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An Approach for Time Travel through Quantum Physics

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Abstract: ***An intra-universe wormhole is a region of space time whose boundary is trivial at the same time whose interior is not connected .This Thesis mainly proposes an effort to explore the existence of wormholes or Einstein Rosen bridges through which time travel can be carried out to land in past or future. Black holes are one way trip but wormholes are two-mouth tunnels. I propose a traversable and stable wormhole for space and time travel. Relativity theory does not allow for travel into the past. But such travel could possibly be achieved using Einstein-Rosen bridges, better known as wormhole tunnels. Theoretically no significant experiment application has been taken directly on this subject. Phantom energy will end the function of universe by creating a space which will be completely anti-gravitational. The existences of wormholes are not proved yet, but our laws of physics supports their existence. Thus, this work is to establish a new path for the future generation.***
Keywords: Time travel, Quantum physics, Einstein Rosen bridges, Black holes, Wormholes.

I. INTRODUCTION TO RELATIVITY

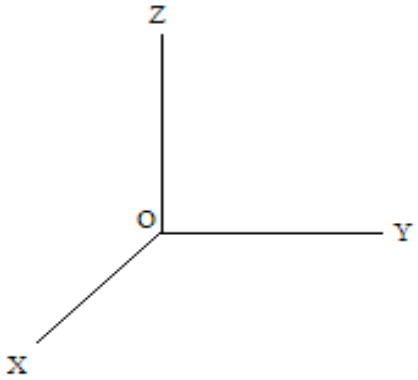

Fig. 1 Static (x,y,z) coordinate System

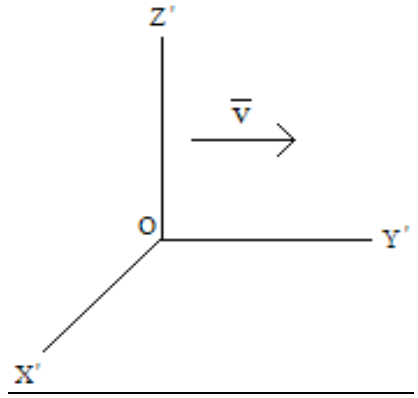

Fig.2. Moving (x',y',z') coordinate System

The coordinate system obeys Newton's law of motion and also, it is well known for its non-accelerating nature. Time is measure in terms of light travel in meters[1]. Distance is measured by the invariant interval from one inertial frame to another.

The above mentioned coordinates discuss about the concept of relativity theory. Some other theories about wormholes are as follows

A. Quantum Leap Theory

Relativity theory assumes speed of light as universal and proved that distance and time are not absolute but affects one another by its motion. Time is relative to the speed at which a body is moving[2].

B. Fixed Timeline Theory

The Parallel Dimension theory, states that the change which has occurred in one universe will have effect on another.

There are many non-expectable results in photon experiments[3]. A filter has been arranged, through which photons are fired, the behaviour of photons are very peculiar which encountered an interface created by other photons which actually does not exist. This proves the existence of parallel dimensions, and if time travel has been carried out, there is a possibility to arrive in such a parallel dimension[4]. The reason for such behaviour of photons is completely unpredictable, but it shows the possibility of interference from another dimension.

The existence of other dimensions alone doesn't give the possibility of time travel. Parallel Dimension theory co-relates with Einstein's Relativity theory by the fact of supporting time travel. Two ends of wormhole have different velocities and different time for them. With the wormholes, the effort carried is to increase the time boundary, by increasing velocity and distance from one side to another. There is a chance for temporary displacement even if both the ends are in same dimensions. A clear time travel theory is the one which allows the traveller to move to the past [23].

