CHITKARA UNIVERSITY | PUNJAB

BEST BCA COLLEGES

STATE RANK

All India Rank - 10

in Indian
Institutional Ranking
Framework (IIRF) 2023

published by

EducationPost
A NEW HIGH IN EDUCATION

WALL FOR ALL

Volume 10| Issue 2

Department of Computer Applications
Chitkara University Institute of Engineering and Technology
Chitkara University, Punjab

Dear Readers

The nostalgic feeling that one experiences while sifting through the dusty old pages of the college magazine cannot be expressed in words. However, very few of us have retained those copies, and most of those precious articles that we wrote during those golden days with enthusiasm are lost forever. With the advent of e-books and other online media, the days of paper-bound college magazines are gone, and the digital platform has paved way to allow retention of such publications without much effort.

Wall-for-All, the e-Magazine published by the Department of Computer Applications, is one such effort that was started with an intent to provide a chance to all students and faculty members to share their thoughts and knowledge, and hone their skills in creative writing.

I am happy to see the enthusiasm of eminent members of the department to contribute to Wall-for-All. This shows the positive and creative energy of the contributors. However, it would be really wonderful if we can see the articles contributed by more students in the next editions, for this e-Magazine is intended to be a writing pad for each member of the department.
I proudly present the current edition of Wall for All.

Dr. Jaiteg Singh
Professor & Dean
Department of Computer Applications
Chitkara University, Punjab

CONTACT INFORMATION

DR. JAITEG SINGH

Professor & Dean
Department of Computer Applications
jaiteg.singh@chitkara.edu.in

DR. RUCHI MITTAL

Professor
Department of Computer Applications
ruchi.mittal@chitkara.edu.in

DR. DIVYA KHANNA

Assistant Professor
Department of Computer Applications
divya.khanna@chitkara.edu.in

MS. PUNINDER KAUR

Assistant Professor
Department of Computer Applications
puninder.k@chitkara.edu.in

Mr. Prabhdeep Singh

BCA- 5B (Student), Department of Computer Applications, Chitkara University, Punjab, India

Dr. Vandana

Associate Professor, Department of Computer Applications, Chitkara University, Punjab, India

In Search of the Impossible: The Science of Warp Drive

It is demonstrated that it is possible to alter spacetime in a way that enables a spaceship to move at any given speed within the confines of general relativity while avoiding the need of wormholes. Motion faster than the speed of light as perceived by observers beyond the disturbed region is feasible via a purely local expansion of spacetime rear the spacecraft and an opposing contraction in front of it. The distortion that results is similar to the "warp drive" in science fiction. However, to produce a deformation of space like the one described here, exotic matter would be required, just as it is with wormholes.

Introduction

The idea of warp drive has long captivated the imaginations of scientists, authors, and fans alike in the fields of theoretical physics and science fiction. The warp drive is frequently depicted as a futuristic propulsion device with the potential to enable faster-than-light (FTL) travel. It was first made public by the renowned physicist and author, Dr. Miguel Alcubierre, in 1994. Many science fiction works, most notably the Star Trek series, have used this idea as a primary theme.

The fundamental concept behind warp drives is the idea of "warping" or warping spacetime in order to travel faster than the speed of light, which is thought to be the limit of all possible travel. in accordance with Albert Einstein's theory of relativity.[3].

The warp drive imagines a spacecraft creating a bubble or warp in spacetime around it, effectively contracting the space in front of the ship and expanding it behind, allowing the ship to traverse vast cosmic distances in a relatively short amount of time from its own perspective. This is different from travelling through space faster than light.

Even though warp drive is still firmly grounded in science fiction, it has sparked scholarly debates and inquiries into the system's potential viability. To try to make the warp drive idea more consistent with our current understanding of physics, researchers have investigated a variety of unconventional notions and principles, such as negative energy or exotic matter. The development of a functional warp drive, however, remains completely hypothetical, and enormous technical and scientific hurdles must be cleared before even beginning to explore its practical application. [3]

In conclusion, warp drive is an intriguing idea that has been widely used in science fiction.

