

Peer Review

Review of: "Stability and Synchronization of Kuramoto Oscillators"

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This paper presents an analysis of the phase synchronization process of oscillators in Kuramoto's model. As a first step, I would ask the author to clarify the purpose of this paper and to whom it is addressed. The author titles some sections "A Primer", but if they are addressed to an audience of non-experts in the field, more care must be taken not to assume too much background.

For example, on page 3, the author says: 'If we assume our critical coupling constant for synchronization to occur to be K_C , then [...]'. If it is a reading for beginners approaching the problem, it cannot be assumed that there is a critical value of K . Why does it exist? How does it show up? Of course, this will be discussed later, but the meaning of this constant should be clarified at this point. Or, for example, in the first formula at the top of page 2 of the pdf, what is $Z(\theta_i)$? Z is never defined and never taken up in the sequel. Moreover, the definitions must be placed before their use in the text: for example, the definition of the torus is given after the use of the symbol T^n in the frequency synchronization.

Second, in general, the writing must be improved and revised. Sometimes it is difficult to read and understand the meaning. For example, on page 2: 'But this model was not widely accepted by the scientific community because it lacked certain symmetries like that of translational invariance when both phases are slightly perturbed, the model does not remain invariant.' And 'But how high does a coupling constant do we need?', or on page 9: 'If the oscillators are to at least asymptotically synchronize'.

There are some notational problems. It is not always easy to distinguish between scalars and vectors. On page 3, I would use the most common symbol for the Moore–Penrose pseudoinverse, L^+ , but this is

just a personal choice. Moreover, the main formulas should be numbered consecutively.

In addition, it is important that if there are original results in this paper, they are highlighted and separated from known results. For example, I assume that K_L on page 10 is a new lower bound found by the author. I would put more emphasis on it being a new result that improves the value of the K_C bound. I think it would also be useful for the author to explicitly state which proofs are original. It would be helpful to know whether they are all new demonstrations or already in the literature. For example, the fact that the Jacobian is equal to minus the Laplacian matrix of the graph is known, but the author provides an interesting proof. Is it a novel proof?

In section 4, the author writes 'I will consider here an AC power network from Dorfler's paper.' Which paper? It is not cited in the bibliography. In general, the bibliography must be enriched.

I have tried to access the links in the paper, but in most cases, I get "access denied" (see links on pages 15 and 17). Only the link on page 24 works.

There are many typos: for example, in the title of Section 3: 'Kuramoto Oscillatoras'; or the right and left brackets on page 10.

Declarations

Potential competing interests: No potential competing interests to declare.