Relativistic Interpretation of Time and its Cosmological Model

Translated from *"El Camino del Hombre", by M. Urueña,* 2019 *León, Spain.*

Manuel Urueña Palomo

A simplified visual representation of time curvature and space curvature is postulated regarding general relativity and supported by the empirical evidences of the present cosmological model in macroscopic scales. Although this representation does not invalidate the nowadays model, it is concluded that time is a special dimension in our universe, and by its correct interpretation, many other physical enigmas can be theorized based on such conception of time.

Regarding the shape of the universe initially with a positive curvature (spherical shape), according to the sphere of an imaginary time history without boundary that leads to a real time expansion, beginning in one point in an inflationary manner[1], with the three-dimensional space as we know it in the bidimensional surface of that sphere (Figure 1.1 and 1.2), that lacks of thickness, we can place time as another dimension representing the radial vector of spherical coordinates, with its centre in the inside of the sphere.

This time vector will be considered as another dimension and would be useful to compare it to an accelerated growing vector of one of our space dimensions:

> We can not only describe different speeds that our space accelerating vector has had during his path, but also different instants during its route. Placing time instants of "time" in our time dimension might be a difficult task and may require a reference time interval such as Planck time, but we will only need the essential idea for the next explanations. (Figure 2.)

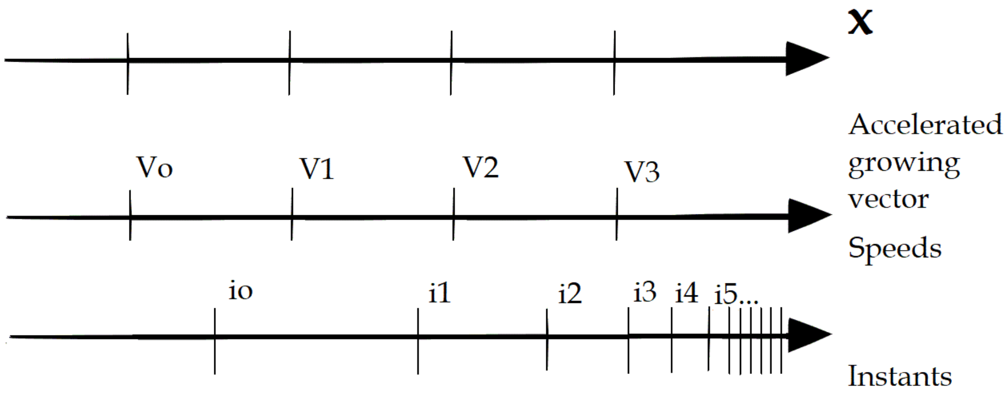

Figure 2. Time as a vector

Back to our model, if we inflate the sphere, leading to a metric expansion of its two-dimensional surface (relying on the evidence of way the universe expands), it would be visualized as an increase in the value of the magnitude of the time vector. We can imagine now each time instant as infinitesimal layers of our sphere growing in number towards the exterior. This matches the common representation of time as another dimension. (Figure 1.3)

The only requirement to understand this model is to imagine the two-dimensional surface of the sphere's layer as a three-dimensional space, meaning that the in the real representation of our world, every single point of the three-dimensional space would have a different value for the time vector, which would be impossible to visualize by us:

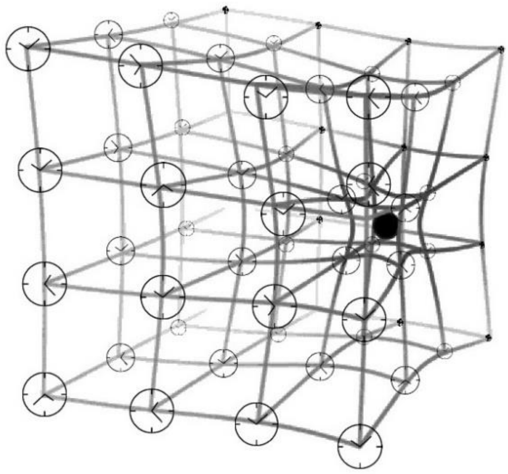

Figure 3. Dimensional visualization of time

This visualization matches what a four-dimensional feature would look like in our three-dimensional space, with a magnitude appearing suddenly in our space but without letting us know where does it come from. Thus, we are unable to see the complete fourth dimension, that is, the dimension of the radial vector that represents time, but only one layer of it. Thankfully, we can relate those magnitudes geometrically to our space by the Einstein's general relativity theory.[2] (Figure 3.)