II. WHAT ARE WORMHOLES

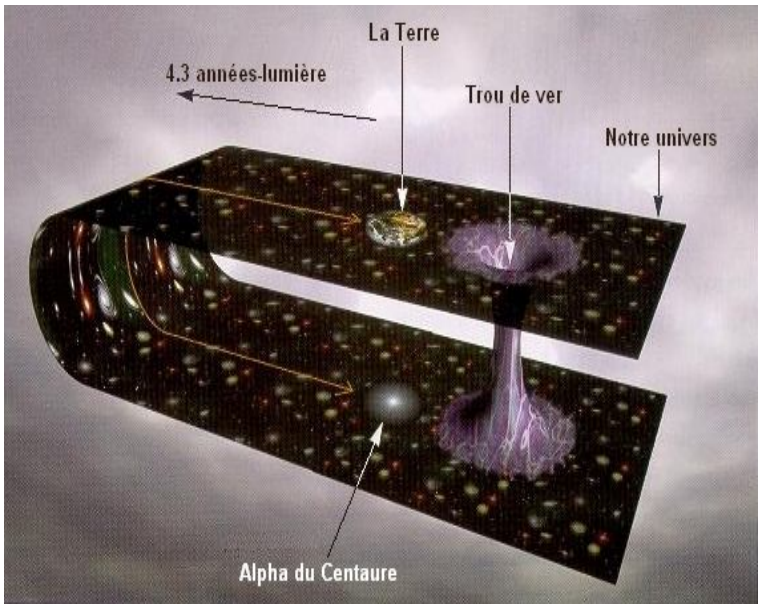

Fig.3. Wormhole illustrating Timetravel

A. They are tunnels which allow moving through space time.

B. Wormholes are actually spherical, although represented as 3D tunnels for better understanding.

Wormholes create multiply connected space by connecting two unrelated regions**.** The path created by connecting space is faster in nature than the path in ordinary space. Wormholes allow travel between different times as well as different locations, so time travel may be theoretically possible. Wormholes are commonly exist at the centers of black holes or between parallel universes with no other connections.

Characterizing inter-universe wormholes is more difficult. For example, one can imagine a 'baby' universe connected to its 'parent' by a narrow 'umbilicus'. One might like to regard the umbilicus as the throat of a wormhole, but the space time is simply connected.

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III. TYPES OF WORMHOLES

A. *The Schwartz Child Wormhole*

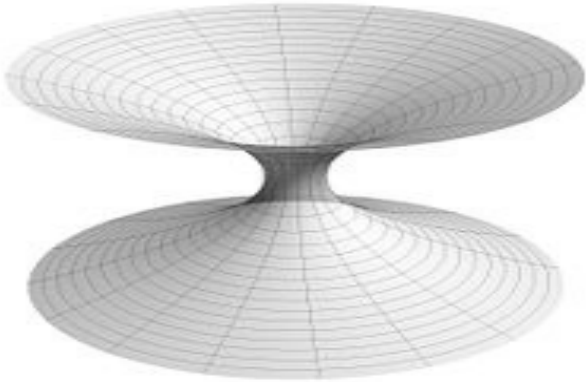

Fig.4. Embedded Diagram of Schwarzschild Wormhole

Lorentzian wormholes known as Schwarzschild wormholes or Einstein-Rosen bridges are bridges between areas of space that can be modelled as vacuum solutions to the Einstein field equations by combining models of a black hole and a white hole. These wormholes are unstable, also it doesn't allow light to penetrate through.

In this type of wormholes, white holes will form at its end which may be a reason for its instability. It admits both negative and positive square root solutions for its geometry[15].

The Schwarzschild geometry consists of a black hole, a white hole, and two Universes connected at their horizons by a wormhole.

The negative square root solution inside the horizon represents a white hole. A white hole is known as a black hole running backwards in time. But there is an alternate theory stating that, white holes cannot exist, since they violate the second law of thermodynamics. General Relativity doesn't consider this second law of thermodynamics and also its cause and effect. The negative square root solution outside the horizon represents another Universe. The wormhole joining the two Universes is known as the Einstein-Rosen Bridge.

