

Accepted Manuscript

Gaussian noise and the two-network frustrated Kuramoto model

Andrew B. Holder, Mathew L. Zuparic, Alexander C. Kalloniatis

PII: S0167-2789(16)30152-X

DOI: <http://dx.doi.org/10.1016/j.physd.2016.09.009>

Reference: PHYSD 31854

To appear in: *Physica D*

Received date: 4 April 2016

Revised date: 11 September 2016

Accepted date: 28 September 2016

Please cite this article as: A.B. Holder, M.L. Zuparic, A.C. Kalloniatis, Gaussian noise and the two-network frustrated Kuramoto model, *Physica D* (2016), <http://dx.doi.org/10.1016/j.physd.2016.09.009>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Gaussian noise and the two-network frustrated Kuramoto model

Andrew B. Holder^a, Mathew L. Zuparic^a, Alexander C. Kalloniatis^a

^a*Defence Science and Technology Group, Canberra, ACT 2600, Australia*

Abstract

We examine analytically and numerically a variant of the stochastic Kuramoto model for phase oscillators coupled on a general network. Two populations of phased oscillators are considered, labelled ‘Blue’ and ‘Red’, each with their respective networks, internal and external couplings, natural frequencies, and frustration parameters in the dynamical interactions of the phases. We disentangle the different ways that additive Gaussian noise may influence the dynamics by applying it separately on zero modes or normal modes corresponding to a Laplacian decomposition for the sub-graphs for Blue and Red. Under the linearisation *ansatz* that the oscillators of each respective network remain relatively phase-synchronised centroids or clusters, we are able to obtain simple closed-form expressions using the Fokker-Planck approach for the dynamics of the average angle of the two centroids. In some cases, this leads to subtle effects of metastability that we may analytically describe using the theory of ratchet potentials. These considerations are extended to a regime where one of the populations has fragmented in two. The analytic expressions we derive largely predict the dynamics of the non-linear system seen in numerical simulation. In particular, we find that noise acting on a more tightly coupled population allows for improved synchronisation of the other population where deterministically it is fragmented.

Keywords: synchronisation, oscillator, Kuramoto, network, frustration
2010 MSC: 34C15 37N40

Email addresses: `andrew.holder@dsto.defence.gov.au` (Andrew B. Holder),
`mathew.zuparic@dsto.defence.gov.au` (Mathew L. Zuparic),
`alexander.kalloniatis@dsto.defence.gov.au` (Alexander C. Kalloniatis)

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات