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Interstellar Communication Theories and its Possibilities

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Abstract: *This paper reviews and discusses the research dimensions in four dimensional time travel and time dependencies of future and past on the basis of present. The paper investigates the theories that support time travel in any manner and explore possibilities based on them for interstellar communication.*
Keywords: *cosmological constant, paradox, worm hole, black hole, event horizon, telepathy, parallel universe.*

I. INTRODUCTION

The history of mankind has always seen interest in the measure of time. The biggest factor that made man determine time was the run of nature &his self development .As time passed by he noticed the surroundings around him &he himself metamorphosing into a different self from which he was before one of the important factor that led to the functioning of time was the movement &presence of the sun &the moon .the waxing and waning of the moon & the rising & setting of the sun lead to the invention or so called discovery of the day & night , fortnight &years which then lead to invention of sundials, sand clocks, analog, digital clocks, etc. But as the time passed by man noticed. the days ,the fortnight, the minutes repeated themselves but every time in a different manner, which led to the conclusion that time never repeat itself though time was in perfect cycles. Like the day followed by night &then day followed full moon by half moon &than no moon. it seemed never to be in perfect circles. Even in the nature like the day &night were interfered with solar &lunar eclipses. Similarity if a thing was present in a place for one second, it didn't guarantee zero displacement in the following second. thus time was considered as a phenomenon that never returned in one's life when once passed away , which lead to the human conquest of capturing the past moments and re-living them also to find the mystery of so called unstopping "time".

All the theories that will come across in this thesis directly or indirectly support time travel and explore the possibilities leading to interstellar system and interstellar system travel.

II. FACTORS SUPPORTING TIME TRAVEL

Einstein's theory of relativity &cosmological constant present in Einstein's field equation is the only strong factor that determined scientists around the world a possibility of time travel. the equation appears as such

$$R_{\mu\nu} - \frac{1}{2}R\,g_{\mu\nu} + \Lambda\,g_{\mu\nu} = \frac{8\pi G}{c^4}T_{\mu\nu}$$

Here R and g pertain to the structure of space-time, T pertains to matter and energy (thought of as affecting that structure), and G and c are conversion factors that arise from using traditional units of measurement. When Λ is zero, this reduces to the original field equation of general relativity. When T is zero, the field equation describes empty space (the vacuum).

The solution is lambda known as cosmological constant here ,cosmological constant devices the relation of wormholes& its dimension &also determine the structure of the universe that follows Einstein's theories of special& general relativity, though modern physics tells us that there could be as many as 10 or 11 different dimensions, under normal circumstances humans are able to observe 4dimensions ,we experience 3 dimensions i.e, height, width & depth actively., meaning we can navigate them & one dimension passively, meaning we can detect & observe it, but we can't control how we move through it. the ramification of Albert Einstein's relativity equation are vast, but it ultimately breaks down into this .man& energy are inter changeable & there's only a set amount of matter/energy in the universe .energy only comes into being at the expense of matter &matter only comes into being at expense of energy. These technological advances involve nuclear energy & gives us a framework with which we can understand distant stars. In observing the expansion of the universe, astronomers discovered that it holds a lot more than just the matter & energy we can observe as shown in fig (i) dark energy & dark

