On the logical consistency of special relativity theory and non-Euclidean geometries: Platonism versus formalism

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Abstract

The Lorentz transformations in the theory of special relativity~(SR) lead to a little-investigated phenomenon called relativistic determinism. When two relatively moving inertial observers A and B coincide in space at a given instant, it is possible that a particular distant event is in the future of one of the observers~(B), but is in the present or even in the past of the other~(A); this is a well-known consequence of the relativity of simultaneity. Hence B's future at the instant of coincidence with A is determined by the fact that A had already seen it at that instant. In this paper, it is argued that Platonism is inherent in relativistic determinism and from the point of view of formalism, a logical inconsistency can be deduced in SR, as formalized in classical first-order predicate logic~(FOPL). Similarly, it is argued that Platonism is inherent in non-Euclidean geometries~(NEG) and that formalism demands that Euclid's fifth postulate~(EP) be provable in plane neutral geometry~(NG) consisting of Tarski's axioms (as formalized in FOPL). The essential argument here is that models of NEG can only be constructed by assuming that the postulates of Euclidean geometry~(EG) are metamathematically or Platonically `true'. Formalism demands however that such Platonic truths do not exist and so one concludes that formally, the provability of EP follows from its truth in every model of NG. The classical argument for `interpreting' NEG within EG must be formally rejected as amounting to assuming the Platonic/metamathematical truth of the Euclidean postulates. So from the point of view of formalism, this argument does not really prove the relative consistency of NEG with respect to EG. An argument for provability of EP in NG is presented in the non-Aristotelian finitary logic~(NAFL) proposed by the author.

Keywords:	relativistic determinism, relativity of simultaneity, consistency, inconsistency, non-Euclidean geometries, Euclid's fifth postulate, classical logic, non-Aristotelian finitary logic, Platonism, formalism, non-constructive existence
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