Olbers' paradox bijective solution

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Abstract

The bijective research of the Olbers' paradox based on the bijective function of set theory confirms that the paradox is fictitious. The set X is the universe and set Y is the model of the universe. Every element in the set X has exactly one correspondent model in the set Y. Elements in both sets are defined on the basis of the elementary perception. NASA has measured that the universal space has Euclidean shape, which means it is infinite. The luminosity of stars that are on a finite distance from the Earth is not strong enough to make the night a day.

Key words: Space; Time; Olbers' paradox; Bijective research methodology; Bijective cosmology.

1. Introduction

In the bijective research methodology, the universe is taken as a set X and a model of the universe as a set Y. Set X and set Y are related by the bijective function, which means that every element in the set X has exactly one element in the set Y (Figure 1).

Figure 1. Bijective function of set theory.

Figure 1 represents the bijective function $f: X \rightarrow Y$, where in this example the set X is $\{1, 2, 3, 4\}$ and the set Y is $\{A, B, C, D\}$.

The fundamental elements of the universe are chosen on the basis of elementary perception: matter (M), energy (the entire spectrum of electromagnetic energy) (E), space (in which matter and energy exist) (S) and change (matter and energy are changing) (C).

$$X: \{M_x, E_x, S_x, C_x\}$$

$$Y: \{M_y, E_y, S_y, C_y\} \quad (1).$$

Time is not seen as the fundamental element of the universe because it is not a physical entity; experimental physics confirms that time is a duration of material change, i.e. motion in space. The bijective analysis of Special Relativity formula confirms that the fourth coordinate X_4 is not time, it can be called “temporal coordinate”, but it is not the time t :

$$X_4 = ict \quad (2),$$

where i is imaginary unit, c the light speed and t is duration. In Eq. (2) the time t is duration, it is not X_4 [1]:

$$t \neq X_4 \quad (3).$$

The bijective research methodology confirms that the time is duration of material change, i.e. motion, duration is not the 4th dimension of space. Considering time as duration of change running in space, the universal space results time-invariant; the duration of a given event running in the universal space does not change in any way the physical properties of space and is not part of the space. I will examine the Olbers’ paradox in the perspective that the universe exists in a time-invariant space that seems to be infinite, namely, NASA has measured in 2014 that the universe space has Euclidean shape [2], measuring the angles between three stellar objects and getting 180° with 0.4% margin of error. This means that the universe has Euclidean shape and is infinite.

2. Olbers’ paradox bijective solution

The formula for the luminosity of a star on finite distance from the Earth is as follows:

$$L = b \cdot 4\pi \cdot d^2 \quad (4),$$

where b is the apparent brightness of the star, L its luminosity, and d the distance to the star (Figure 2).

Figure 2: Olbers' paradox finite distance solution.

As solution for Olbers' paradox I argue in this way: the luminosity of stars which are in the area of finite distance from us is too low to make a day when we have a night. The light from the stars which are on infinite distance will never reach us.

3. Discussion

Harrison definition of the Olbers' paradox is as follows: "Olbers in 1826 was the first to show that the radiation density everywhere in an infinite static universe should equal to the radiation density at the surface of the stars. Hence, Olbers' paradox is that the sky is dark at night" [3]. Olbers did not take in account that only the light from stars that are on a finite distance from the Earth can reach us. The light of stars that are infinitely faraway cannot reach us, and that of stars on a finite distance is not strong enough to make night a day. This is also the conclusion of Harrison article back in 1964: "Thus the radiation-level is low in our universe at present and the night-sky is dark simply because the stars are so widely separated from each other, or, in other words, because the characteristic time τ_0 is so very large [3].

Our comment to the last Harrison's citation is that time in the solution of Olbers' paradox does not count. Time is a duration of light motion from the stars to the Earth. Time here does not play any role in Olbers' paradox solution. The decisive role is played by the distance and the luminosity of stars; the luminosity of stars on a finite distance is not strong enough to make a night sky a day. The light from stars that are on an infinite distance will never reach us and does not count.

Sakar's and Jeffries's research suggests that the paradox is resolved by the fact that the universe is expanding, which means that distant light has not yet reached us [4]. Taking into account that the universe is expanding, our solution is still valid, namely that the light of stars which are infinitely way from us will never reach us and the light of stars on a finite distance is not strong enough to make of a night sky a day.

Knutsen's research suggests: "It is dark at night because: (1) the speed of light is finite; (2) the universe is still young, and the stars only started to shine rather recently; (3) the light sources in the universe are small; (4) the light sources in the universe are far apart, so the energy density in the universe is very small. Both obscuration and expansion are quite unimportant" [5]. None of these conclusions above is an exact explanation. It is dark at night because the light coming from the stars on a finite distance is not strong enough to make a night sky a day.

Harari's research suggests: "For terrestrial observation, when we consider the resolution of Olbers' paradox, we can use the apparent magnitude 8 as a conservative limiting magnitude. Thus, we can restate our earlier conclusion by noting that any star that has an apparent magnitude of fainter than 8 will not be visible to the average unaided human eye, and can, therefore, be considered non-existent for the analysis of the cumulative apparent brightness of the night sky under observation by the unaided eye. This limiting apparent magnitude constraint acts as a high-pass apparent brightness filter that effectively removes all fainter stars from the population of visible stars as far as unaided eye vision is concerned, thereby rendering finite the population of visible stars, irrespective of the initial size of the population of stars that exist in the universe, a population that may indeed be infinite" [6].

Harari's solution of Olber's paradox is tuned with our solution: all the stars in the universe that have apparent magnitude below 8 and are on a finite distance from the Earth are invisible to the unaided human eye, which means that the luminosity of stars on a finite distance is not strong enough, to make the night sky a day.

4. Conclusions

The bijective research methodology confirms that the Olbers' paradox is fictitious. If it would be understood that only the light from the stars on a finite distance can reach the Earth and that the luminosity of these stars is too low to make the night sky a day, the question about "why night sky is dark" would be not created. Regardless the universe is expanding or not, the luminosity of stars at a finite distance from the Earth is not strong enough to make the night sky a day.

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