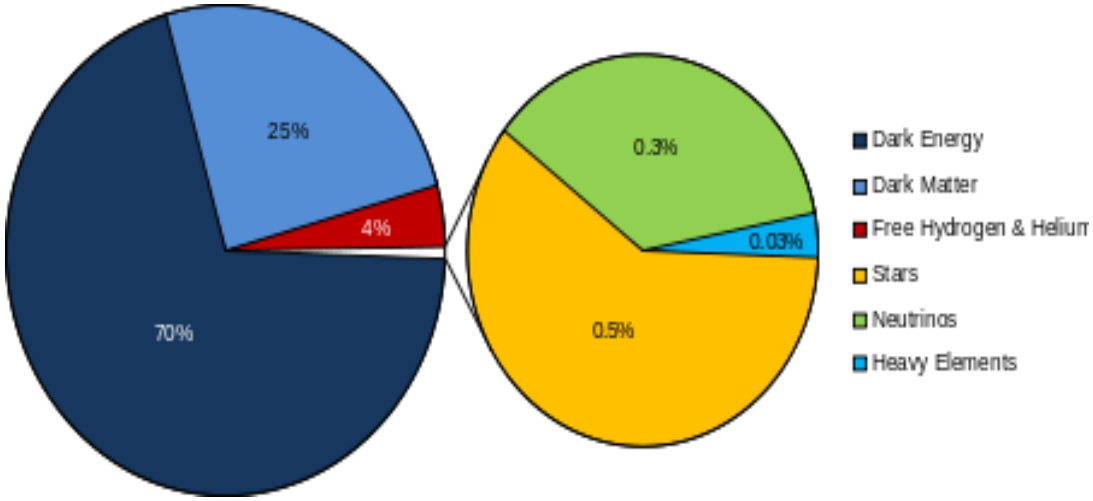


Fig (i)

matter may be impossible to see but have huge consequences on our universe. dark energy, an invisible energy that speeds up expansion, makes up 73% of the universe, dark matter invisible material that may cause the universe to expand on itself makes up 23% of our universe. The remaining 4%is the matter we can see , here dark matter is the matter that neither emits nor scatters light or other electromagnetic radiation , dark energy is a hypothetical form of energy that permeates all of the space & tends to increase the speed of expansion of universe. Einstein's theory of relativity says that time travel is perfectly possible if you're going forward , finding a way to travel backward and breaking of speed of light, which so far seems impossible the factors affecting it shall be discussed later.

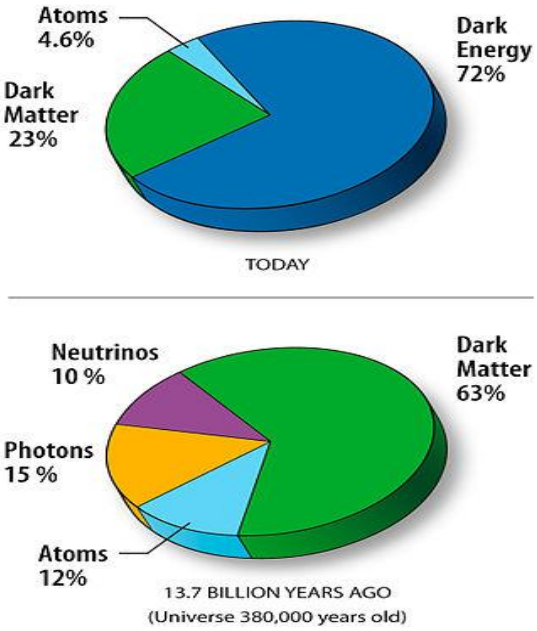
The Einstein's theory does not exactly take account of the universe. the universe is in account of Einstein's theory is the persent universe& we know that universe components keep changing whereas the universe remains constant for instance the universe now was not the universe before this second if keeps on changing every second. for clarity we shall see the contradictory pie diagram of the components of universe.

1. When there is tremendous amount of change in 13.7billion years every year there might be small or minute change in the universe which will also affect the (demonstration) of Einstein's equation because the cosmological constant in Einstein's equation depends upon the components of the universe .in common terms cosmological constant is nothing but ratio of dark matter &dark energy which keeps on changing which being the biggest dark drop in the equation.
2. Another backdrop being that Einstein while deriving the equation look the universe as stable which he later quoted as his biggest blunder in his life. & later modified it with some specifications.
3. But for the Einstein's equation to be perfect the universe must rotate around a centralized axis with perfect time period which does not seem to happen as for now. if above stated turns out to be true the cosmological constant will tend to zero. Resulting in a possibility of time travel.

