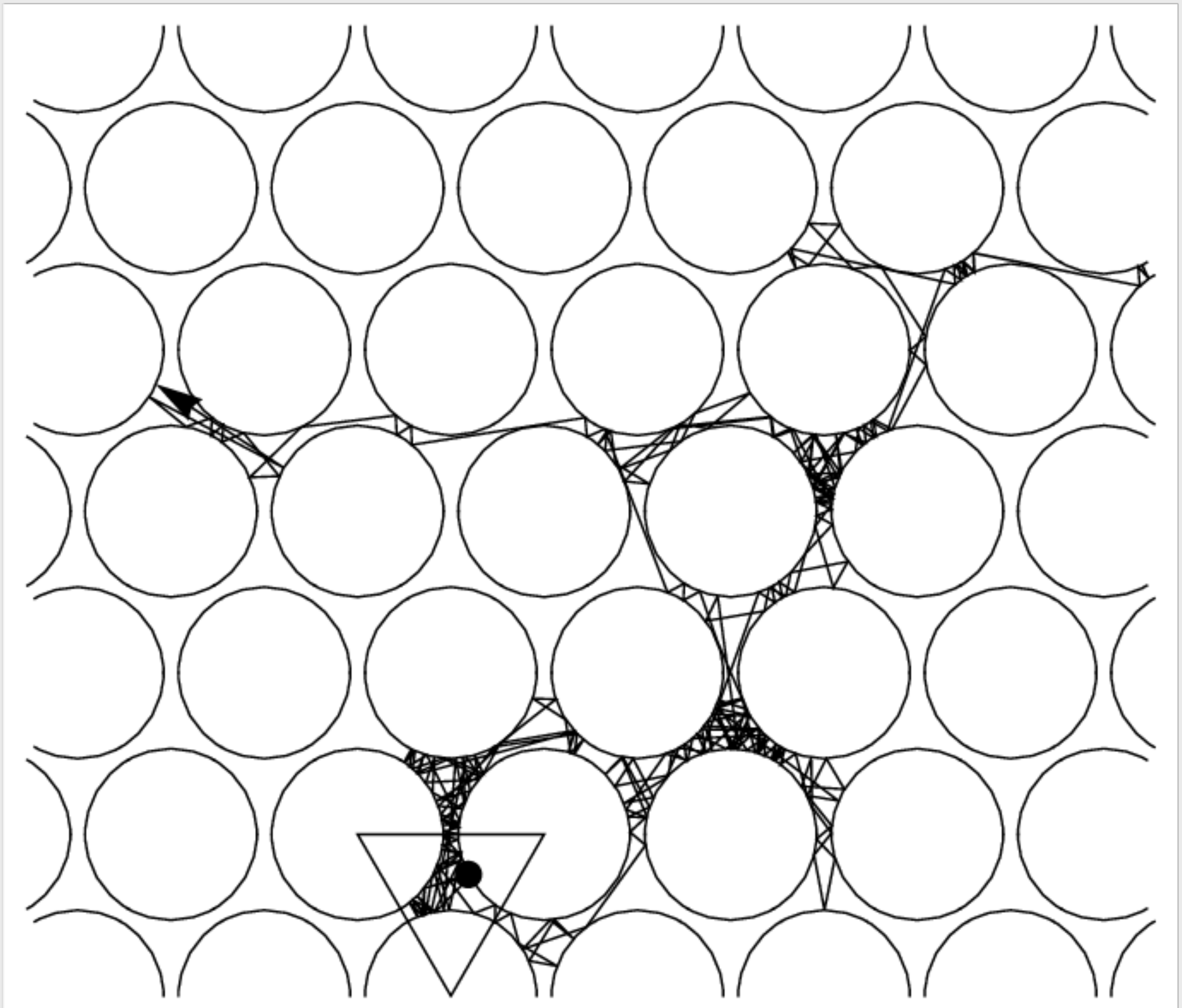
Sistemi con interazioni a lungo raggio

Applicazioni a fenomeni