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The properties of Traversable Wormholes

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General relativity theory is a gravitational theory describing relation between spacetime geometry and mass/energy. General relativity provides mysterious prediction of spacetime geometry such as black holes and wormholes. Black hole is a spacetime geometry surrounding a massive object in which there exists a characteristic radius that even light cannot be escaped from the object. Wormhole is a spacetime region which connects between two asymptotically flat spacetimes. In fact, the wormholes can exist in the black hole solution, even in the simplest solution called Schwarzschild solution. However, it is not possible to travel through this region by human. Recent investigation shows that it is possible to construct the theoretical model of wormhole in which human can travel through namely "Traversable Wormhole". The objective of this project is to investigate geometries and properties of the traversable wormhole. First, we study basic properties of a simple wormhole in Schwarzschild and Reissnor-Nordstrom geometries. It was found that the traversable wormhole must satisfy three conditions as follows: the horizon is absent in the wormhole, travelling time in the wormhole travel is about 1 year, and gravity in the wormhole is comparable to gravity on the Earth. To create such the wormhole, one may need an exotic matter and the properties of this matter are left to investigate for further work.

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