III. Theories Of Time Travelling & Its Defects

1. Wormhole theory (quantum mechanics theory)

A wormhole is any structure connecting two regions or areas otherwise distant or unrelated. That have been by two methods discussed as a possible mode of interstellar travel & even of time travel. Wormhole connect two (otherwise unrelated region to form what is called a multiple connected space).their present paths must be quicker to travel than the paths presented by normal space . For example; the distance from point A to point B can be covered by two methods.



Fig(ii)

Fig (iii)

The blue path is the normal path in which two universes can be a few light years away which is impossible for a man to travel .the zig- zag path as shown in the fig(iii) if human is considered to be a point charge where as the suction path in fig(iv) creates a suction vacuum that pulls the organism in it and makes the person reach the point in fraction of sections instead of light years. the theory of wormhole evolved from the theory of quantum mechanics that a electron travels through an extremely short path under high pressure & settles there instead of travelling the entire distance through the molecules, it acquires the shortest distance possible with about 10^100 times normal energy contributed to the transfer of electron.

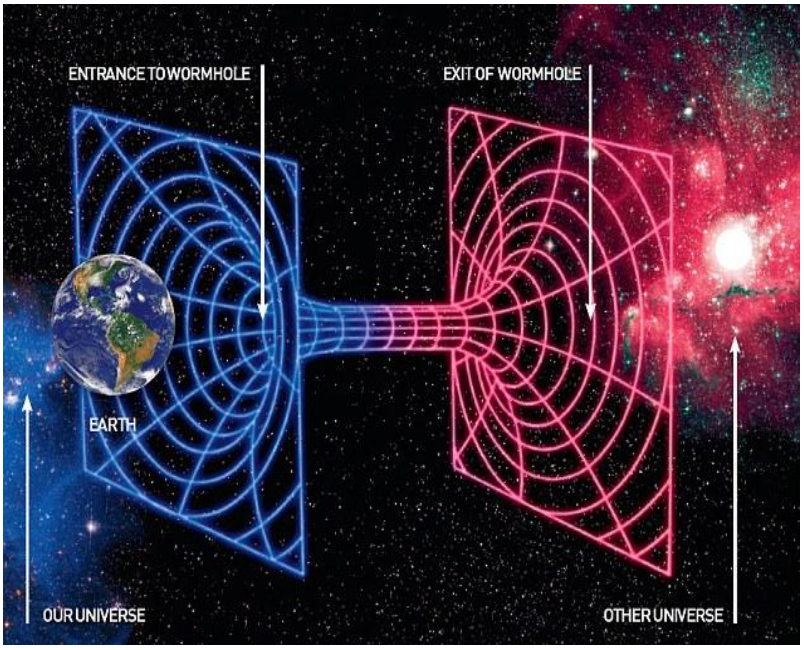


Fig (iv)

Here if the entire galaxy is defined as the space around us & any two definite places in the galaxy are defined as two set of molecules & the organism being man. he can travel through the wormhole & reach the other destination.

After the introduction to wormhole there were 5 types of wormhole introduced
1) Riemann cuts
2) Einstein-Rosen bridge
3) kip throne's wormhole
4) Stephen Hawkins's wormhole
5) Sidney Coleman's wormholes

As we are just talking about the theories we wouldn't like to go in detail to the types wormholes since they are similar types of wormholes with a very little modification in each of them, the Stephen hawking wormhole being the most modified one.

