Redshift in Lattice-Cellular Models of the Universe: Lindquist-Wheeler and beyond[1]

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ABSTRACT

Many physicists and philosophers alike have debated a long standing puzzle: whether the space is continuous or discrete. It has been known for long time that most of the existing cosmology models rely on pseudo-Riemannian metric as the cornerstone of Einsteinian universe. But the metric itself is based on continuum model. It is known that such models have led us to too many (monster) problems, including dark matter and dark energy etc. Now what if the universe is discrete? Then perhaps we can solve these problems naturally. Despite majority of cosmologists rely on such a Standard Model which is called Lambda CDM theory, we will explore here the redshift theory based on a few of lattice-cellular models, including Lindquist-Wheeler theory and beyond it. We will also touch briefly some peculiar models such as Voronoi tesellattice and also Conrad Ranzan's cellular model. It is our hope that the new proposed method can be verified with observation data.

Keywords: discrete cosmology models, lattice universe, cellular automata,

"*...I consider it quite possible that physics cannot be based on the field concept, i.e., on continuous structures. In that case nothing remains of my entire castle in the air gravitation theory included, -and of- the rest of modern physics.*" A. Einstein

[1] This paper is dedicated for 72th anniversary of Indonesia's Independence Day, 17 august 2017.

1. Introduction

Many physicists and philosophers alike have debated a long standing puzzle: whether the space is continuous or discrete. It has been known for long time that most of the existing cosmology models rely on pseudo-Riemannian metric as the cornerstone of Einsteinian universe. But the metric itself is based on continuum theory. It is known that such models have led us to too many (monster) problems, including dark matter and dark energy etc. Now what if the universe is discrete? Then perhaps we can solve these problems naturally.

Philosophically speaking, the notion of discrete space can be regarded as basic question in definition of differential calculus and limit. If it is supposed that space is continuous then we can use standard differential calculus, but if we assume it is finite and discrete, then we should use difference equation or finite difference theories. This problem is particularly acute when we want to compute our mathematical models in computers, because all computers are based on discrete mathematics. Then we can ask: is it possible that the discrete mathematics can inspire cosmology theorizing too?

Despite majority of cosmologists rely on such a Standard Model which is called Lambda CDM theory, we will explore here the redshift theory based on a few of lattice-cellular models, including Lindquist-Wheeler theory and beyond it. We will also touch briefly some peculiar models such as Voronoi tessellattice and also Conrad Ranzan's cellular model of the Universe.

It is our hope that the new proposed method can be verified with observation data.

2. Review of redshift equations in some Lattice-Cellular Cosmology models

In this section, we will review some redshift theories based on a few of lattice-cellular models, including Lindquist-Wheeler theory and beyond it. We will also touch briefly some peculiar models such as Voronoi tessellattice and also Conrad Ranzan's cellular model of the Universe.

a. Lindquist-Wheeler's theory:

In this model, the matter content is assumed to be discrete; identical spherically symmetric islands uniformly distributed in a regular lattice. This attempt was first introduced in 1957 by Lindquist and Wheeler (LW) in a seminal paper. While LW suggested that their global dynamics is similar to Friedmann universe for closed dust dominated universe, Shalaby has shown that LW-model can be extended to yield a redshift equation, as follows:[2]

$$1+z=1+\langle\gamma\rangle\ln\left(\frac{a_r}{a_e}\right)=1+\langle\gamma\rangle\ln(1+z_{FRW})\cong(1+z_{FRW})^{\langle\gamma\rangle} \quad (1)$$

It can be shown, that the value of $\langle\gamma\rangle$ approximates geometrically to be 2/3, however, numerically its value was estimated to be 7/10.[2] Liu also analyzed LW model, and he concludes that the LW redshifts can differ from their FLRW counterparts by as much as 30%, even though they increase linearly with FLRW redshifts, and they exhibit a non-zero integrated Sachs-Wolfe effect, something which would not be possible in matter-dominated FLRW universes without cosmological constant. [3]

b. Voronoi Tessellation model:

Rien van de Weygaert describes a novel model based on Voronoi tessellation. The spatial cosmic matter distribution on scales of a few up to more than a hundred

Megaparsec displays a salient and pervasive foamlike pattern. Voronoi tessellations are a versatile and flexible mathematical model for such weblike spatial patterns. Cellular patterns may be the source of an intrinsic geometrically biased clustering. However, so far we do not find a redshift equation from this model.[5]

c. Nonexpanding cellular universe:

Conrad Ranzan suggests a DSSU cellular cosmology (dynamics steady state universe), which he claims to be problem-free. The cosmic redshift is shown to be a velocity-differential effect caused by a flow differential of the space medium. He obtains the cosmic redshift equation in its basic form:[7]

$$z = (1 + z_{GC})^N - 1 \tag{2}$$

There are of course other cellular cosmology models, some of them have been reviewed by Marmet, but this paper is not intended for such an exhaustive list of redshift models. See Marmet [10]. For a simple cellular simulation with MS Excel, the readers are advised to see [9].

3. Concluding Remarks

Despite majority of cosmologists rely on such a Standard Model which is called Lambda CDM theory, we explore here the redshift theory based on a few of lattice-cellular models, including Lindquist-Wheeler theory and beyond it. We will also touch briefly some peculiar models such as Voronoi tessellattice and also Conrad Ranzan's cellular model of the Universe. [7][8]

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