The description of black holes requires wormholes at their centres. These wormholes, called Einstein-Rosen bridges after Einstein and Nathan Rosen, seem to connect the centre of a black hole with a mirror universe on the "other side" of space time. The first relativistic solution involving black hole was Einstein's equation. These bridges give a valid consistency to support that equation. Wormholes are non-transferable, because of its singular nature and infinite gravity. The basic requirement to travel in a wormhole is to travel faster than light which is physically impossible[12]. This is the major reason for downfall of Einstein – Rosen bridges. Because of which it doesn't create any impact in physical reality.

Kerr solution is the most realistic solution to Einstein's equation. The assumption made Kerr was, there will be a rotating star which forms the black hole doesn't collapse at a point, but rather to a ring. Travelling through the ring will create finite gravity. An object can get access to mirror universe if it with stands gravity inside the ring.

B. *The Morris Thorne Wormhole*

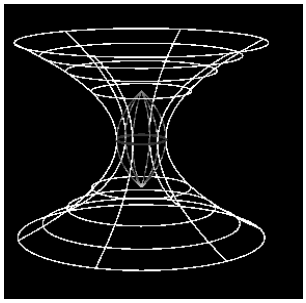

Fig 5.Morris Thorne Wormhole

This type of wormholes allows time travel both inter universe and intra universe. The possibility of wormhole in relativity was illustrated by Kip Thorne and his graduate student Mike Morris in a 1988 paper; referred to as a **Morris-Thorne wormhole**.

The wormholes should not create any harm to its travellers like ripping, freezing etc. Also it should stay open during the phase of trip. It requires an exotic matter whose total energy is negative.

Based on this solution, Thorne later made the first scientific proposal for the design of a machine for time travel. A chamber containing two parallel metal plates is placed on a rocket ship and accelerated to near-light velocities. An identical chamber, with the time traveller inside, is placed on earth. The electrical field created by the plates (the Casmir effect) creates a tear in space time. Due to relativistic effects, the clocks in two chambers run at different rate, the traveller will be hurtled either in to the past or to the future[16].

Another possible time machine involves a cylinder made of the abovementioned exotic matter. A traveller must stand inside the exotic matter filled wormhole, where he can travel to his desired location.

It is very difficult to locate and exploit exotic matter. There is a condition called averaged weak energy condition (AWEC), which must be eradicated for the wormhole to work. Additionally, Stephen Hawking has declared that the wormhole entrance will emit radiation which make it unstable or even close it permanently[18].

C. The Visser Wormhole

The Types of Visser Wormhole are

1) Inter Universe Wormhole:

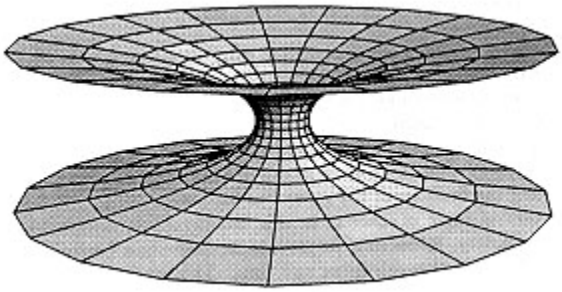

Fig 6.Inter Universe Wormhole

These types of Wormhole connect our Universe with other Universe.

2) Intra Universe Wormhole:

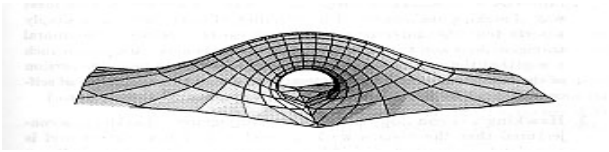

Fig 7.Intra Universe Wormhole

a) The wormholes that connect two distant regions of our universe with each other.
b) Require cutting two similar holes in space-time and sewing the edges together.
c) It uses a lot of negative mass; therefore it has smaller tidal forces.

IV. POSSIBILITY OF TIME TRAVEL

Einstein-Rosen bridges, better known as wormholes scientifically allows time travel to the past. The theory connects distant points through space and time. Kip Thorne, a gravitational theorist at the California Institute of Technology in Pasadena, showed in 1988 that these tunnels could be kept open by an exotic form of matter known as Casmir energy.

