

The Time Machine Factory [unspeakable, speakable] on Time Travel -TM2019



Contribution ID: 7

Type: talk

Remote time manipulation

Wednesday, 9 October 2019 16:30 (20 minutes)

Harnessing the flow of proper time of arbitrary external systems over which we exert little or no control has been a recurring theme in both science and science-fiction. Unfortunately, all relativistic schemes to achieve this effect beyond mere time dilation are utterly unrealistic. In this work, we find that there exist non-relativistic scattering experiments which, if successful, freeze out, speed up or even reverse the free dynamics of any ensemble of quantum systems present in the scattering region. This “time warping” effect is universal, i.e., it is independent of the particular interaction between the scattering particles and the target systems, or the (possibly non-Hermitian) Hamiltonian governing the evolution of the latter. The protocols require careful preparation of the probes which are scattered, and success is heralded by projective measurements of these probes at the conclusion of the experiment. We fully characterize the possible time translations which we can effect on n target systems through a scattering protocol of fixed duration; the core result is that time can be freely distributed between the systems, and reversed at a small cost. For high n , our protocols allow one to quickly send a single system to its far future or past. In this sense, we have devised a time machine for very small stuff.

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Session Classification: Faster Than Light - SpaceTime Navigation