

Dear Reviewer and Editors,

Thank you for the reading the paper and responding with helpful comments. I have considered them and made some changes to the work. To make the back and forth easy, I have *italicized* your comments and have inserted responses below in **bold** font.

Nathan Moore

REVIEWER REPORT(S):

Referee: 1

COMMENTS TO THE AUTHOR(S)

The manuscript focuses on the recovery process of videos recorded with the camera in motion. For this purpose, the author proposes the use of a point in the images to serve as a fixed reference, by changing the reference frame.

The work consists of using this technique based on two concrete video examples. Although very simple, it seems to me that the work is very useful for Physics Education readers, namely teachers who can thus recover some videos for their classes with great simplicity, and instruct their students to use the same technique.

The author mentions two computer programs for video analysis: Tracker and LoggerPro. In the examples given, only LoggerPro is used, but a more careful search of the bibliography would have found examples where this technique of changing the reference frame is part of one of Tracker's tools and available to its users. I will make some comments about that later.

Without wanting to disparage the work presented, I have a few comments to value the work that I would like the author to consider.

- Page 3, lines 39 and 40: the author states: "In both of these examples, students are presented with videos that can be analysed frame by frame at constant time intervals, typically 60 frames/second". This is only true for the Peter Bohacek video, because the Etkina video was recorded at 15 fps. Therefore, a correction is needed.

Noted and changed

- Page 3, line 44: in the sentence "There are also a number of video analysis software programs", the word "also" seems to me to be misapplied. Consider deleting it.

deleted

- Page 4, line 7: the author writes "Figures 1 and 3 show the analysis process for the video", but actually this only applies to Figure 3, because figure 1 is a screenshot of that video with the calibration bar, which also appears in Figure 1. Consider reviewing.

Given the movement of the calibration bar I prefer to include both images. The calibration step is one of the main source of error in video analysis and I think it merits a separate figure.

- Page 7, end of Section 2: The author may not be aware that the Tracker software provides an automatic tool for changing the reference frame. In the case of Etkina video, by changing the coordinate system to the clock reference, we immediately obtain the coordinates of the ball in relation to the clock without the need to create a new column. Then, the acceleration of gravity and the horizontal velocity of the ball can be measured. Changing the coordinate system in Tracker does exactly what is described in the text for the X and Y coordinates for LoggerPro. Attached to these comments is a screenshot of Tracker that I made with

this procedure in the mentioned video. On the right side the author can see the X and Y positions of the ball in relation to the clock.

I appreciate the reviewer's comments about tracker – thanks for the screenshot! I've asked students to use Tracker a number of times over the past 5 years and have seen mixed reliability of the software. Sometimes it works excellently, and other times students get stuck on the import/play a video stage. Logger Pro has been more reliable, supporting one system is easier than supporting two, so that's what I use. I have read about Trackers automatic motion tracking feature, and while I agree it is cool, that "magic button" takes away the direct connection to relative velocity. Again, thank you for pointing out this feature of Tracker.

The reference frame tool of Tracker software was used in the paper Mariana Balaton et al 2021 Phys. Education 56 045018, as a strategy to show the retrograde movement of the planets. It seems to me that the citation of this work completes the strategy proposed by the author by giving an example of its implementation with the two video analysis programs.

Thanks for the paper reference. Added.

The author may also be interested in analysing another paper in which the frame of reference switching is used, albeit in a different educational context (numerical analysis without video analysis): André G C Guerra and Paulo Simeão Carvalho 2016 Phys. Education 51 055012.

Again, thank you for the paper reference. Added to the end of section 3

- Page 8, lines 31 and 32: the author comments that the values obtained may be inaccurate, based on the values extracted for gravitational acceleration. This, in fact, is true. One way to improve is to initially consider the calibration stick in pixels or arbitrary units (e.g. 1000 a.u.). After the acceleration analysis, a direct conversion from pixels or a.u. to meters must be made, assuming a gravitational acceleration of 9.8 m/s^2 . Only then the video calibration stick is fully recovered. I suggest the author to read the paper M Rodrigues e P Simeão Carvalho 2013 Phys. Education 48 431 for more information on this procedure.

Thanks for the observation. Comment and reference added in Figure caption 8

Minor corrections:

- Page 4, line 27: In the sentence "frames of reference sometimes seems dry or contrived", the word "seems" must be replaced by "seem" since it speaks in the plural.

corrected

- Figures 6, 7 and 8 are out of place in the text and need to be better framed.

I agree with you. I am deferring figures placement to LaTeX right now and I assume the Editors' aesthetic sensibilities will intervene if the paper is accepted.

In conclusion, I believe that the manuscript will be very well received by Physics Education readers given the practical interest in the use of videos and their analysis. The manuscript is simple to read and written in a direct and very understandable language, but it contains some (few) inaccuracies that need to be corrected. It also seems to me that it should be completed with some references from other works. Finally, I urge the author to review the format of the references, as they do not seem to be in the PED style.