Nara Workshop on Nonlinear Dynamics
under HAS-JSPS Joint Research Project

At Middle meeting room of Faculty of Human Life and Environment
on the second floor in Bldg. F in Nara Women's University

20 February 2016 (Sat)

10:00 – 12:00 Meeting among members of HAS-JSPS Joint Research Project

Chairman: S. Kitsunezaki

13:00 – 14:00 Ferenc Kun (Invited, Univ. Debrecen, Hungary)

"Dynamics of magnetic particle systems - towards discrete element modeling of the memory of magnetic field in desiccation induced cracking"

–15 min. break time –

Chairman: T. Mizuguchi

14:15 – 14:45 Ooshida Takeshi (Tottori Univ.)

"Calculation of displacement correlation tensor: from single-file diffusion to vortical cooperative motion in colloidal liquids"

14:45 – 15:15 S. Kitsunezaki (Nara Women's Univ.)

"Development of stress anisotropy in the memory effect of paste"

15:15 – 15:45 A. Nishimoto (Kansai Univ.)

"Columnar joints in basalt and starch"

– 15 min. break time –

Chairman: A. Nakahara

16:00 – 16:30 M. Toda (Nara Women's Univ.)

"Time Frequency Analysis to molecular dynamics simulation of proteins"

16:30 – 17:00 H. Adachi (Nara Women's Univ.)

"Study of emotional propagation in SNS- Network of emotional words constructed by reference relation of comments -"

17:00 – 17:30 T. Mizuguchi (Osaka Pref. Univ.)

"Size frequency distributions of names"

17:30 – 18:30 Free Discussion

Akio Nakahara (Nihon Univ.)
TEL : 047-469-5201, E-mail: nakahara@phys.ge.cst.nihon-u.ac.jp
http://www.phys.ge.cst.nihon-u.ac.jp/~nakahara

So Kitsunezaki(Nara Women's Univ.)
TEL: 0742-20-3988, E-mail: kitsune@ki-rin.phys.nara-wu.ac.jp
http://www.complex.phys.nara-wu.ac.jp/~kitsune/

Abstract

Calculation of displacement correlation tensor: from single-file diffusion to vortical cooperativemotion in colloidal liquids

Ooshida Takeshi (Tottori Univ.)
[in collaboration with Goto, Matsumoto & Otsuki]

Displacement correlation of colloidal particles,as an indicator of collective motion, is calculated analytically and compared with numerical results. The idea is clarified in terms of the one-dimensional problem (single-file diffusion [1]) and then applied to the two-dimensional case [2]. The calculation is based on the relation between the displacement correlation and the Lagrangian correlation of the deformation gradient tensor. Tensorial treatment of the statistical quantities, including the displacement correlation itself, allows capturing the vortical structure of the cooperative motion [3].

References:
[1] Ooshida et al., PRE 88 (2013) 062108
[2] Ooshida et al., http://arxiv.org/abs/1507.05714
[3] Ooshida et al., in preparation

Development of stress anisotropy in the memory effect of paste

S. Kitsunezaki (Nara Women's Univ.),
A. Nakahara and Y. Matsuo (Nihon Univ.)

Paste-like mixtures of fine granular particles and water can remember the direction of shaking applied for a short time and exhibit directional crack patterns after drying. Although it is inferred that anisotropy in residual stresses caused by plastic deformation is responsible for this *memory effect of shaking* [1-3], it has been difficult to detect such anisotropy in paste before cracking by now. We found that a paste layer in a soft container bended with drying in the direction of initial shaking and investigated stress development in drying paste experimentally by using the bending of elastic plates. We confirmed that small stress anisotropy develops with drying before crack formation and the stress differences are smaller than the yield stresses of drying paste.

[1] A.Nakahara and Y.Matsuo, J. Phys. Soc. Jpn. **74**(2005) 1362.
[2] M.Otsuki, Phys. Rev. E **72**(2005) 046115.
[3] Ooshida Takeshi, J. Phys. Soc. Jpn. **78**(2009) 104801.

Columnar joints in basalt and starch

A. Nishimoto (Kansai Univ.)

Columnar joints in cooling lava have fascinated many people for centuries and are studied mainly by field work in geology. Recently, the crack patterns formed in drying starch water mixtures have attracted considerable attention for their likeliness to columnar joints. We study the formation of three-dimensional prismatic cracks in the drying process of starch water mixtures numerically. The mixture is assumed to be an elastic porous medium which possesses a stress field and a water content field. The evolution of the former is represented by a spring network model and the latter is represented by a phenomenological model with the water potential. We find that the water content distribution has a propagating front, and the prismatic structure of cracks driven by the water content field is observed. We also discuss the contrast between starch columns and geological columnar joints.

Time Frequency Analysis to molecular dynamics simulation of proteins

M. Toda (Nara Women's Univ.)

I will present time series analysis toward molecular dynamics simulation of proteins combining wavelet transformation and singular value decomposition. Wavelet transformation enables us to reveal nonstationary features of time series and singular value decomposition does to extract colective behavior of proteins. I will investigate how hierarchical structure of proteins corresponds to that of colective behavior.

Study of emotional propagation in SNS
- Network of emotional words constructed by reference relation of comments -

H. Adachi (Nara Women's Univ.)

Influence of emotions through the internet is of great interest these days. In particular, propagation of negative emotions in SNS is problematic and damages social security. In order to manifest how negative/positive emotions become spread through internet, we study emotional interactions in SNS. Based on the usage of words expressing emotions, we investigate how emotional expressions in a certain comment affect those of other ones. We construct a network which represents how usage of words expressing specific emotions stimulates that of other/same words expressing a certain emotions. We analyze various characteristics of this network to reveal emotional interactions in the internet.

Size frequency distributions of names

T. Mizuguchi (Osaka Pref. Univ.)

Size frequency distributions of Japanese names are analyzed. Power law behavior is obtained in the small size range of the family name distribution as reported by Miyazima, whose exponent γ is around *-1.75* [1]. Similar power law behaviors are observed for the name distributions in other countries [2,3]. Interestingly, Japanese given name distribution also exhibits similar behavior with similar exponent[4]. A model for given name distribution is suggested and analyzed.

[1] Miyazima, S. et al., (2000) Physica, **A278**: 282--288.
[2] Zannette, D. H. and Manrubia, S. C., (2001) Physica, **A295**: 1--8; Manrubia, S. C. and Zanette, D. H., (2002) J. theor. Biol., **216**: 461--477.
[3] Baek, S. K., Kiet, H. A. T. and Kim, B. J., (2007) Phys. Rev. E. **76**: 046113.
[4] Hayakawa, R., Fukuoka, Y. and Mizuguchi, T., (2012) J. Phys. Soc. Jpn., **81**: 094001.