If every instant of past time and every smaller speed time is placed in an internal layer, it would only be necessary that mass, or more specifically momentum (energy), could bend this sphere's surface in such a way that a point in the surface (which is a three-dimensional point in our world) would be moving against the positive sense of the time vector. Such bending would only be well represented considering those layers as time velocities instead of time instants (onward, we will consider the magnitude of the time vector as a measure of time speeds). (Figure 1.4)

Depending on the way the acceleration of the expansion of the universe occurs (specifically if there is jerk), these speed layers would be equally distanced, or not. But time instants, that should also be considered and in which the Planck time should be taken into account, would not be equally distanced for sure, and we should find a greater number of them the further we go from the time origin. (Figure 1.5)

Time would then pass slowly in the point of the space in which the curvature is deeper compared to another point with a bigger radial distance from the centre of the sphere (they would be assigned different speed times), coinciding with the general relativity theory.[2] In the case of considering an static mass and the required relative point of view by which it does not move and change the curvature of space, it would be situated in a different time speed compared to another smaller mass in a different point of space, so time in the first point would pass slowly than in the other. This conclusion is considered by using an external reference system, that is, looking at the sphere from outside, and if applied to our space, should fit our new reference system.

An easy visualization would be imagining the typical representation of the time of the universe, dragging it on three dimensions and considering the bidimensional surface as three-dimensional, so the dimension of time is added. (Figure 1.6) By this way, space and time will not be treated as one, but as two different conceptions closely and always related, and initially, everything in the universe would always be moving in time (for every point of space there will be a different magnitude of the radial growing vector of time in the case that there is not a mass or energy that slows this growth) and consequently always moving in space according to the mixture of the movement between time and space of the general relativity theory (explanation of gravity).[2]

> Due to the progress of the accelerated expansion and time, and the different treatment of time for different space points, its acceleration could tend to minimize the bigger deformations of mass and energy, tending to soft the deeper peaks and leading to a better and more balanced mass and energy distribution towards the equilibrium. This suggests that it could be a causal explanation for the second law of thermodynamics and the maximization of entropy (closely related to time) without probabilities, and not only the fact that the expansion of the space between particles should be considered, answering the question *"why the direction in which entropy increases is the same in which the universe expands?"* formulated by Stephen Hawking.[3] (Figure 1.7)
>
> The relative times between different relative systems would explain and confirm special relativity. For example, a space ship travelling at almost the speed of light from the Earth to Pluto would have a very big energy (momentum) and would be assigned a lower speed of time (time dilatation), so in his reference system, he will conclude he has reached Pluto much quicker than he expected, although he has travelled the correct distance for an external observer, who would conclude that the distance travelled by him should have stretched considering the observers time speed and the space ship speed. That is because we are now considering time a variable feature for different points of space.
>
> > If this interpretation is not correct, then space should compress depending on the speed and direction as a reaction to that speed (or energy effect), and such compression of the space may have an effect on the movement of the time vector (special relativistic effect). (Figure 1.8) Another hypothesis is described in Figure 1.9, in which the discrete movement of a particle at the speed of light would not feel the pass of time because in every step, it is going to be situated in the future time instant of its next position, jumping to future instants and not been influenced by the passing time.

