Modeling with fractional derivatives - spread of the dengue fever epidemic

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SUMMARY

The dynamic behavior of epidemic disease is an important topic in the real world. This problem was studied in the literature from a very long time and plenty of mathematical researchers had tried to describe this phenomenon using mathematical tools. An important branch of this research is modeling using systems of ordinary differential equations or partial differential equations. Nevertheless, it appears that in some cases, like for the dengue fever epidemic, this framework seems insufficient to capture some part of the dynamics. This is in particular the case when some memory effects occur. One way to take into account such kind of behavior is to change the setting of ordinary differential equations to fractional differential equations. This change can be in some cases interpreted and the relation between the classical and fractional modeling can be precised. In this talk, we will present a global view of such a framework with numerous concrete examples. A special emphasis is given to the modeling problem of the spread of the dengue fever epidemic. We construct a new fractional model and we provide supporting numerical simulations for the validity of this model.

Keywords: Fractional calculus, Dengue fever, embedding formalism,...

AMS Classification: 26A33, 49M25, 65Q30

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