the general science journal

10 January 2024
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Experimental Confirmation for Newton's Absolute Local Space ©

A Modification of Newton's Bucket Experiment to Challenge Mach's Mechanics

Abstract

The results of a unique modification offered here using Newton's experiment of the accelerating rotating water in a bucket could give clear support for his Absolute space frame for rotation. If gravity drops out of the picture even though the bucket is still in gravity's grip, then the results need to be examined in detail and given a new different understanding.

Although the acceptance by physics of an absolute reference frame for space and time is not clearly defined, Newton believed in a Universe that did provide for an absolute Space-Time Frame. [1] He suggested his famous rotating bucket experiment to use as proof but that was not accepted by his colleagues. Ernst Mach criticized it claiming that only the distance stars could serve as the Absolute Reference Frame. Then Einstein embraced Mach's approach to justify and establish what he believed was a credible argument for his space curvature over a time grid system called Space-Time as the only reasonable alternative to the problem. [2]

Absolute Space

The issue of absolute space has never been properly analyzed and settled. Newton was limited to the intellectual level of the discussion of the subject in his time.

> *"Absolute space, in its own nature, without relation to anything external, remains always similar and immovable. Relative space is some movable dimension or measure of the absolute spaces; which our senses determine by its position to bodies ... because the parts of space cannot be seen, or distinguished from one another by our senses, there in their stead we use sensible [i.e. perceptible by the sense] measures of them ... but in philosophical disquisition, we ought to abstract from our senses, and consider things themselves, distinct from what are only sensible measures of them." -- Newton,* ***Principia I****, Motte trans.* [1]

His colleagues also were unable to address it in any depth, except perhaps Ernst Mach. Mach supported the notion that the distant stars would have to serve as the Absolute space Newton was looking for. Einstein's analysis led him to use Mach's position to support his special Space-Time ether theory of GR writing in his paper:

> *"It is true that Mach tried to avoid having to accept as real something which is not observable by endeavoring to substitute in mechanics a mean acceleration with reference to the totality of the masses in the universe in place of an acceleration with reference to absolute space. But inertial resistance opposed to relative acceleration of distant masses presupposes action at a distance; and as the modern physicist does not believe that he may accept this action at a distance, he comes back once more, if he follows Mach, to the ether, which has to serve as medium for the effects of inertia. But this conception of the ether to which we are led by Mach's way of thinking differs essentially from the ether as conceived by Newton, by Fresnel, and by Lorentz. Mach's ether not only conditions the behaviour of inert masses, but is also conditioned in its state by them.*
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> *Mach's idea finds its full development in the ether of the general theory of relativity. According to this theory the metrical qualities of the continuum of space-time differ in the environment of different points of space-time, and are partly conditioned by the matter existing outside of the territory under consideration. This space-time variability of the reciprocal relations of the standards of space and time, or, perhaps, the recognition of the fact that "empty space" in its physical relation is neither homogeneous nor isotropic, compelling us to describe its state by ten functions (the gravitation potentials gmngmn), has, I think, finally disposed of the view that space is physically empty. But there with the conception of the ether has again acquired an intelligible content although this content differs widely from that of the ether of the mechanical undulatory theory of light. The ether of the general theory of relativity is a medium which is itself devoid of all mechanical and kinematical qualities, but helps to determine mechanical (and electromagnetic) events."*[2]

History about Space, Force, and Mass even to this day shows these topics are still difficult to understand and define and are even more avoided now than in the past. Physics is content to just accept the current equations that allows them to do their calculations and leave the discussions to the philosophers of science.

Reference Frames

Will examine the different reference frames here before looking at Newton's Bucket in detail.

The whole issue of reference frames is a problem since physics cannot agree on how to understand all the various reference frames that are present in a system being analyzed which leads to the confusion of centrifugal and centripetal forces that physics believes it has an explanation to the layman for via the bizarre notion of 'fake or fictitious forces' that can still have a real physical impact. It is not just the distinction between the Inertial Reference Frame (IRF) and the non-IRF, that is, the Accelerating Reference Frame (ARF). There is the necessary part of the observer(s), and which frame they are in, and just as important, but sometimes ignored, downplayed, or completely missed, that is, what the part that is being observed plays in the system under analysis. Physics establishes the Earth reference frame's observer as the final word as to what is real, when what is real is also relative for the reference frame.

Relativity cannot be limited to velocity difference between non-accelerating objects in linear motion. The situation that arises in the real world could make it difficult to define the reference frames. This will become clearer when examining the specific examples covered here.

Relative Acceleration

A good example of a confusing acceleration is a car accelerating on the flat surface of a huge ship that is also accelerating with its accelerating vector in the opposite direction while all this is being observed by an observer on shore.[3] The observer on shore might see the car on the ship as if the car was on a treadmill thinking the car is not separate from the ship. The ship is treadmill to the sea, not the car. The observer on shore still sees, if he is looking, that the car really is moving towards the right end of the ship. Because it is accelerating at the same rate in that direction due to power from the car it only appears to be stationary to the shore reference frame observer if he fails to examine the whole scene.

