

Theory: On the wormhole-warp drive correspondence

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As was shown by Ellis in gr-qc/0411096, one can establish a correspondence between the Schwarzschild metric and a particular Natario warp drive metric, making it possible for a warp drive spaceship to cross the black hole horizon. We generalize this result to Morris-Thorne wormholes and demonstrate that wormholes without horizons can be mapped to a different “quasi-Natario” class of metrics with a nonzero intrinsic curvature. We prove that these metrics are nonsingular and admit timelike geodesics, making them a viable alternative to Natario–Alcubierre warp drives. We study whether nonzero intrinsic curvature could help to avoid or alleviate the violation of the null energy condition found in all Natario-type metrics (Santiago, Schuster, Visser). For metrics with horizons, we also discuss the possibility to avoid the destruction of the spacecraft by Hawking radiation if the spacecraft’s design allows it to absorb the radiation and use it as an energy source.

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