economici e sociali

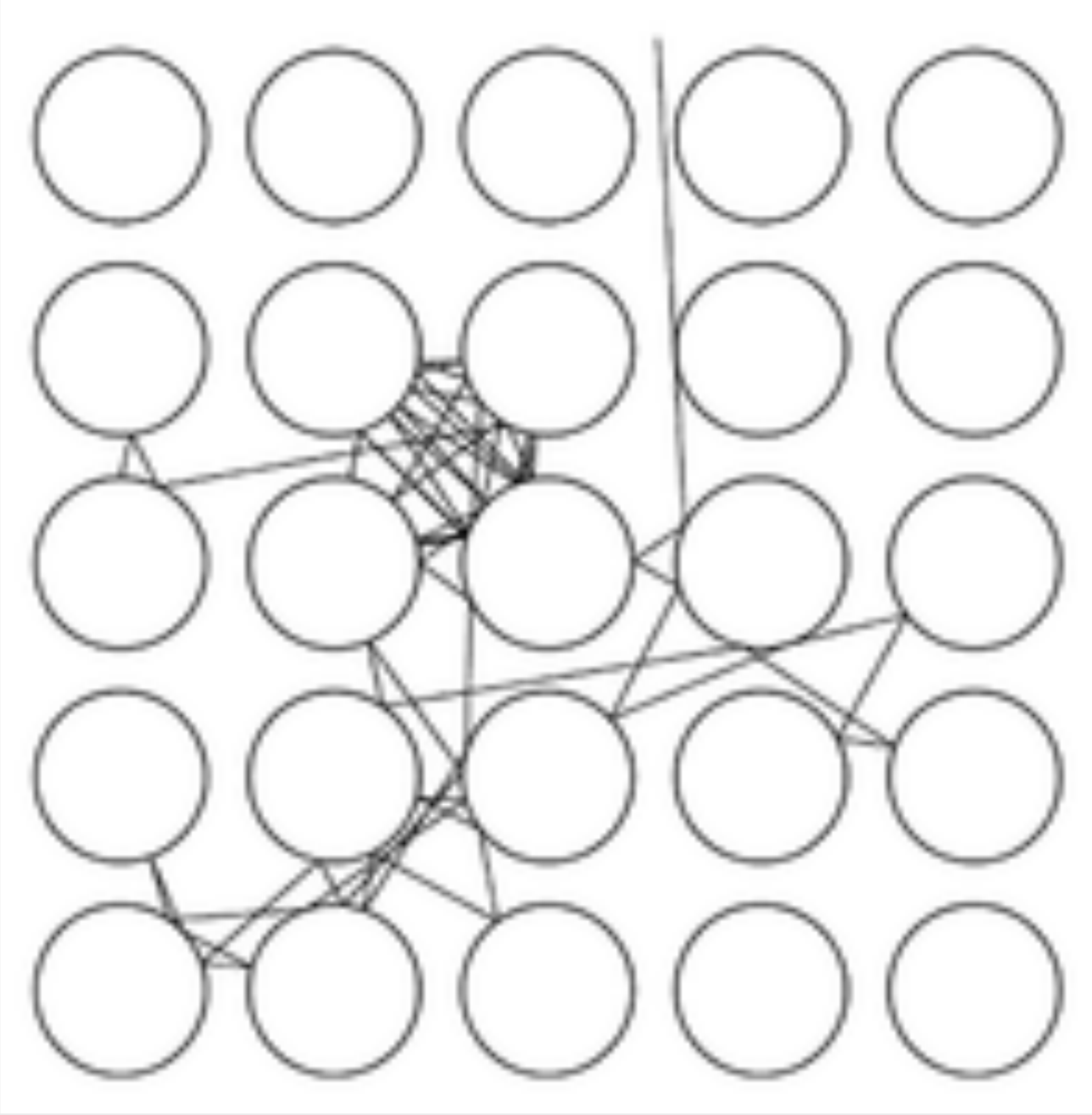
Trasporto stocastico normale: random walk