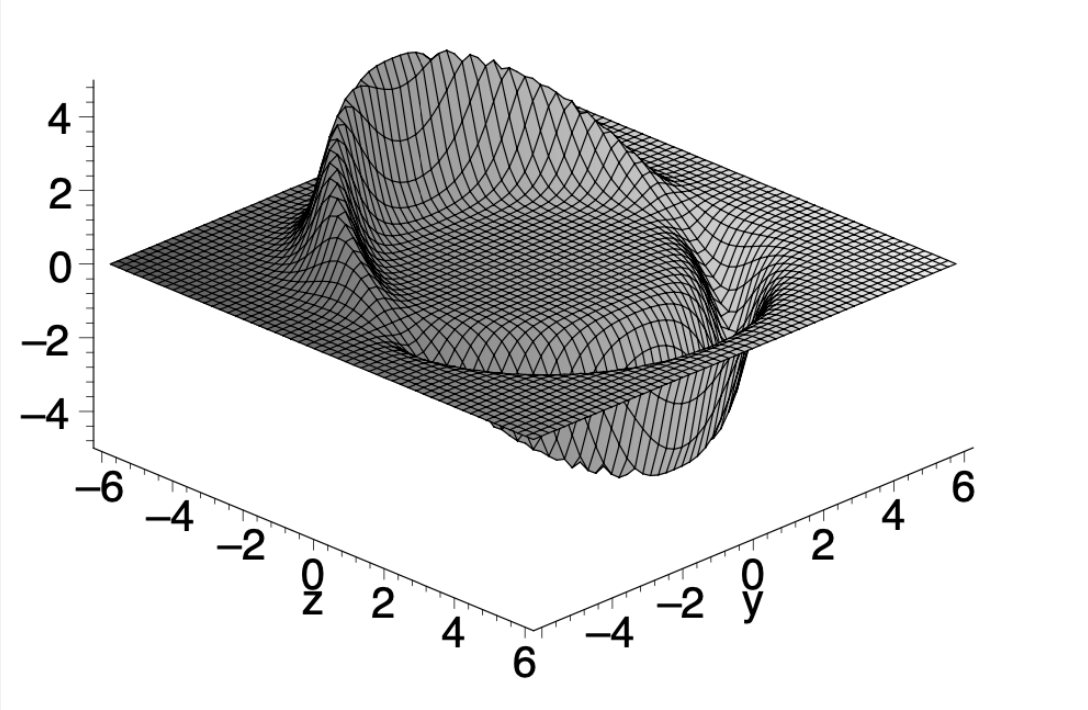


Figure 1: The plot shows the expansion of the volume components of an Alcubierre warp bubble

It has sparked conversations about the viability of faster-than-light travel and piqued scientific curiosity.
Here are some key warp drive theories and concept here-

1. Alcubierre Warp Drive[4]: According to the initial Alcubierre warp drive hypothesis, a warp bubble will form around a spacecraft. The ship may move inside the bubble without deviating from the speed of light calculated inside the bubble because of the way this bubble compresses space in the direction of the ship but expands it behind it. To stabilise the warp bubble, this idea, however, depends on the presence of exotic matter having negative energy density, a substance that is yet hypothetical and difficult to create.[1]

2. Krasnikov Tube [4]: A different theory for FTL travel is the Krasnikov tube, which was put forth by physicist Serguei Krasnikov. It entails the construction of a spacetime wormhole or "tube" that can be passed through between far-off places. FTL travel is possible through this tube, but doing so still requires exotic matter to maintain the wormhole stable and presents several theoretical difficulties.

3. White-Juday Warp Field Interferometer [4]: In 2012, scientists Harold White and Eric W. Davis presented an alteration to the Alcubierre drive idea called the White-Juday Warp Field Interferometer. However, there are still many obstacles to overcome before such an experiment can be implemented practically.

4. Harlod White's Improved Warp Drive Metrics: Harold White has tried to improve the mathematics behind the warp drive theory, suggesting updated warp drive measurements that lessen the amount of exotic matter needed. These metrics rely on speculative elements but try to increase the plausibility of warp drive concepts within the bounds of known physics.

5. Wormholes [4]: Wormholes are speculative spacetime shortcuts that might one day provide fast-time travel (FTL). While not warp drives in the conventional sense, travelling via a stable wormhole could provide equivalent effects. Wormholes must also be able to stabilise and preserve their integrity, which may call for unusual substances or as-yet-unidentified types of physics.

Warp Drive With Internal CTC'S [5] –
In order to analyse the Euclidean continuation of the two-dimensional Alcubierre spacetime and, consequently,

its stability against quantum vacuum fluctuations, we shall avoid the complexity of Kruskal extension in this section.

