

Review of: "Trigonometric Approximation of the Three-Body Problem: A Double Centroid Approach"

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Potential competing interests: No potential competing interests to declare.

This article suggests a practical geometric approximation to the problem of finding the center of mass of three bodies to simplify it. The authors provide two figures (Figs 2 & 3) to show their approach to the problem by considering each pair in isolation and then by determining the center of mass by combining them (Fig 2) and then finding the average of centripetal forces on each body when they are in motion (Fig 3), respectively. Although there are not many specific scientific papers that exclusively outline the geometric method for approximating the center of mass of three bodies by considering each pair as a binary system, this method is more commonly taught as a concept in introductory physics or celestial mechanics courses (Goldstein, Poole & Safko 2001; [Kleppner & Kolenkow 2013](#)) rather than being the subject of a dedicated research paper. In that sense, this manuscript can be considered as a summary review rather than an original research paper.

You can find my comments for each section below.

Abstract:

I think the phrase "novel approach to determine their dynamic center of mass" should be changed because this is not an unknown technique to approximate the problem, although it is brought to attention with a new title (Double Centroid Approach).

1. Introduction:

The authors should provide some citations discussing the issue in the literature prior to their work. Are there any similar studies? What are the problems in them? There are too few citations in the paper in general.

I find Fig-1 unnecessary and not illustrative of the concept.

p2l1 (paragraph-2 line-1): "stopped bodies" → "stationary bodies"

p2l2: "This is an approximation, so I'm going to do it 100% trigonometrically, which is much easier and more intuitive" → "A fully trigonometric approximation is more practical and intuitive."

p2l6: "my first theory" → "the theory I proposed"

2. Calculate the center of gravity of 3 bodies in space (Lagrange points) without taking into account their motion

A reference to Fig-2 should be provided in the text with more information because this is the essence of this section.

Fig-2 should be annotated, and more information should be provided in its caption. Are the masses of bodies in scale with their sizes on the figure? If so, why are the centers of mass of each binary pair closer to the smaller circles? What are the masses in relative units at the least, and how are they scaled in the drawings? What are the distances between them (at least in relative units), and how are they scaled compared to the radii of the drawn circles representing the bodies?

3. Add motion; bodies will rotate at a direction and speed known

Authors should provide their calculations of the vectors given in Fig-3, with a reference to it in the text. If these are the same bodies depicted in Fig-2, this should be mentioned in the caption of this figure too.

4. Calculate the new centroid, or center of mass

Again, authors should provide their calculations given in Fig-4, with a reference to them in the text. If these are the same bodies depicted in Fig-2 & 3, this should be mentioned in the caption of this figure too.

p2l1: “there are more factors..” → there are certainly more factors, and they should be listed in the order of their importance. Solving the three-body problem can be done only numerically, and the reason for this should be mentioned by proper citations to earlier works.

p2l2: “awesome” → “intriguing” (I think such words should never be used in scientific publications!)

p2l3: “my great theory” → “the theory I proposed”

p3l1: “For future moments, is not so complicated but calculating for past moments(**backwards**) could be much more complicated.” → Grammatically incorrect and should be rewritten!

Fig-5 and the last sentence are unnecessary and unrelated.

Overall, I think the manuscript is poorly written without proper citations (other than two self-citations) and no calculations. I would suggest rejection of the paper and no further considerations without significant revision.