

# Why Temporal Movement is the Cause of Spatial Movement. Why Space is a Function of Time – The Accurate State Variables of Time Themselves Can Solve the Mystical Universe

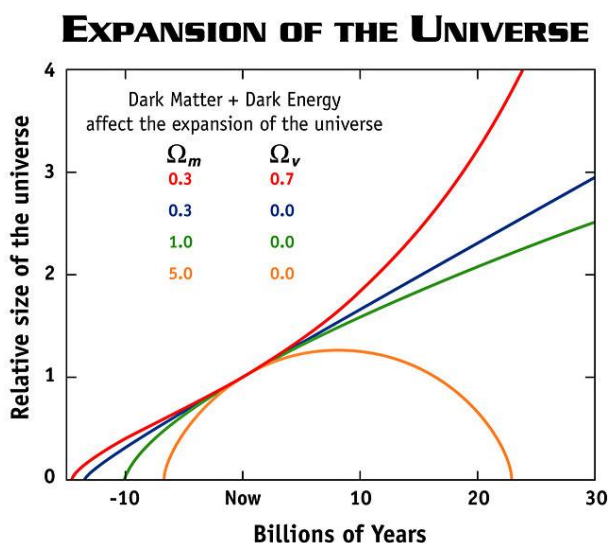
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**Abstract:** State space analysis probably the best analysis of any particular system because it incorporates non-linear systems as well as time varying systems. A state space representation of a system can be termed as the internal description of the system. The state space representation of the system has many advantages. It provides an insight into the behavior of the system. It makes feasible to handle multiple inputs and multiple outputs (MIMO systems) system in a unified way. Since the state space representation gives us equations in matrix form, we must have fair idea of handling large matrixes and linear algebra to solve state space equations to identify the state variables of the Universe. If we can identify states of the Universe for a given time  $t_0$ , we can do calculations of past and future states of the Universe i.e.  $t \geq t_0$  (Past) or  $t \leq t_0$  (Future). We know that the Universe is expanding and it is fueling by the mysterious dark energy. It is also true that the more distant the galaxies are, the faster they are moving away from us. It is because the distant galaxies that we observe are not of present time  $t_0$ . It is  $t_K \gg t_0$  where  $t_K$  is any past state. The farther the galaxy, the more past state we observe of the Universe which itself proves that initially the Universe expanded in an inflationary manner; it slowed down gradually and become cooled as it goes forward with time. No matter how much dark energy (assumed 68.3%) and dark matters (assumed 26.8%) are there, since the Universe slowed down with time, the dark energy getting reduced with time. When the total dark energy will be equal to the gravitational pull of the total matters of the Universe, the Universe will be stagnant with time, in other words, the expansion will be halted by time. And after that eventually, the Universe will start to contract when the dark energy will be further reduced to be less than the gravitational pull of the total matters of the Universe. The physical time's role is clear in the expanding phase of the Universe; it is moving forward. But what must be the physical time's role on stagnant phase of the Universe as well as the contracting phase of the Universe. For clarifications of the physical time's role, we need state variables of time as well as the dimension or dimensions of the physical time too.

**Keyword:** State space analysis, non-linear and time varying systems, multiple inputs and multiple outputs systems (MIMO systems), dark energy and dark matters, State variables of the Physical time.

## 1. Introduction



Since the Big Bang, the evolution of the universe is basically determined by the struggle between the momentum of expansion of the Universe and the pulling force of gravity [1, 2]. The today's rate of expansion is measured by

the Hubble Constant [3, 4], while the strength of gravity actually depends on the density and pressure of the matter in the universe [5, 6]. If the pressure of the matter is low as is the case with normal ordinary matters, we know that the fate of the universe is governed by the density only [7, 8]. Now if the density of the universe is less than the certain value called the critical density [9], then the universe will expand forever, like the red, green or blue curves in the graph above [10]. Gravity slowed down the expansion rate over time, but for densities below the critical density, there is not enough gravitational pull from the matter to stop or reverse the expanding Universe [11]. This is also known as the "Big Chill" or "Big Freeze" because the universe will be slowly cooled down as it expands until eventually it is unable to sustain any life [12]. Now, if the density of the universe is greater than the so called critical density, then gravity will eventually slow down the expansion [13]. And the universe will be collapsed back on itself, the so called "Big Crunch", like the graph's orange curve [14]. In the current Universe, there is sufficient mass in the universe to slow the expansion to a stop, and then eventually reverse it because dark energy continuously being spent to expand the Universe and at sometime it will less than the gravitational pull [15]. The farther the galaxy, the faster they are moving away from us. It had deep implication on the fate of the Universe which implies that the expansion of the Universe is getting slowed

down with time [16]. Hence, Big Crunch is the only viable and most feasible outcome of the Universe since Big Bang [17].