Because metric and the de Sitter metric in both dimensions are comparable, we can visualise the dimensionally compressed Alcubierre spacetime in the form of three-hyperboloid according to metric

$$-v2 + w2 + x2 = v0\text{-}2$$

in when v0 > 1. This hyperboloid is immersed in E3, and the expression that is induced in this embedding is the most generic expression of the two-dimensional metric of Alcubierre space for v0> 1:

$$ds2 = -dv2 + dw2 + dx2 \quad [5]$$

which has topology R * S2 and invariance group SO. in the warp drive's initial locations. Identifications imply that the boost transformation within the (v, w) plane will also produce the boost transformation on the two-dimensional Alcubierre space. In the region covered by such a metric, that is, the region w > |v|, in which there are CTCs, with their borders at w = ±v, and x2 = v0-2 being the Cauchy horizons that define the beginning of the nonchronal region within the Alcubierre causal exterior, the symmetry can be satisfied for coordinates defined by, resulting to the static metric with an obvious horizon as metric. [6]

The conversion of a two-dimensional warp drive with a constant, faster-than-light apparent velocity into a multiplexed warp drive with CTCs only inside the spacecraft and its horizon of events at r0 in a chronology boundary has been accomplished in this fashion. This is a very different method of converting warp drives into time machines than the one.Even if the astronaut at the centre of the warp bubble is still completely cut off from the outside world in our example, he or she may always go back in time to assist in building the warp drive on request or create the initial circumstances for the control.[6]

CTCs, with their borders at w = ±v, and x2 = v0-2 being the Cauchy horizons that define the beginning of the nonchronal region within the Alcubierre causal exterior, the symmetry can be satisfied for coordinates defined by, resulting to the static metric with an obvious horizon as metric. [6]

The conversion of a two-dimensional warp drive with a constant, faster-than-light apparent velocity into a multiplexed warp drive with CTCs only inside the spacecraft and its horizon of events at r0 in a chronology boundary has been accomplished in this fashion. This is a very different method of converting warp drives into time machines than the one.Even if the astronaut at the centre of the warp bubble is still completely cut off from the outside world in our example, he or she may always go back in time to assist in building the warp drive on request or create the initial circumstances for the control.[6]

Quantum Stability of Multiply Connected Warp Drive [5]-

In this part, we're going to show how the presence of either a self-consistent Rindle vacuum or microscopic warp bubbles makes the two-dimensional, multiply linked warp drive spacetime entirely stable to vacuum quantum fluctuations. We've previously demonstrated that the two-dimensional warp drive spacetime may be rooted in the Minkowskian covering of the three-dimensional Misner space if the symmetries of this space implied by identifications (which lead to identifications in Alcubierre coordinates) must remain also in the two-dimensional Alcubierre spacetime with v0 > 1. He obtained an observed energy density near the horizon proportional to [f – (1- v0-1)]-2 , which in fact diverges as r → r0. [5]

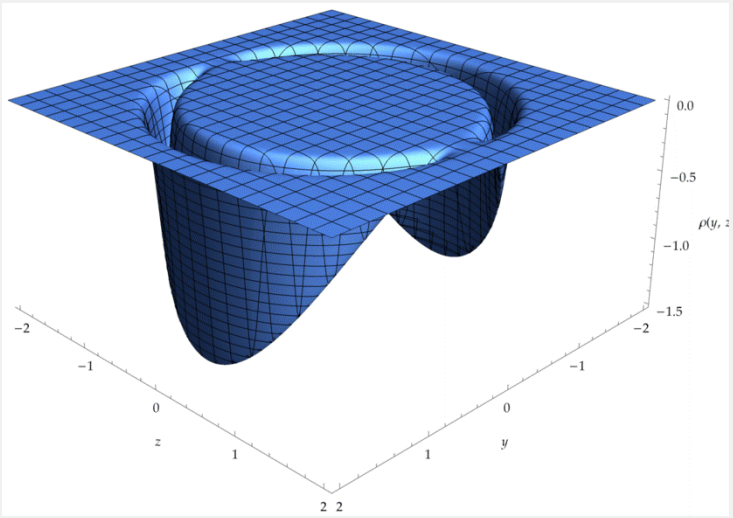


Figure 2: The distribution of energy density around a warp drive bubble

Metric can be transformed into a metric of a three-dimensional Misner space explicitly by using the coodinate re-definitions.

$V = \theta \cosh x1$

$w = \theta \sinh x1$

$x = x2$ [7]

Then, $ds2 = -d\theta 2 + \theta 2 (dx1)2 + (dx2)2$,

which is three-dimensional Misner metric for coordinates $0 < \theta < \infty$, $0 \leq x1 \leq 2\pi$ and $0 \leq x2 \leq \infty$.
The regularised Hadamard function should then be calculated using an imaging method that should also be updated to account for the fact that the period of the enclosed spatial axis is time dependant. [7]

The Event Horizon-

Now the question arises is that will Warp drive escape The event Horizon??
The answer is surprisingly not!!