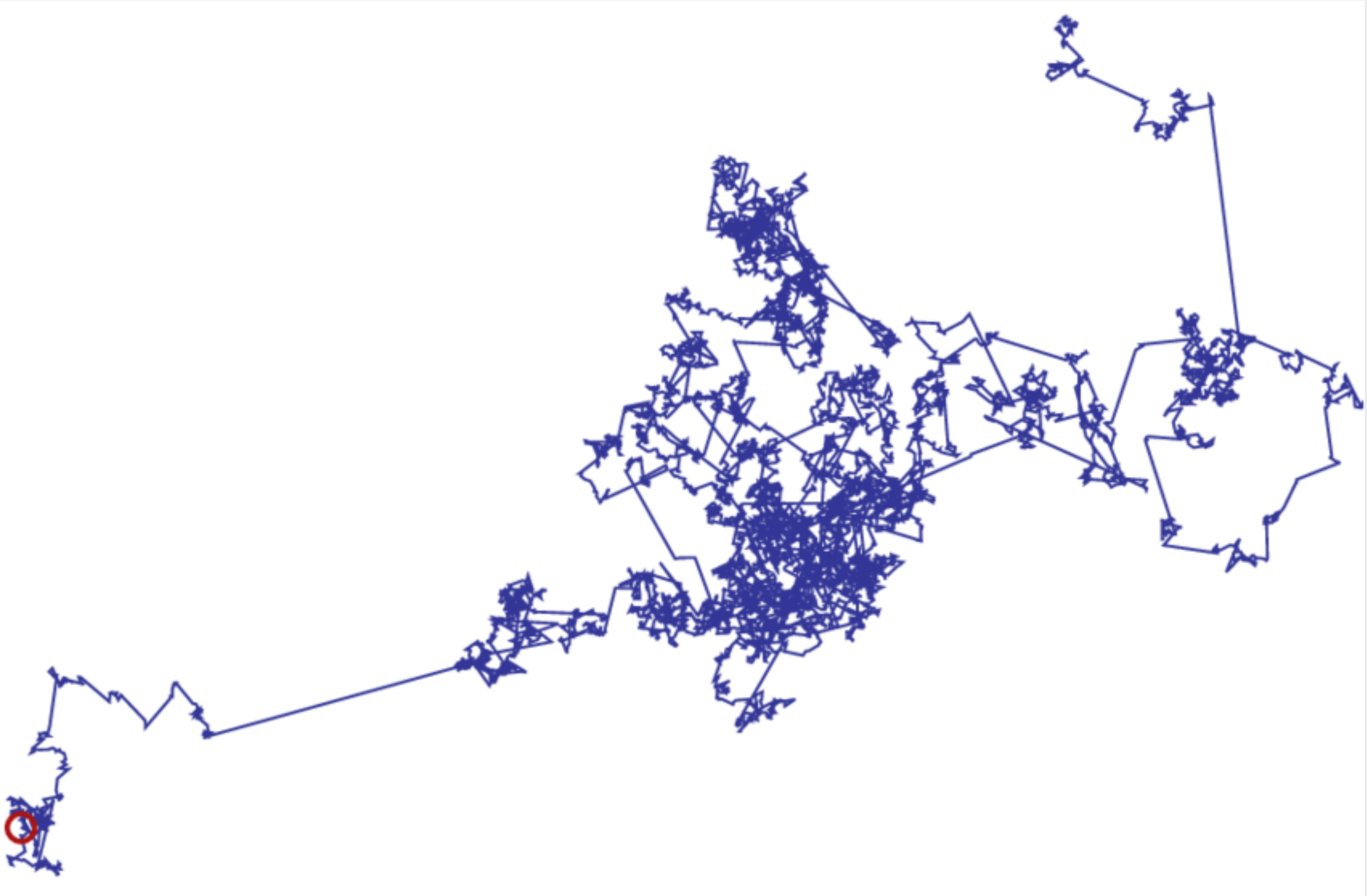
Trasporto deterministico normale: gas di Lorentz a orizzonte infinito



