BT6270: Computational Neuroscience

The details of Assignment-3 are given below

Assignment description:

For this assignment, consider two Hopf oscillators (equation given below) coupled together. Calculate the coupling coefficients (w_{12} and w_{21}) required to achieve a given phase difference in the between the oscillators. Two types of coupling are to be considered –

a. Complex coupling

   The phase differences to be achieved are – 47^0 and 98^0. Consider $\omega_1 = \omega_2 = 5$.

b. Power coupling.

The *normalized* phase differences to be achieved are – 47^0 and 98^0. Consider $\omega_1 = 5$ and $\omega_2 = 15$

Hopf oscillator equations are given as follows,

$$\dot{x} = -y + \mu x(1 - x^2 - y^2)$$

$$\dot{y} = -x + \mu y(1 - x^2 - y^2)$$

In polar coordinates, the equations become,

$$x = r \cos \cos \theta , \ y = r \sin \sin \theta$$

$$\dot{r} = \mu r(1 - r^2)$$

$$\dot{\theta} = 1$$

Plot the response of the oscillators over time for all the cases. Kindly attach the codes used along with any helper modules or functions used to run the code, along with a report containing a summary of your findings, and/or calculations along with the necessary plots. The code can be either in **MATLAB or Python.**

General Instructions:

● Please email the TAs the completed assignment (zip or rar file named <ROLLNO>_A3.zip) with the subject: " BT6270: Assignment - 3". The email IDs of the Tas are given below,

- Please note this is an individual assignment. Please do not share your assignment with other students.

Please note the deadline for Assignment-3 is 08/11/2023, 23:59. Delay in submitting the assignment will only be accepted if found valid and should be informed to one of the TAs at least 3 days before the due date.