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An Alternative Idea to the Rubber Sheet Analogy in General Theory of Relativity

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Abstract : According to GTR(General Theory of Relativity), the Gravity is considered as a four-dimensional curvature of space-time. And this space-time curvature is often visualized as a Rubber Sheet by some Experts. Though some people raise doubts on it. Here, In this paper, I've tried to give an Alternative Idea to the Rubber Sheet Analogy in General Theory of Relativity.

Discussion : Though the Rubber Sheet Analogy gives very satisfactory ideas to visualize some famous concepts like – Bending of Light, Progress of Gravitational Waves, e.t.c., It sometimes may not give clear ideas to some concepts in GTR.

Consider Our Earth, placed on Rubber Sheet like Space-Time Curvature. If we consider the rubber sheet, the people and all other objects on the lower half of the Earth(that part of the rotating Earth that sits on the rubber sheet like space-time curve for a time being) are supposed to get suppressed by the invisible Rubber Sheet(Ha Ha!!! Just kidding!).

(I'm explaining this, in this way, just to say that the Rubber Sheet Concept may not give a clear picture to visualize the Space-time curve.)

Many Physicists say that the concept of a marble rolling on a rubber sheet does not explain the actual motion of a planet around a Star in space- time curve. [1]

But still, it gives very good explanation to Some Concepts like – Bending of Light, Progress of Gravitational Waves, e.t.c.

Well! Let's think about something else.

Suppose the whole universe is filled with an invisible fluid with matter of zero mass. But consider the fluid is highly viscous.

Now, recall that, in a highly viscous fluid, if we drop some metal balls having different masses, metal balls having heavier masses go deeper into the medium. But balls having smaller masses can't go that deep into the fluid medium. Similar to the rubber sheet, where heavier objects create more deformation but objects having small masses can't create that much deformation.

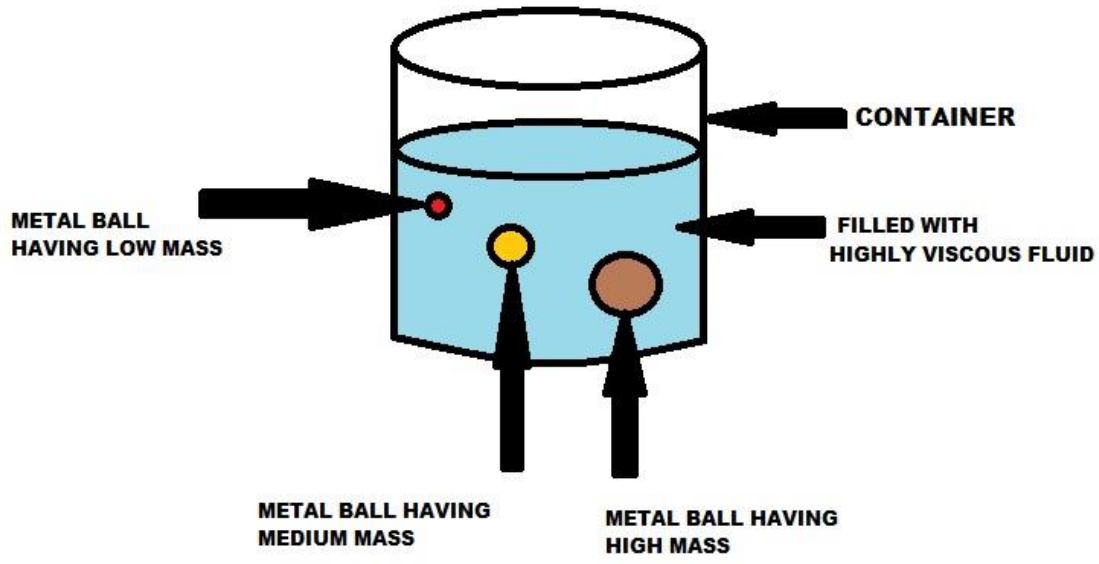

Fig.1 – Displacement of different metal balls in a highly viscous fluid

Now, we have a challenge to explain those incidents like- Bending of Light, Progress of Gravitational Waves, using this model.

We can also explain these phenomena using this fluid model.

Consider the motion of a fluid around a spherical object (Ignore turbulent motion).

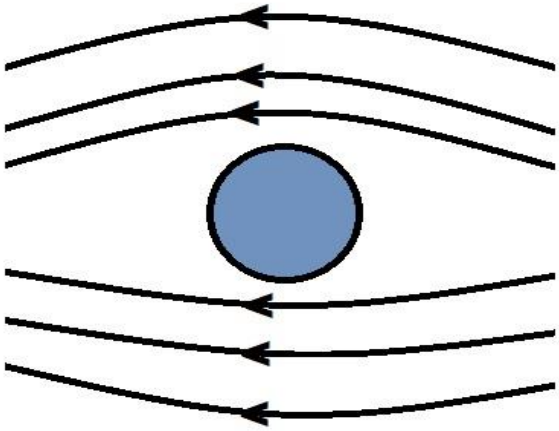

Fig.2 – The motion of a fluid around a spherical object (Ignoring turbulent motion)

As described in the above picture, the fluid passes through the spherical object , following the path indicated by arrows.

Thus, we may visualize the bending of light around a planet or heavy object in the similar way. As we have considered the fluid that universe is filled with have zero mass, light also having zero mass can be considered as a flow of fluid. As Light(visualized as fluid) passes through any obstacle, follows the same path as shown in the diagram, which supports the phenomenon of bending of light.

Another phenomenon Gravitational waves can be explained very easily using this model. Because we all are familiar with the idea of movement of two heavy objects inside a fluid medium, that creates ripple which

spreads through the whole space. Just like Rubber sheet, we can also explain the same, using this fluid model.

Conclusion : The Rubber sheet model is widely accepted though many physicists are not happy with that idea. Here, I've tried to explain the same concept, using a different approach.

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