Addition to Relativity Trail

beginning with 2nd edition, rev 4.

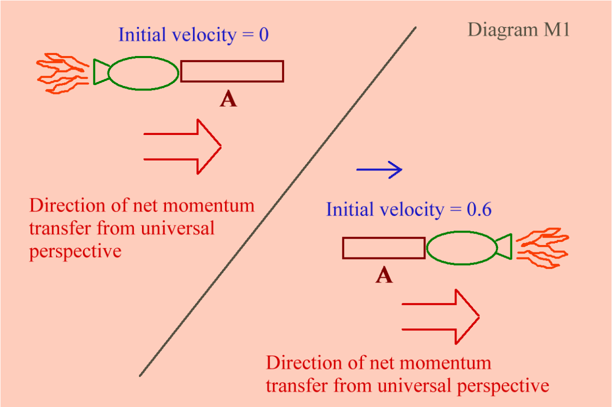
Two page addition to chapter nine, explaining mutually measured mass increase by parties of different inertial frames.

The mass of an object has an absolute reality, just as does its clock rate and length. An object with a rest mass of 1 in absolute terms will have a mass of 1.25 and a length of 0.8 when its speed is 0.6 in absolute terms.

Two identical (when at rest) objects in different inertial frames will measure each other's mass as increased, even though their masses are now different in reality, just as we saw in the case of length contraction and clock rates.

We'll explain how in a bit. First, let's consider the following progression:

Suppose we accelerate an object A, initially at absolute rest, to an absolute speed of 0.6c. To maintain the wholeness of object A, we must accelerate it using energy from outside of object A. There is a transfer of momentum to object A, at the net expense of everything that is not object A. Object A now has an actual mass of 1.25. If we now accelerate A again, we are not necessarily going to increase its actual mass. It is going to depend on the direction in which object A is next accelerated. It might well be a deccelaration, in absolute terms. In that case, object A's actual mass will decrease, and there will be a net transfer of momentum, in absolute terms, from A to everything that is not A.



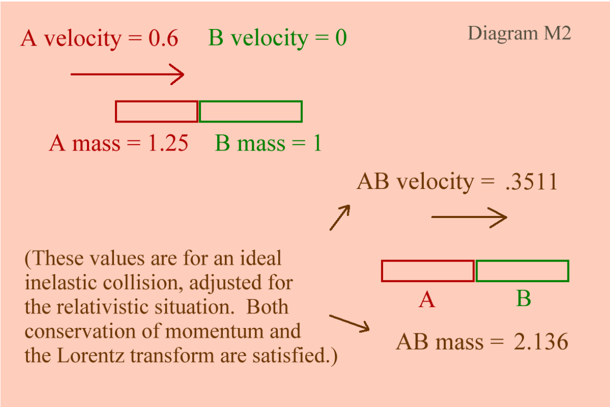
Any application of force involves a reaction force. The direction of the net momentum transfer associated with the force would seem arbitrary without an absolute frame of reference. From the perspective of the absolute frame of the universe, it is always the body whose speed in relation to the whole of the universe (universal point of origin or membrane of origin) increases that has the net increase in momentum. In our proceedings with object A, we are dividing the universe into two parts - object A and everything that is not object A.

Well, there are actually four entities involved in diagram M1: A, the rocket pushing A, the thrust material, and the rest of the (very dynamic) universe. Any of those entities that increase in speed in relation to the entire universe also increase in mass and therefore in momentum. This is a very dynamic situation. Somewhere in the mix, something is losing mass and or energy as a result of A's acceleration.

Let's consider two identical (when at rest) objects, A and B, who wish to assess each other's mass as they collide one with the other. If B is at absolute rest, and A is therefore moving at say 0.6c, then might we expect the more massive A to experience less damage than B?

If so, that would violate the POR. So let's look at that:

We can create diagrams of the same sort as we did earlier in this book for the mutual assessments of lengths and clock rates. Instead of trying to diagram "damage" as a "blowing to bits", let's simply diagram an inelastic collision. But rather than allowing A and B to become crumpled, we'll allow them shock absorbers.



Note that A's clock rate is 0.8 that of B's. Although B's mass is inflicting only 0.8 the momentum transfer upon A that A is upon B at the outset of the collision, A's inversely slower clock rate implies a momentum transfer experience for A matching that of B's experience. Obviously, no matter where one differentiates along the curve of changing speed as the momentum transfer plays out, the mutual experience will be the same.

Once the collision has played out, A and B will be together in a new inertial frame, with identical lengths.