To arrive at the metric of special relativity an observer must follow the following procedure:

1) Choose a free particle (a particle that obeys Newton's first law and moves in a straight line with constant speed as the origin of coordinates.

2) Choose a second free particle, stationary relative to the first to define the orientation of one of the coordinate axes.

3) Ensure that the clock is running at a constant rate and that the coordinate system is not rotating ~~by using a free particle~~ by ensuring a third free particle whose path does not pass through the origin obeys Newton's first law of motion. (assign times and distances to events.)

Special relativity assumes spacetime is empty, and that space is euclidean flat like the plane. But general relativity implies that the presence of matter makes spacetime curved. Matter curves space. The universe is not empty of matter, hence the special theory metric is at best only an approximation applicable in situations of low gravitational fields.

A good analogy between the spacetime of special relativity and that in the presence of large aggregates of matter is the distinction between the plane and a curved surface eg a sphere. In keeping with the spirit of