Rotating Mass

The biggest wrench in the mystery of reference frames happens when the object(s) in the system under study is in rotation to the Earth reference frame.

Take the classic amusement ride called the Graviton where the system rotates at high speed and the occupants feel they are being forced and held against the perimeter wall. Those in the Earth reference frame assign the centrifugal force experienced by the occupants on the ride as a fictitious force. A fictitious force that is used in applications that can cause injury. The outside observer defines the real force as the centipedal force coming from the wall pushing to the center. The mathematics all works out, but it is confusing if the different observers cannot agree on what is real because the reality is also relative.

Free-Fall

There is a well-known demonstration displaying Einstein's General Relativity.[4]
Prof. Brian Greene on the Stephen Colbert Report is holding a bottle with holes showing water leaking out. He says that according to Einstein GR the water will stop leaking out of the holes when he lets go of the bottle because at that point the water is in free-fall where gravity is not experienced. When he releases the bottle, it is in free-fall and the water leaks stop. From the Earth reference frame GR says a free-falling object no longer feels Gravity. A person in free fall only stops feeling his weight because he is not at a fixed coordinate point.

So, the hypothesis: It is what is experienced in the reference frame under study that the object is in that explains what is happening, not the perspective of the observer in a different reference frame. That is why it is wrong for an observer to conclude that he can make a judgement about the clock in another IRF, which is done in Special Relativity (SR). And if you add on a declaration that 'c' must be constant when jumping between reference frames in that judgment, you get another wrong result, time dilation.

The water in the bottle that is fixed in the Professor's hand is all part of the Earth reference frame. The bottle of water with holes is in the planet gravitational field and the water is observed to naturally leak out as expected.

When the bottle is released, the situation could be judged to now have a second reference for the observer to consider. The bottle is falling because it is still in a gravitational field. However, that field could be said to be outside the bottle reference frame observer. From the bottle reference frame there is also no reason for the water to leak out now.

Now Newton's Bucket

His bucket experiment called for it to be spun up on the hanging rope to generate the tension to spin the bucket. Initially, the bucket does rotate but the water does not. The water maintains a flat surface. The energy does get to the water, and it also rotates with the surface forming a parabolic curve.[5,6]

When the bucket rotation is stopped, the water continues to rotate and maintain the parabolic curve in the surface. The bucket can be in rotation while the water is not, and its surface is flat. The bucket could be stationary while the water is in rotation. Newton thought this result indicated the bucket was not controlling the water and meant the possibility of the presence of an Absolute Frame (AF) for rotating objects.

Others argued that the presence of gravity ruled out the water could be aligned to an AF. It was suggested that the bucket be considered out in space but that leads to the water being ejected from the bucket without gravity, thus requiring the presence of a gravitational mass. Newton then offered the idea of two balls attached to each other and in rotation without the presence of gravity. That gave Mach's position to suggest the Universe at large would be the proper place for an absolute reference frame for acceleration. This is where Einstein, in his time, made use of Mach's position as the basis for his Space-Time curving grid special ether system that would resolve the issue of no AF for rotation.

An experiment with bucket modification is suggested here to perhaps find that the AF might still be seen using Newton's approach. Consider the free-falling water bottle discussed above where the water in the bottle stops falling out as it is aligned in the bottle reference frame and not the external Earth reference frame, or as Prof. Greene described it, the water "no longer feels gravity."

Newton's bucket is hanging on a rope, so it is in the gravitational field and not in free-fall. It might be possible to keep that configuration, add a couple of holes near the bottom and see if the water stops flowing out when it is in rotation and the bucket is not rotating. If that happened that would be a substantial change indicating that the water mass has aligned with the local AF as gravity is still in the picture for the outside observer but not having an effect.

But there are other potential issues involved to really conduct an accurate experiment. The above setup would be difficult, if not impossible to execute. How fast must the water be rotating to reach that point? Does it have to accelerate at 'g' or higher?

The better setup would put the clear bucket on a rotating table base that provides the experimenter with full control of the bucket rotation, the hole openings position, and recording of the data.

Summary

It was the complex business to find clarity of understanding of reference frames that provided the notion that this strange modification of Newton's Bucket could possibly lead to the same result experienced with a dropped water bottle with holes in it. I wondered what if the water in Newton's bucket would "disconnect" from gravity even if it were not in free-fall when holding water that is under angular acceleration with holes in the bucket because there is an Absolute Frame to align with in Space. That would be the only reason it could work. Since it is not in free-fall, if the water stops, that supports Newton's position of an absolute frame for an accelerating mass.

An Absolute Frame of reference for acceleration may exist but is still just out of sight. Perhaps, if the experiment suggested were designed and executed to find it were successful, that would have a considerable impact on our understanding of the Universe.

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