Drawbacks
1. The generation of a human sized wormhole will require energy up to 10^100 times the normal energy required for space travel which is near to impossible for today's man.
2. There are many theories that work on quantum levels but fails when applied to man size bodies.
ex:-Heisenberg's uncertainty principle.
3. The return of man from the destination is in doubt because of two factors.
(a) According to quantum mechanics if an electron alternates a wormhole from one place to other place he may or may not use that wormhole in his return journey to other set of molecules so if at all we introduce a wormhole from earth to some other planet we may need to install another wormhole for our return journey or else we may live there forever.
(b) this wormhole phenomenon also takes account that to return from the destination we would have to generate tremendous amount of energy ie same energy which took for to travel if the place is deficient of energy we would remain in that place &never returning from there.
4. According to Sidney Coleman's wormholes, wormholes are not mathematically predictable. In fact, it would be simple to say that infinite universe connected by infinite wormholes are necessary to keep the cosmological constant (lambda in Einstein field equation) very close to zero. if it was negative, the universe would wrap up into a tiny hypo sphere & if it was positive ,the universe would virtually explode , so the correction imply that only tiny wormholes keep the universe in stable condition which support the 2nd part mentioned above. If at all tiny wormhole are made into existence the tiniest wormhole for a normal human to pass through will require tremendous amount of energy which may not be possibly generated.

2. Einstein's basic equation

Using Einstein basic equation can help astronomers better understand how the universe began –The Big Bang Theory along with events that happen now & might occur in the future. for example, Einstein didn't stop at "E=MC^2" .He expanded the equation to help explain what happens to energy in motion, most of us who study math, science& physics .find it much easier to understand when it is expanded to include 'p' for momentum, however it adds understanding about transfer & transformation of light & energy, in outer space; the energy can be measured as when millions of stars orbit within a black hole. A black hole is a gigantic & mysterious example of how resting mass converts into energy.

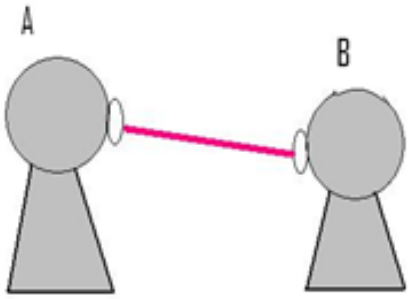
A black hole is formed when a large star that has burned up all its fuel collapses upon itself due to the pressure of its own mass , the gravitational field that is formed by the explosion is so strong that it sucks in everything that enters in contact with its "event horizon"(the edge of a black hole from which nothing can get back out),although this kind of black hole crushes any matter that reaches its centre, there are other types of black hole, such as rotating black holes, which astronomers have proposed could serve as perfect for time travel.

Scientists say that "E=MC^2" form the basis of fusion ,which explains not only how energy transfer to light from the sun, but also how nuclear fusion could one day create energy for, nuclear power. and that's just one of many practical & well, universal applications of Einstein's equation because its a mathematical equation that most of us need reminding us from time to time that everything has energy & Einstein's work continues to open doors to exploration of a world here on earth & beyond. Even the radiation pressure that propels spacecraft to study our distant universe is made possibly by Einstein's equation "E=MC^2"
Because atomic nuclei transform mass into energy.

IV. Time Machine Being Developed Now

Messenger telepathy

This kind of machine is being developed at the Princeton University by physicist Dr. Richard Goft. In this experiment he puts two protons such that they are a distance apart, then offer a stimulus to one proton & then the other proton would react to the stimulus before the stimulus receiving proton receives it completely by fraction of nanoseconds. It has not been successful so far but if it succeeds it may lead a different perspective in time-travel as the time signal reaches the proton two will be before the proton one gives a stimulus that results in the travel of proton two into future for further clarity a pictorial representation is given bellow in fig(v).



Fig(v)

In the above figure the proton (A) say name it as bob & proton(B) name it as jack when bob gets a stimulus due to the laser which irritates it passes the stimulus to jack .but the proton(B) i.e.; jack receives the stimulus before the stimulus leaves bob. thus jack travel into future, if this phenomenon is made out in macro form it may turn out to be true but it has not been yet proved in micro form.

A similar machine in form of sound signal is being developed in japans .but due to lack of disclosure we can't comment on that.