A further modelling will make us wonder what would happen if a deformation by a certain energy could be so that the speed of the moving time vector would be countered for an observer in that point and with that system of reference. In a discrete movement of the time vector, this would be considered as if that point of space would be jumping to the previous time instant in each step. That region of space in which time for itself tends to zero and time tends to infinite for an external observer is what we call a black hole.

Space beyond this limit would be the same, and very distorted due to the vast energy, but it would be moving in the opposite sense in the time dimension, that is, reducing its assigned magnitude of the time vector in contrast to the usual sense of the time's vector progress. Thus, the considered singularity, or more specifically, the event horizon, would not be more than the place in space in which time begins to move backwards, and would not tend to infinity but to a reference value, which determines the sense of time in the next instant. Consequently, time "flows" backwards beyond this region (which in our sphere model is represented as a circumference and in the real three-dimensional world as a sphere). (Figure 1.10)

Following this model, on the other side of this region there is space with a different shape which could expand or not, depending on the mass (energy) contained (absorbed) and the thermodynamics and energy conservation of the black hole. This region would have to contain a white hole inside, radiating energy. The author suggests that time should be reversing progressively, starting from zero near the white hole, and physical events would tend to the equilibrium and order because of the second law of thermodynamics and its time dependency. The shape of this region should be restricted by the white hole, and space should be very distorted at its surroundings. A surface-based model is suggested by matching the correlations of deformations between the sphere's model properties of that space and the real space dimensions (considering two paths named "1" and "2"). Time placement in this model is also proposed in a suitable manner. (Figure 1.11) The distorted curvature of the space around the white hole would prevent energy from escaping this region of space.

As stated in the beginning, the model is based on the hypothesis of a spherical curvature universe, but we should consider the possibility of the new created space been wrinkled by energy in the past and in the present, leading to a better matching of an inflationary expansion and a later slowed down expansion, if a flattered sphere is also considered.[1] This roughness would explain the CMB measurements[4] and, if situated in the flattest part of the sphere, the small curvature measurements of our universe.[5] (Figure 1.12)

The author intuits that the magnitude of the time vector might not depend on the depth of the space point but maybe on the curvature (slope) of the space deformation and the speed deformation of the space would match the speed of light as stated by recent evidence of gravitational waves.[6] In addition it is suggested that antimatter's negative energy solution from Dirac's equation, interpreted as positive energy with negative time (particles moving backwards in time),[7] would bend space towards the interior of the sphere, approaching past instants of time, so that antimatter and negative energy is the already known and existing matter we have always considered, and the other solution which involves positive energy with a positive time (moving forward to the future) would bend space towards the exterior, and would be the revealed one. Thus, the distinction between the two kinds of matter (and energy) would be the sense of the deformation of the sphere, that is, the sense of time deformation (Figure 1.13). This physical phenomenon has not been detected due to the difficulties of measuring such small gravitation effect of the small mass of the created matter in experiments. Photons with no mass should be considered their own antiparticles with positive time, following Figure 1.9. The combination of both deformations or energies would determine the way the sphere will change, either expanding or contracting (dark energy enigma).

The mathematical development of the model is left for the one interested in these ideas.