## 2. Relationship of the Physical Time and Space

The big question is that whether it is the Universe expansion or the time dilation. If we apply time on human race – the next generation is always more adaptable to time. They acquire better ability on critical situations of time. Thus, they are smarter than older generation because of their better ability to cope up with time or in other words, they have better ability as a function of time [18]. It is as if they understand better with time and better in time (more appropriate and accurate with respect to time). Thus evolution of life is a function of time too. The next big question is why the next generation is more accurate and appropriate with time. Why next generation understands better with time and better in time and why they are moving with better shape in time scale. Suppose we captured a photo in our camera [19]. A sight is captured in the camera. One click in the camera indicates the sight at sometime  $t_0$ . The second click gives the same sight at some time  $t_1$ . Both sights are different because the time  $t_0$  and  $t_1$  are different. If we could have hold the time  $t_0$  at the time  $t_1$ , we would get the first sight at  $t_1$  too which reveals that at every discrete time instant, the Universe can have a stagnant picture. If we could stop time at particular time instant, we could have one and unique picture of the Universe just like a snap of the camera. It looks like to us that the Universe is expanding because time is flowing from  $t_0$  to  $t_1$ . If it would be from  $t_1$  to  $t_0$ , we would see the Universe is contracting just like rewinding of a video. Thus, the Universe expansion and contraction are the effect of time flow from  $t_0$  to  $t_1$  or from  $t_1$  to  $t_0$ . While time is moving forward from  $t_0$  to  $t_1$ , it is analogous to space movement, more precisely the Universe expansion. We need energy for spatial movement and given a fixed energy in the spatial movement, the energy gets reduced gradually in proportional to the spatial movement. As energy gets reduced, the speed of the movement will be slowed down. That is what happening with time; there is something that drives the time and it is fixed constant value and it is getting reduced as the time progresses; thus, time is getting slowed down proportionally. As time is getting slowed down, the next generation gets more time to adapt with time flow and thus, they are more adaptive to time than ever. The Universe is not moving anywhere. The present expansion of the Universe is nothing but the different snaps of the stagnant Universe at different time instants. As long as time moves forward, the Universe will expand. Because of the time dilation, it looks like that the Universe is slowing down. The farther the galaxy, the faster it is moving away from us because we observe the older time with less time dilation in it. The older the time, the faster the time is in proportional. When we observe farther galaxy, we also go back in time where time was faster as proportional to as older the history is [20]. Thus the

evolution to be better is always on the card, as it is the function of time too.

## 3. State Variables of the Physical Time

The consecutive time instants at the Big Bang were faster than the consecutive time instants of today. So, the initial inflation of the Universe just after the Big Bang occurred is also the result of the faster time movement from one discrete time instant to another discrete time instant because at every time instant the Universe is stagnant. The time during Big Bang was like new born baby and it is getting older as it is passing in forward direction. And thus, it is getting slower and slower due to time dilation, just like a human life. We are intelligent because we are a learning machine which trains itself with the physical time. Because we can retain past made us intelligent as well as trained. Because spatial movement of the Universe if a function of temporal movement, the state variables of temporal movement with incorporating time dilation is the root of the solution of the Universe at one go.

## 4. On the Existing Physics Theories

The second law of thermo dynamics which states that the entropy always increases with time [21, 22] is seemingly true theory of the Universe. The same thing can be applied to the two most successful theories of nineteenth century – the general theory of relativity and the quantum mechanics (which incorporates famous uncertainty principle) [23, 24]. These two theories are smartly taking care of the psychological limitations of human race and experimental conditions of human race to validate these two theories. Within the psychological range and experimental conditions, these theories can never be proved wrong. Do we have free space where astronomers are floating around [25, 26]? The astronomers are getting advantage of very very weak gravitational field of Sun [27] and because human mass is so small to have negligible effect (momentum) of gravity of Sun. Inside the solar system, there is always gravitational field of Sun, in other words, there is nothing called free space inside the solar system. At the present economic conditions and technology, we cannot go outside the solar system to find an ideal free space (if exists any) to set up experiments. If the spatial moments are effect of temporal movements of a stagnant Universe at a particular time  $t_0$ , it does not matter whether entropy increases with time or not. Because nothing is moving in the space of the Universe but the time is only moving forward; if we can find the state variables of time and if we can find the discreteness of time (time instants) with incorporating time dilation measurements, we can solve the whole Universe at one go.

## 5. Conclusion

Finding the state variables for the solution of the physical time is not an easy task. But we need to initiate research on that with positive attitude so that at someday we can fully solve the mysterious physical time; its dimensions. There can be many questions need to be addressed. Why we feel time but do not see it. If time dilation is correct, time flow is definitely not a straight line but a curvature. Then what must

be the curvature looks like. Why temporal movement is the cause of spatial movement. What should be the property of the physical time that makes a stagnant Universe moving chaotically over a long time range (million or billion years). Why psychology interprets a stagnant Universe as a chaotic place. Why steady state conditions of the Universe is desirable for psychology. Why psychology prefers peace over chaos. Why psychology hates an unstable system and why unstable system is of no worth for psychology. At the end, the solution of temporal movement can solve spatial movement and thus eventually, can solve the mystical Universe at one go.

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