V. Paradoxes Against And For Time Travel

1. Twin paradox

Paul Langerin, a French physicst devised the twin paradox in 1911 on the basis of Lorentz factor according to this theory ,if one twin lives at the bottom of a mountain &other lives at the top ,the twin who lives at the bottom ,which is nearer to the earth's gravitational pull, will age slowly. The difference, however would be very minimal which result in the twin living above to travel forward in time but that will be less than a nanosecond this theories were proved in an experiment in 1962,when an atomic clock that scientists placed at the bottom of a water tower ,closer to the earth's gravitational pull, ran slower than an atomic clock placed at the top of the water tower .Einstein used the term "time dilation" to describe this phenomenon.

For another example consider a space ship traveling from earth to the nearest star system outside of our solar system: a distance d = 4 light years away, at a speed v = 0.8c (i.e., 80 percent of the speed of light). (to make the numbers easy, the ship is assumed to attain its full speed immediately upon departure—actually it would take close to a year accelerating at 1 g to get up to speed.) The earth-based mission control reasons about the journey this way: the round trip will take $t = 2d/v = 10$ years in earth time (*i.e.* everybody on earth will be 10 years older when the ship returns). the amount of time as measured on the ship's clocks and the aging of the travelers during their trip will be reduced by the factor $\epsilon=\sqrt{1-v^2/c^2}$, the reciprocal of the lorentz factor. in this case $\varepsilon = 0.6$ and the travelers will have aged only $0.6 \times 10 = 6$ years when they return.

The ship's crew members also calculate the particulars of their trip from their perspective. they know that the distant star system and the earth are moving relative to the ship at speed v during the trip. in their rest frame the distance between the earth and the star system is $\varepsilon d = 0.6d = 2.4$ light years (length contraction), for both the outward and return journeys. each half of the journey takes $2.4/v = 3$ years, and the round trip takes $2 \times 3 = 6$ years. their calculations show that they will arrive home having aged 6 years. the travelers' final calculation is in complete agreement with the calculations of those on earth, though they experience the trip quite differently from those who stay at home.

If twins are born on the day the ship leaves, and one goes on the journey while the other stays on earth, they will meet again when the traveler is 6 years old and the stay-at-home twin is 10 years old. the calculation illustrates the usage of the phenomenon of length contraction and the experimentally

verified phenomenon of time dilation to describe and calculate consequences and predictions of Einstein's special theory of relativity.

As we all know that atomic clock is the most accurate clock in the world it ticks 9billion times per second i,e $1/10^{(4)}$ billionth of a nano second which are only 6 in the world. it requires large amount of cesium to make it & if misses a beat, its something to worry about

Now, if both twins send a video feed of themselves to each other, what do they see in their screens? Or, if each twin always carried a clock indicating his age, what time would each see in the image of their distant twin and his clock?

Shortly after departure, the traveling twin sees the stay-at-home twin with no time delay. At arrival, the image in the ship screen shows the staying twin as he was 1 year after launch, because radio emitted from Earth 1 year after launch gets to the other star 4 years afterwards and meets the ship there. During this leg of the trip, the traveling twin sees his own clock advance 3 years and the clock in the screen advance 1 year, so it seems to advance at $\frac{1}{3}$ the normal rate, just 20 image seconds per ship minute. This combines the effects of time dilation due to motion (by factor ε=0.6, five years on earth are 3 years on ship) and the effect of increasing light-time-delay (which grows from 0 to 4 years).

Of course, the observed frequency of the transmission is also $\frac{1}{3}$ the frequency of the transmitter (a reduction in frequency; "red-shifted"). This is called the realistic dopler effect. The frequency of clock-ticks (or of wave fronts) which one sees from a source with rest frequency f_{rest} is

$$f_{\text{obs}} = f_{\text{rest}}\sqrt{(1 - v/c) \,/\, (1 + v/c)}$$

As for the screen on Earth, it shows that trip back beginning 9 years after launch, and the traveling clock in the screen shows that 3 years have passed on the ship. One year later, the ship is back home and the clock shows 6 years. So, during the trip back, *both* twins see their sibling's clock going 3 times faster than their own. Factoring out the fact that the light-time-delay is decreasing by 0.8 seconds every second, each twin calculates that the other twin is

