

# A fractional-order love dynamical model with time delay for synergic couple : Stability analysis and Hopf bifurcation

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November 12, 2021

## Abstract

We investigate the fractional order love dynamic model with time delay for synergic couples in this manuscript. The quantitative analysis of the model has been done where the asymptotic stability of the equilibrium points of the model have been analyzed. Under the impact of time delay, the Hopf bifurcation analysis of the model has been done. The stability analysis of the model has been studied with the reproduction number less than or greater than 1. By using Laplace transformation, the analysis of the model has been done. The analysis shows that the fractional order model with a time delay can sufficiently improve the components and invigorate the outcomes for either stable or unstable criteria. In this model, all unstable cases are converted to stable cases under neighbourhood points. For all parameters, the reproduction ranges have been described. Finally, to illustrate our derived results numerical simulations have been carried out by using MATLAB. Under the theoretical outcomes from parameter estimation, the love dynamical system is verified.

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