This energy can be formed by quantum vacuum. Weighing less than zero, Casmir energy would have an anti-gravitational effect, keeping the wormhole's walls apart.

If one opening of the wormhole was moved around using the gravitational effect of a spaceship travelling at a speed close to light, a clock at the opening would run slow compared to one on the other end of the wormhole. This could turn the wormhole into a portal

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between two different times, past and future[20].

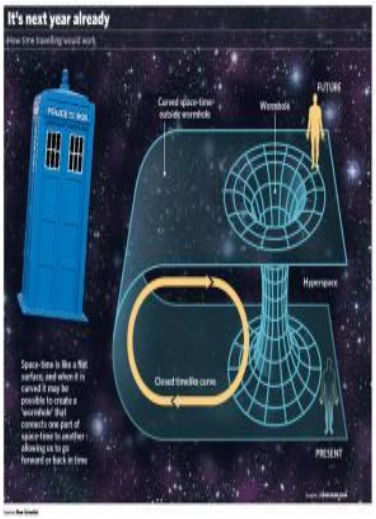

Fig 8.Intra Universe Wormhole

V. CURRENT RESEARCH

A. Mostly theoretical, no significant experimental approach has been taken directly on the subject.
B. Exotic matter experiments have shown that this material is obtainable.

VI. PRACTICAL PROBLEMS

A. All wormholes require exotic (negative) matter to keep their throat open.
B. It takes to much energy to just open them, leave alone maintain them.
C. Fine tuning problems; too much precision needed.
D. There is no known way to create these enormous amounts of negative energy.
E. We currently don't know how to create or sustain a wormhole.
F. Einstein equations and the theory itself do not prohibit the idea of time travel, although there have been many attempts since Einstein to prove that travelling back in time is impossible. The biggest theoretical problem is known as the time-travel paradox. If someone travels back in time and does something to prevent their existence, then how can time travel be possible?
G. The practical problems with time travel are too immense to solve, and even if you could, who would want to?
H. You might travel back in time and kill one of your grandparents by accident. Then where would you be?
I. If time travel is possible, why are we still waiting to welcome our first visitors from the future?

VII. ILLUSTRATIONS

There is nothing in the laws of physics to prohibit it. In physics, so the saying goes, if nothing is prohibited, it must happen at some point. All we need to do is to work out how to manipulate black holes and wormholes, and away we go.

A. Stabilising a Wormhole

In principle, a wormhole could be stabilized by threading its throat with `exotic matter'. In the stable wormhole at left, the exotic forms a thin spherical shell.

B. Steps to Build a Wormhole

1) Find a wormhole which exists naturally in deep space, or in the big bang. The wormholes can be sub atomic in nature
2) Stabilize the wormhole by in fusing negative energy. The particular negative energy is known as Casmir effect. This effect allows an object to pass safely through a wormhole. Negative energy forms an anti gravitational radiation, which prevents wormhole to pinch off to indefinite density. This energy also prevents the chance of getting converted to a black hole.
3) Tow the wormhole. A wormhole can be towed with the help of a spaceship, presumably of highly advanced technology. The space ship will separate the mouths of the wormhole. One mouth might be positioned near the surface of a neutron star, an

extremely dense star with a strong gravitational field. The intense gravity causes time to pass more slowly. Because time passes more quickly at the other wormhole mouth, the two mouths become separated.

VIII. CONCLUSION

A. We have not seen wormholes directly, but our known laws of physics do not ban their existence. It is not outrageous to believe they exist.

B. Regarding space travel, maybe only future generations will be capable of telling whether it is possible or not.

C. We have seen that whilst the construction of wormholes is technically very difficult the long-term payoffs are very great.

D. A civilisation can expand through the universe, stamping its own chronology on its locality, at a speed only limited by its energy resources.

E. At the very least the problems of construction, theoretical and practical, will exercise the advanced intelligences of the future considerably.