Ironically, the singularity behaves like a sphere that shrinks uniformly around you because to the damaged curvature of space-time (like being imprisoned inside a huge steel bubble with spikes pointing towards you). At the same moment, you'll have a really strange sensation that makes you feel as though you're travelling or looking in all directions "downhill" towards the singularity. Additionally, you will be surrounded by an empty super black nothingness in which the singularity and event horizon are invisible.
You can, however, escape a black hole if your warp drive has the ability to go through time indefinitely backwards in addition to warping space at the speed of light.[8]

Conclusion-

The conclusion of this hypothetical theory is that warp drive will get possible but we have to overcome some of the physical as well as theoretical challenges coming our way. Like first one the of the biggest challenge is “Energy Requirement/ Fuel”, we may need an enormous amount of energy, potentially on the order of the entire mass-energy of the planet. Harnessing and managing such vast energy sources is currently beyond our technological capabilities and Even though a warp drive can travel faster than light inside the event horizon of a black hole, it is still impossible to escape because of time curvature.

Even though a warp drive can travel faster than light inside the event horizon of a black hole, it is still impossible to escape because of time curvature. It is practically impossible to remain still inside the event horizon once you are inside a black hole because space moves at the speed of time (relative to you inside the hole). As a result, whenever you move forward in time (from the present to the future), you will also move closer to the singularity. For a short explanation of space-time graphs within a black hole, look at the Penrose diagrams. Since all potential futures, directions, and trajectories now point in the direction of the singularity and trajectories heading away from the black hole back into the universe now point into the past, the curvature of spacetime inside is actually much weirder and more terrifying than you might expect.[8]
Additionally, your spaceship is equipped with sensitive instruments that can sense the gravitational gradient, allowing you to maintain your orientation. You should be able to point your FTL warp drive in the opposite direction to escape by pointing your instruments in the direction of the singularity, however you are prevented from doing so.
The only theoretical energy component we found is Exotic matter also called as negative energy, our half of the universe is made of dark matter, but we don’t have any evidence of dark matter existence. We must stable that Exotic matter before injecting it into Warp drive engine. And we also must overcome the rules of physics like, Einstein's Theory of Relativity, Causality and Time travel, Cosmic speed limitations and many more. So, the final answer is that Warp drive is a highly speculative and theoretical concept in the realm of theoretical physics, it has been not proven, and faced the numerous challenges, here are some factors that can lead to success of Warp drive in future- Advancement in Theoretical Physics, Discovery of Exotic Matter or other infinite Energy source, Technological Innovation. [4]

References

[1] Warp Drive Basics – Miguel Alcubierre
[2] Lectures on faster-than-light travel and time travel Barak Shoshany
[3]https://www.popularmechanics.com/science/energy/a44590373/warp-drive-breakthrough/
[4] Quora

[5] Warp drive space-time Pedro F. Gonzalez-Dıaz
[6] Probing faster than light travel and chronology protection with superluminal warp drives Stefano Liberati.
[7] P.F. Gonźalez-Dı́az, Phys. Rev. D54, 6122
[8] Negative Energy, Wormholes and Warp Drive Lawrence H.Ford, Thomas A. Roman

Call for Articles

At Chitkara University, the endeavor has always been to hone the skills of learners. Keeping in line with this tradition, the Department of Computer Applications, Chitkara University, Punjab had come up with an online magazine titled ***Wall for All***. This magazine was proposed to provide a platform to the budding learners to share their knowledge and general information pertaining to the computing field. ***Wall for All*** is available for free download in PDF format from CA departmental website: **ca.chitkara.edu.in.**

The students and faculty members are invited to be a part of this venture and contribute their articles to the magazine. The students may forward the articles through their respective mentors while faculty members may send the same directly to the editors of ***Wall for All***.

About Testing Software Society
Department of Computer Applications
Chitkara University

