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# Hubble's law and faster than light expansion speeds

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Naively applying Hubble's law to a sufficiently distant object gives a receding velocity larger than the speed of light. By discussing a very similar situation in special relativity, we argue that Hubble's law is meaningful only for nearby objects with non-relativistic receding speeds. To support this claim, we note that in a curved spacetime manifold it is not possible to directly compare tangent vectors at different points, and thus there is no natural definition of relative velocity between two spatially separated objects in cosmology. We clarify the geometrical meaning of the Hubble's receding speed v by showing that in a Friedmann-Robertson-Walker spacetime if the four-velocity vector of a comoving object is parallel-transported along the straight line in flat comoving coordinates to the position of a second comoving object, then v/c actually becomes the rapidity of the local Lorentz transformation, which maps the fixed four-velocity vector to the transported one.

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