

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Relativistic effects of spacecraft with circumnavigating observer

NATHANIEL SHANKLIN, JOSEPH WEST, Indiana State University — A variation of the recently introduced Trolley Paradox, itself is a variation of the Ehrenfest Paradox is presented. In the Trolley Paradox, a “stationary” set of observers tracking a wheel rolling with a constant velocity find that the wheel travels further than its rest length circumference during one revolution of the wheel, despite the fact that the Lorentz contracted circumference is less than its rest value. In the variation presented, a rectangular spacecraft with onboard observers moves with constant velocity and is circumnavigated by several small “sloops” forming teams of inertial observers. This whole precession moves relative to a set of “stationary” Earth observers. Two cases are presented, one in which the sloops are evenly spaced according to the spacecraft observers, and one in which the sloops are evenly spaced according to the Earth observers. These two cases, combined with the rectangular geometry and an emphasis on what is seen by, and what is measured by, each set of observers is very helpful in sorting out the apparent contradictions. To aid in the visualizations stationary representations in excel along with animation in Visual Python and Unity are presented. The analysis presented is suitable for undergraduate physics majors.

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Date submitted: 12 Nov 2016

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