Trasporto deterministico anomalo: gas di Lorentz a orizzonte infinito



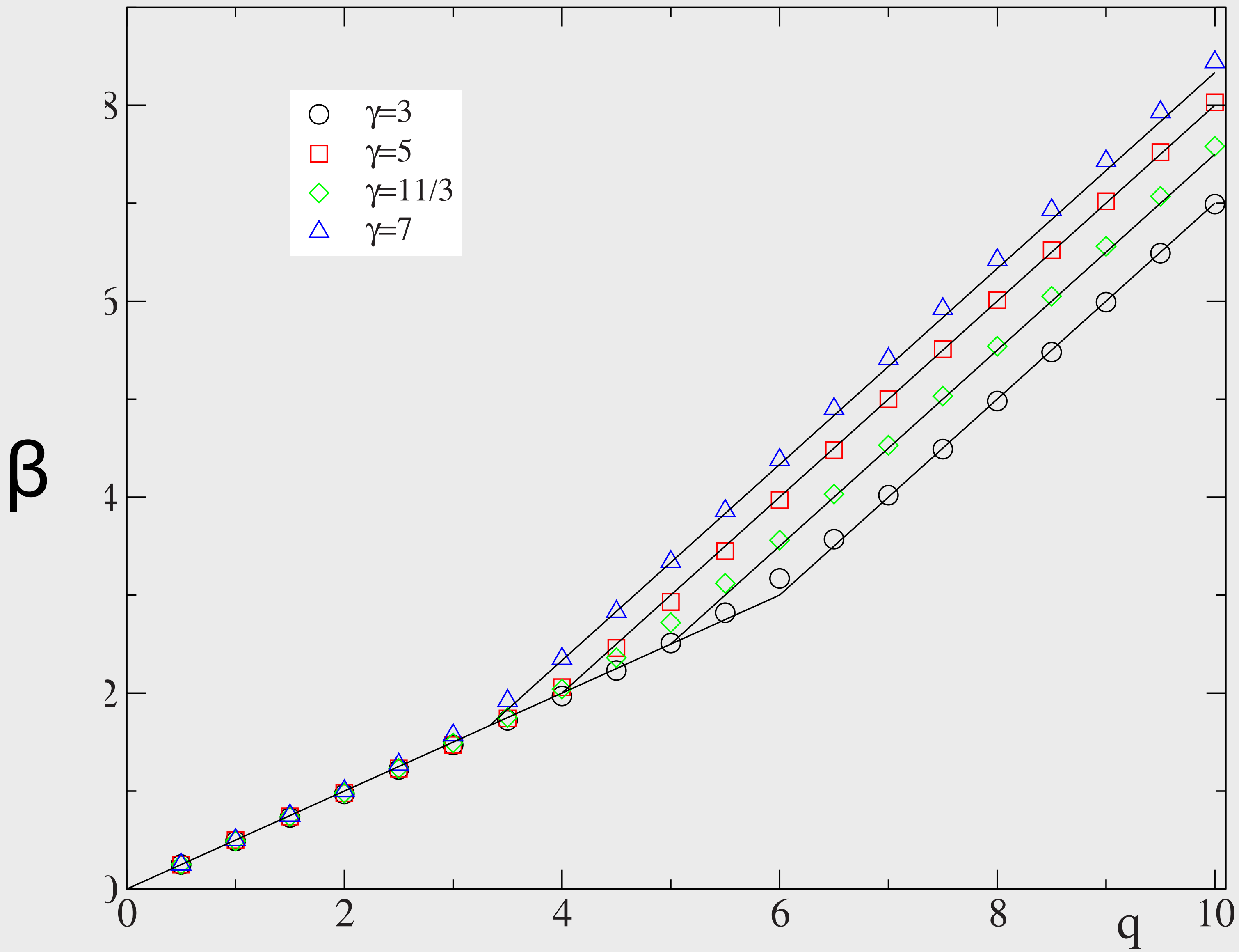
Trasporto stocastico anomalo: gas di Lorentz a orizzonte infinito



Normale *contro* Anomalo

$$\langle |x_t - x_0|^q \rangle \sim t^{q/2}$$

$$\langle |x_t - x_0|^q \rangle \sim t^{\beta(q)}$$



.. oltre il trasporto (parole chiave) ..

