

An Attempt to Modify Special Relativity

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INTRODUCTION

Our goal in this paper is to advance a modified form of special relativity (i.e., STR). All current attempts of research along these lines reject or replace one of the two principles of STR. We consider Einstein's two principles as well founded postulates and hence we do not challenge them. One can still modify STR without rejecting or modifying anyone of these two principles. In order to clear the attempt to be presented here we need to start with Newtonian mechanics.

A BRIEF SUMMARY OF NEWTONIAN MECHANICS

Newtonian space-time

The spatial component of Newtonian space-time is a three dimensional Euclidean space that's rigid and eternal. The temporal component is a one dimensional time that's absolute.

Newtonian laws of motion

The first law, i.e., the law of inertia.

Everybody perseveres in its state of being at rest or of moving uniformly straight forward except insofar it's compelled to change its state by an impressed force.

The second law, i.e., the differential law.

$$F=ma$$

The third law, i.e., the action reaction law.

All forces occur in pairs, and these two forces are equal in magnitude and opposite in direction.

A BRIEF SUMMARY OF SPECIAL RELATIVISTIC MECHANICS

STR space-time

STR space-time is Minkowski-space. The spatial component of STR space-time is a three dimensional Euclidean space and is rigid and eternal. The temporal component is one dimensional time and simultaneity is relative unlike in

Newtonian space-time where it's absolute. The relativity of simultaneity is a consequence of the invariance of the speed of light.

STR laws of motion

STR accepts the first and third laws without any modifications but modifies the second law.

The law of inertia

The second law is modified to

$$F=\gamma ma$$

Enter our attempt at modifying STR

In current research STR has been modified to Doubly STR. This is the impressive work of Pavlopoulos, Giovanni Amelino-Camelia, Lee Smolin, Ted Jacobson, Joao Magueijo, Grigori Volovik, James Bjorken and others. All these impressive bodies of research works attempt to modify or replace one of the two basic postulates of STR. These researchers postulate an observer-independent Planck energy or Planck length. We attempt to modify STR without modifying or replacing the two postulates. The postulates are highly justified as their adoption allowed for reconciliation of classical mechanics with classical electrodynamics. So we accept the two postulates without modifications and modify STR along other lines.

A PRESENTATION OF OUR MODIFIED STR (i.e., MSTR)

MSTR space-time

MSTR space-time's spatial component is a non-Euclidean

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simply connected unbound space. The temporal component is a one dimensional time with relative simultaneity. The spatial component of MSTR is immutable but is not eternal in fact it can be created and annihilated just like particles in quantum field theory. MSTR's spatial component has intrinsic energy just like photons and electrons.

MSTR laws of motion

In MSTR material points are immutable, i.e., material points are only capable of constant velocity motion. The above postulates have as its consequence the idea that there exists an only inertial system. The transformation rules of MSTR are not Galilean ones of Newtonian mechanics but are the Lorentzian transformation rules of STR. MSTR unlike STR does not modify Newtonian mechanics but is a rejection of it. For MSTR material points have constant velocities and there exists only inertial systems and frames of reference while in both Newtonian mechanics and STR there are both inertial and non-inertial as in both frameworks material points are capable of constant velocity motion and accelerated motion. In MSTR force, acceleration, angular momentum, potential energy and Newton's laws of motion are rejected. In our framework MSTR a material point moves at a constant velocity from its creation to its annihilation and has only linear momentum given by $\rho = \gamma m v$, where $m_0 > 0$ and $\rho = \frac{E}{c}$, where $m_0 = 0$.

In our framework during mechanical collisions of material points, the material points before collision are annihilated and those after are new creations.

In Newtonian and STR a material point can lose or gain energy continuously while in quantum theory it can do so discontinuously. In our MSTR a material point can neither lose nor gain energy and thus neither gains nor loses it continuously or discontinuously. The framework of MSTR has no bound systems as all material points are only capable of constant velocity motion.

CONCLUDING REMARKS

All attempts to account for gravity within STR were unsuccessful e.g. those of Henri Poincare, Albert Einstein, Gunnar Nordstrom and others at STR scalar theories of gravity. So it seems plausible that gravity cannot be accounted in any theory that's Lorentz invariant. Einstein road to general relativity showed that gravity could only be accounted for in a framework that went beyond STR and would have STR as a limit case. Our MSTR requires no modifications in order to account for gravity.

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