SPASETIME AND GRAVITY

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ABSTRACT

The article highlights the features that contradict the intuitive quality of time, which seems to be the most democratic of concepts. In 1959, an experiment was conducted in the physics building of Harvard University and it was considered that the speed of time depends on the gravitational environment. By now you may be asking: why should we study relativity? Can't I live my life perfectly without it? Answer: you can't. Every time a pilot lands a plane or uses GPS to navigate to another country, you must consider the effects of general and special relativity. In the following experiment, we will learn that the speed of time depends on the environment, i.e. The force of gravity, and where the force of gravity is stronger, time is slower, and vice versa, time passes faster where the force of gravity is weaker. Through experiment, we can theorize that in distant galaxies, places where the gravity of the stars is much different than that of the earth, the speed of time is different than that of the earth.

Keywords: Speed of time, gravity and space, experiment at Harvard University, GPS, atomic clock.

INTRODUCTION

Before studying the theory of spacetime and gravity, we need to stretch the limits of our conception of time. What is time? The great philosopher Aristotle, speaking about time in his work "Physics", puts the issue in the form of "whether time belongs to existing things or non-existent things, and then what is its nature." Therefore, the remains a mysterious phenomenon, regardless of whether it is studied in physical concrete or poetically emotional form. We base all our knowledge of space on the only definite and real time.

General relativity makes various predictions about the behavior of space and time. One of these predictions, in everyday terms, is that the stronger the gravity, the slower the speed of time. Such a statement runs very counter to our intuitive sense of time as a flow that we all share. Time has always been seen as the most democratic of concepts.

But Einstein said that it seems to us, because until now all people live in the gravitational environment of the Earth, and we have no way to test the idea that the speed of the past time can depend on the force of gravity. Was because we did not experience radically different gravity. Also, the differences in time flow seem very small until really large masses are involved. Nevertheless, Einstein's prediction has now been tested both on Earth and in space. Time travel time machines have been talked about and shawna lost in fantasy literature and movies. How true is this?

These theories were provided by a remarkable experiment conducted in 1959. The experiment was conducted on the ground floor and upper floor of the physics building of Harvard University. Of course, there may not be a significant interval difference in the results, but the most accurate atomic clock known was used to compare the time measurements. For the clock, the experimenters used the frequency (number of revolutions per second) of gamma rays emitted by radioactive cobalt. According to Einstein's theory, such a cobalt clock on the first floor is slightly closer to the center of gravity of the Earth and should run slightly slower than the same clock on the upper floor. Experiments have clearly shown that. Later, atomic clocks were taken on high-flying aircraft and even on one of the Gemini space flights. In each case, the clocks ran slightly faster further away from Earth. The fact that the clock at the top of the building run faster than the clock in the basement may seem insignificant, but this effect is very relevant today. Any smartphone or device that syncs with GPS should fix this, as clocks on satellites run faster than clocks on Earth. GPS relies on 24 satellites orbiting the Earth, and at least 4 of them are visible from anywhere on Earth. Each satellite has a precise atomic clock. Your GPS receiver detects the signals from the satellites above and calculates your location based on the time it took those signals to reach you.

Satellites orbit 20,000 kilometers above Earth, where gravity is about four times weaker than on Earth's surface. According to general relativity, clocks in orbit should stick 45 millionths of a second faster than on Earth. The net effect is that the time on the satellite clock increases by about 38 microseconds per day. If these relativistic effects are not taken into account, navigational errors begin to add up and positions are off by about 7 miles per day. Let's say you want to know where you are 50 feet away. Since it takes only 50 billionths of a second for light to travel 50 feet, the clocks on the satellites must be synchronized to at least this accuracy - so relativistic effects must be taken into account.

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