Universalità di Sparre Andersen

Problemi di primo passaggio

Statistiche dei tempi di residenza (Darling-Kac, Lamperti)

Statistiche dei records

Una complicazione supplementare..

Le tecniche standard (Montroll-Weiss, renewal, espansioni in orbite periodiche ..) **non** funzionano per mezzi eterogenei, o sistemi con persistenza

OPEN ACCESS Freely available online

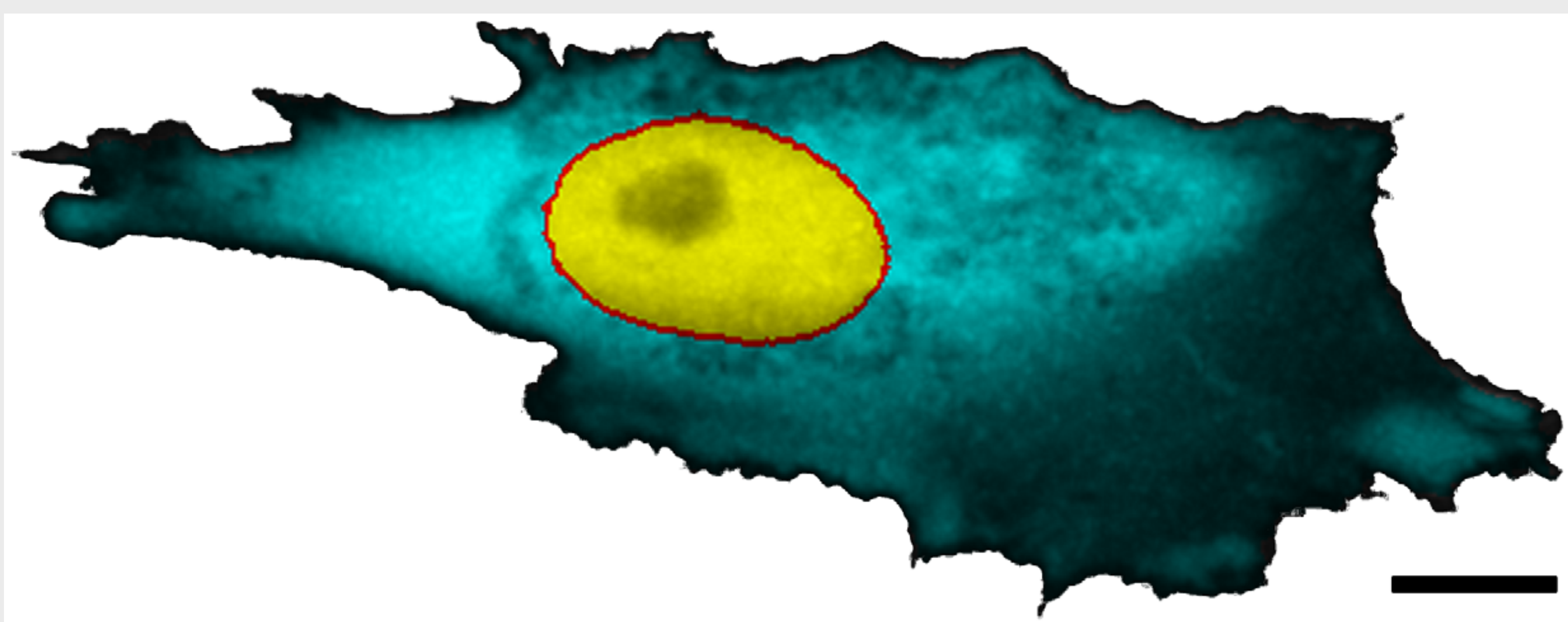
PLoS one

Protein Diffusion in Mammalian Cell Cytoplasm

Thomas Kühn[1]*☯, Teemu O. Ihalainen[2]☯, Jari Hyväluoma[1,3], Nicolas Dross[4], Sami F. Willman[2], Jörg Langowski[4], Maija Vihinen-Ranta[2], Jussi Timonen [1]