F. In the longer term the capabilities of opened-ended infinite information processing lie before the civilisations that solve the problem.

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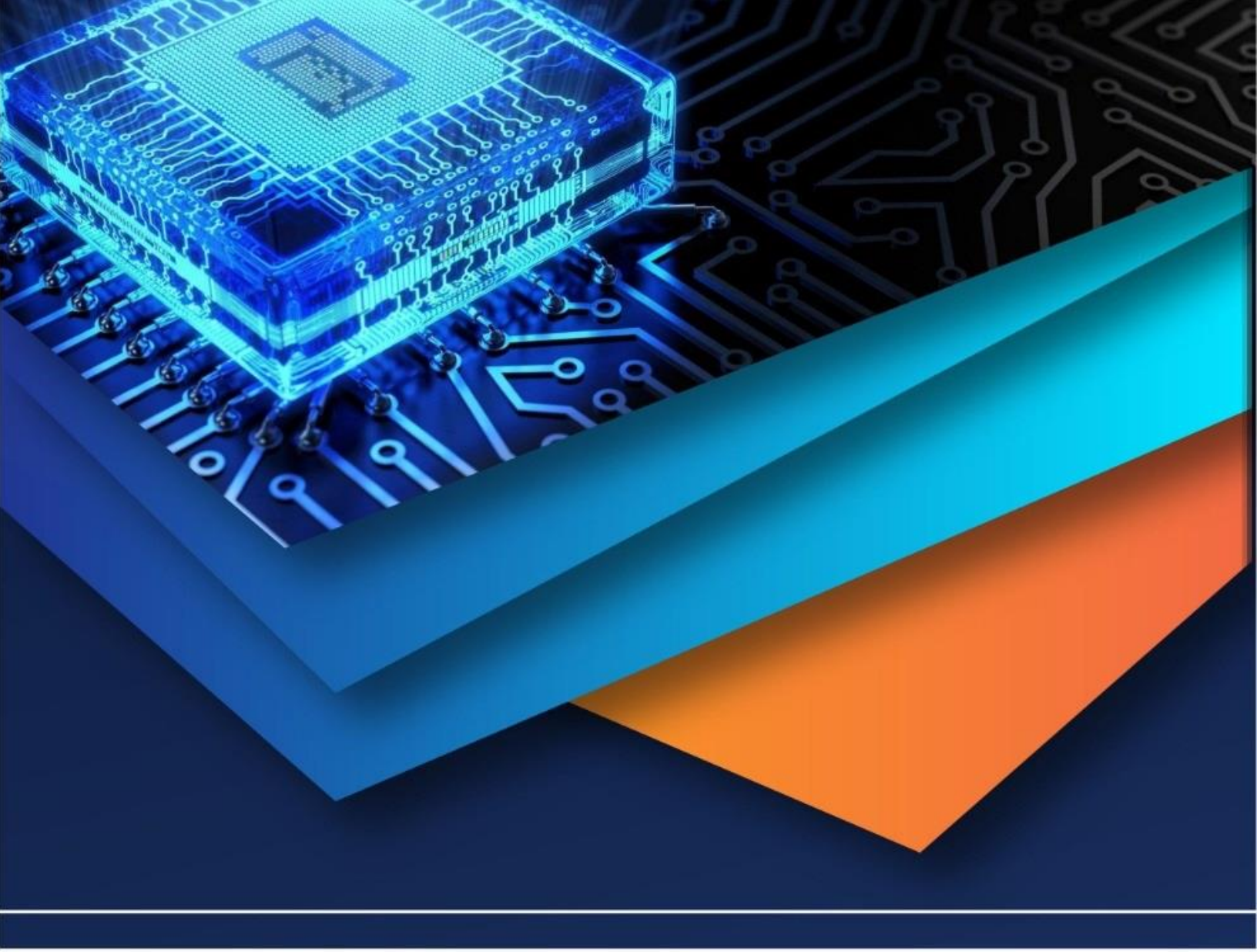

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