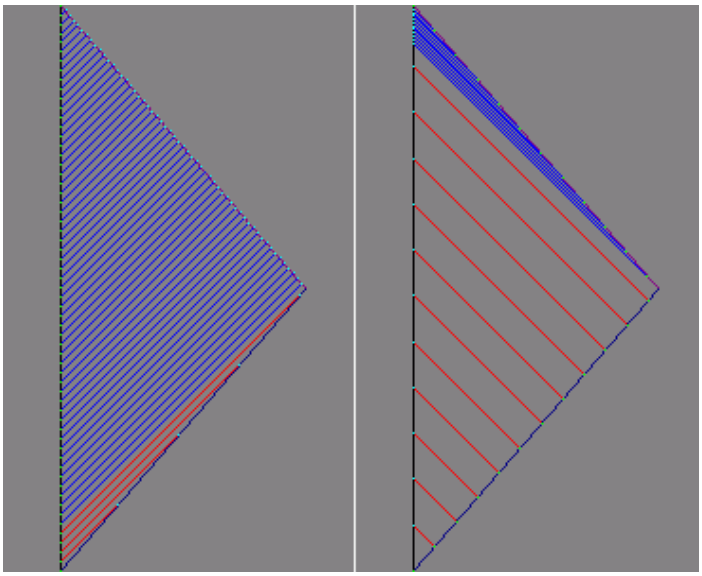


Fig (vi)

aging at 60% his own aging speed The *x*–*t* (space–time) diagrams at left show the paths of light signals traveling between Earth and ship (1st diagram) and between ship and Earth (2nd diagram). These signals carry the images of each twin and his age-clock to the other twin. The vertical black line is the Earth's path through spacetime and the other two sides of the triangle show the ship's path through spacetime (as in the Minkowski diagram above). As far as the sender is concerned, he transmits these at equal intervals (say, once an hour) according to his own clock; but according to the clock of the twin receiving these signals, they are not being received at equal intervals.

After the ship has reached its cruising speed of 0.8*c*, each twin would see 1 second pass in the received image of the other twin for every 3 seconds of his own time. That is, each would see the image of the other's clock going slow, not just slow by the ε factor 0.6, but even slower because light-time-delay is

increasing 0.8 seconds per second. This is shown in the figures by red light paths. At some point, the images received by each twin change so that each would see 3 seconds pass in the image for every second of his own time. That is, the received signal has been increased in frequency by the Doppler shift. These high frequency images are shown in the figures by blue light paths.

Drawbacks

1) The change cannot be shown significantly even in the atomic clock.
2) It may not be possible to construct such huge building just for the sake of time travel
3) The time travel is less than a nano second which does not hold good for micro objects too.

2. Grandfather paradox

This was great counter to all those minds which though they could construct a time machine it was stated by one of the greatest mind Stephen Hawkins ,it states that if you travel into time & go back to your home & kill a person who happens to be your grandfather before your father has been (conceived) then how do you seem to exist .it killing yourself by means of yourself.

How does nature counter that if all we travel into time is the question & may be nature has no alternate to so it does not allow time travel but hawking countered his own statement by introducing the theory of presence of multiple universe according to this statement he says that the universe we live in is one period of time somewhere there exists another universe which runs before our time & yet another universe which runs after our time .he proposed the presence of multiple universes as such where each universe was in a particular period of time .here the 'grandfather paradox' do exist because when you will travel in time you will be actually traveling to a different universe there if you kill your grandfather you will only cease to exist in that particular universe that you belong so but this theory seems to be highly impossible because of at parallel universe exists it may require light years together to go through them

VI. CONCLUSION

Presently the science and technology of space travel and time travel seems to be a very rigid and unappending but seemingly possesses a wide application in future technology and if developed seemingly faster than now can be advanced to analyze the future happenings and the untold mysteries of the past which always seem to fascinate human beings in some or the other way.

Acknowledgements

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