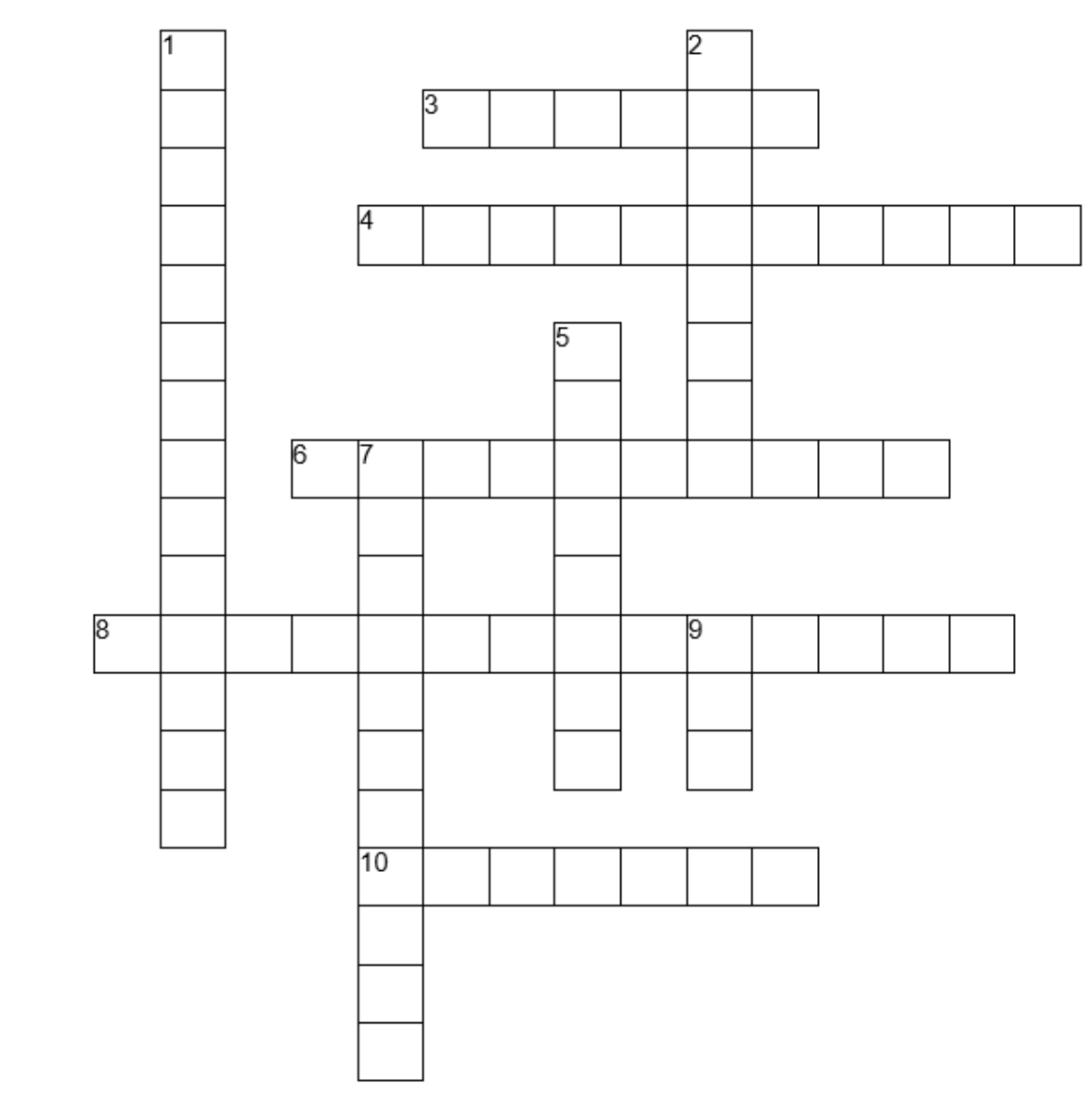
Testing Software Society guarantees that the final product will perform as expected, satisfy the needs of its intended audience, and lack serious flaws.

Some fascinating information regarding the software testing process follows:

1. Ancient Origins
2. Cost-Effectiveness
3. Different Types of Testing
4. Automation
5. Exploratory Testing
6. Continuous Testing
7. Crowdtesting
8. User Acceptance Testing (UAT)
9. Ad-Hoc Testing
10. Certification and Qualifications
11. Bug Bounties
12. Shift-Left Testing
13. Regression Testing

Software testing is a dynamic field that continues to evolve as technology advances. It plays a
vital role in ensuring the reliability, functionality, and security of software applications in today's digital world.

Crossword



Across

3. A language that emphasizes less wordy commands

4. Converts the programming language into machine code AS IT RUNS

6. Word based program that can take time to learn

8. Creator of the analytical engine

10. A collection of pre-scripted commands that someone can use in their programs

Down

1. A computer program set up to run like a computer inside a computer

2. Converts the programming language to machine code AHEAD OF TIME.

5. The low-level language that speaks to the computer

7. The creator of the first program. (It never actually ran)

9. A mistake in programming

EXPLORE YOUR POTENTIAL

A+ NAAC

CHITKARA UNIVERSITY

PUNJAB