Cosmological model

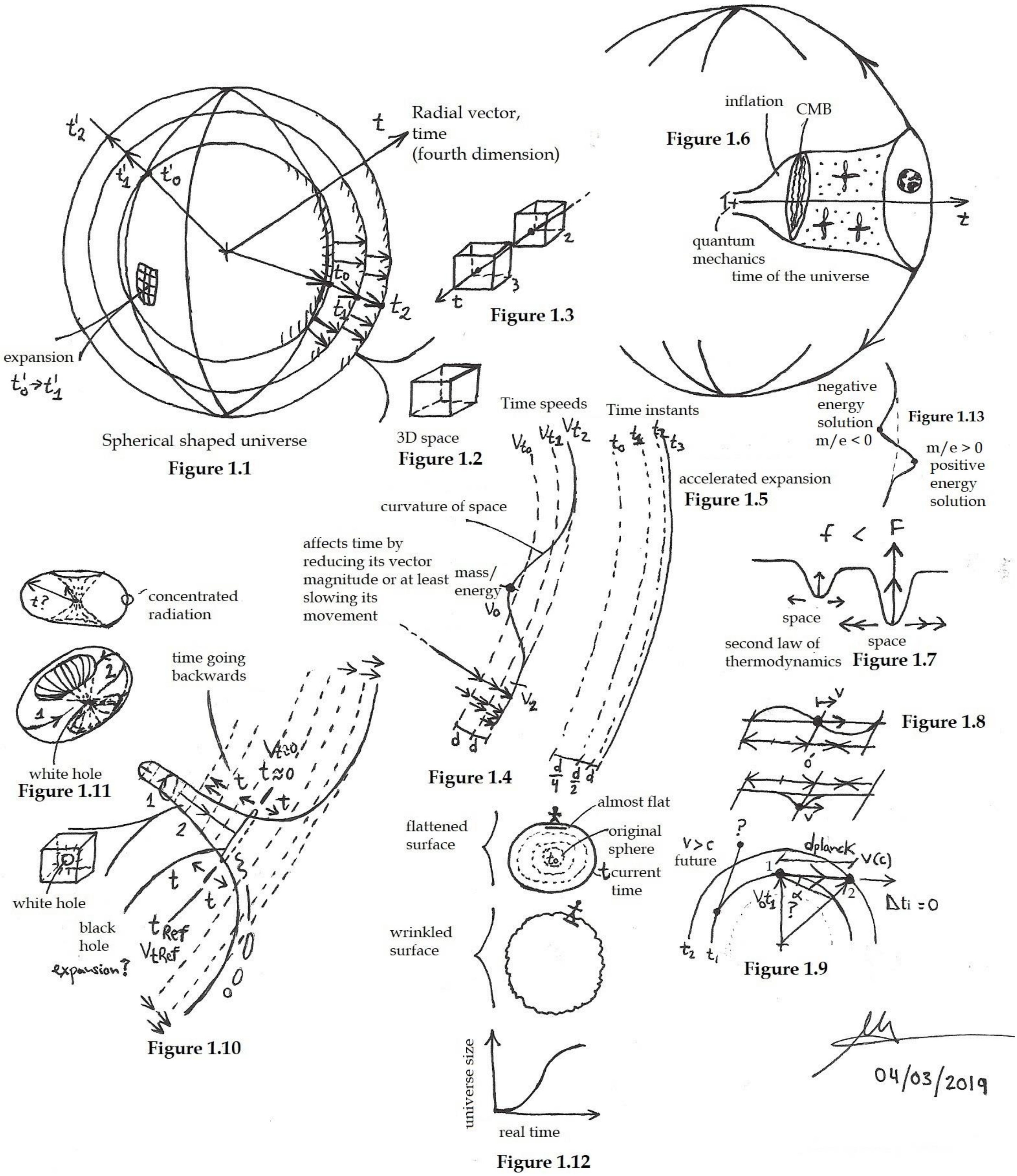

Figure 1. Sketch of the model

References:

[1] S. W. Hawking, *The Universe in a Nutshell*, Bantam Spectra, (2001)

[2] A. Einstein, *Zur allgemeinen relativitätstheorie*, Sitzungsber. preuss. Akad. Wiss. (1915)

[3] S. W. Hawking, *A Brief History of Time,* Bantam Dell, (1998)

[4] R. W. Wilson, *The Cosmic Microwave Background Radiation*, Holmdel, NJ (1978)

[5] Planck Collaboration*, Planck 2015 results. XIII. Cosmological parameters, (2015)*

[6] LIGO Scientific Collaboration and Virgo Collaboration, *Observation of Gravitational Waves from a Binary Black Hole Merger*, (2016)

[7] N. Debergh, J.-P. Petit, G. D'Agostini, *On evidence for negative energies and masses in the Dirac equation through a unitary time-reversal operator,* (2018)