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Study on the controllability of deformable fractional control systems in finite dimensional spaces.

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In this work, we study the controllability of fractional control systems for deformable bodies in finite dimensions. To do this, we use a method based on a fractional exponential matrix of deformable bodies, the Gramian matrix of controllability, and an iterative technique. Some examples are also provided, and the results obtained have been simulated in Python.

Many real-world problems can be modeled only by fractional differential equations. This new calculus has clearly attracted mathematicians who must focus on revealing better results. The concept of controllability has been extended to fractional control systems by various researchers. Recently, in 2017, the Indians Zulfeqarr et al. introduced a new fractional derivative called deformable due to its ability to continuously deform the function being differentiated. In the literature, there is still not much work in this direction, which is unusual. Motivated by this constant, we have worked on the controllability of fractional control systems.

We have studied the controllability of linear and semi-linear fractional control systems under certain suitable conditions and assumptions. Furthermore, an iterative technique is used here to construct an appropriate sequence that, under suitable conditions, converges uniformly to a smooth solution of the semi-linear system.