1 NanoScience Center, Department of Physics, University of Jyväskylä, Jyväskylä, Finland, **2** NanoScience Center, Department of Biology, University of Jyväskylä, Jyväskylä, Finland, **3** MTT Agrifood Research Finland, Jokioinen, Finland, **4** Division Biophysics of Macromolecules, German Cancer Research Center (DKFZ), Heidelberg, Germany

Protein Diffusion in Mammalian Cell Cytoplasm



Un esempio (ingannevolmente) semplice

CENTRALLY BIASED DISCRETE RANDOM WALK

By J. GILLIS (*Rehovoth, Israel*)

[Received 28 February 1956]

1. Introduction

WE denote by $\mathbf{m}$ the general lattice point $(m_1, m_2, \ldots, m_d)$ in a d-dimensional lattice and by $\mathbf{E}_i$ the unit vector parallel to the positive direction of the ith axis. We now consider a random walk starting at the origin and such that the only steps permitted are of the type $\mathbf{m} \to \mathbf{m} \pm \mathbf{E}_i$, with respective probabilities $P_i(\mathbf{m})$, $Q_i(\mathbf{m})$ $(i = 1, 2, \ldots, d)$. A *recurrent point* is defined as one through which the walk will, with probability 1, pass an infinite number of times. The main purpose of this paper is to prove Theorem 3 below. However, the proof will require two preliminary results which it will be convenient to state separately as Theorems 1 and 2.

THEOREM 1. *In a discrete random walk on a one-dimensional lattice let $p_{i,j}$ denote the probability of a step from lattice point i to j. Suppose further that*

$$p_{0,1} = p_{0,-1} = \tfrac{1}{2}, \tag{1.1}$$

$$\left.\begin{aligned} p_{i,i+1} &= \tfrac{1}{2}(1-\epsilon/i) \\ p_{i,i-1} &= \tfrac{1}{2}(1+\epsilon/i) \end{aligned}\right\} \quad (i = \pm 1, \pm 2, \ldots), \tag{1.2, 1.3}$$

$$p_{i,j} = 0 \quad \textit{when } |i-j| \neq 1, \tag{1.4}$$

where $|\epsilon| < 1$.

Journal of Statistical Mechanics: Theory and Experiment
An IOP and SISSA journal

PAPER: Classical statistical mechanics, equilibrium and non-equilibrium

Non-homogeneous persistent random walks and Lévy–Lorentz gas

Roberto Artuso[1,2], Giampaolo Cristadoro[3], Manuele Onofri[1] and Mattia Radice[1,2,4]

[1] Dipartimento di Scienza e Alta Tecnologia and Center for Nonlinear and Complex Systems, Università degli Studi dell'Insubria, Via Valleggio 11, 22100 Como, Italy
[2] I.N.F.N. Sezione di Milano, Via Celoria 16, 20133 Milano, Italy
[3] Dipartimento di Matematica e Applicazioni, Università degli Studi di Milano-Bicocca, Via Cozzi 55, 20125 Milano, Italy
E-mail: roberto.artuso@uninsubria.it, giampaolo.cristadoro@unimib.it, m.onofri@hotmail.com and m.radice1@uninsubria.it

Received 24 May 2018
Accepted for publication 3 August 2018
Published 29 August 2018

Online at stacks.iop.org/JSTAT/2018/083209
https://doi.org/10.1088/1742-5468/aad822

J. Stat. Mech. (2018)

Passaggio al continuo, equazioni di Fokker Planck con correnti o diffusione non omogenea

Generalizzazione di argomenti alla Darling-Kac