



TECHNIEK

A SOUND OF THUNDER

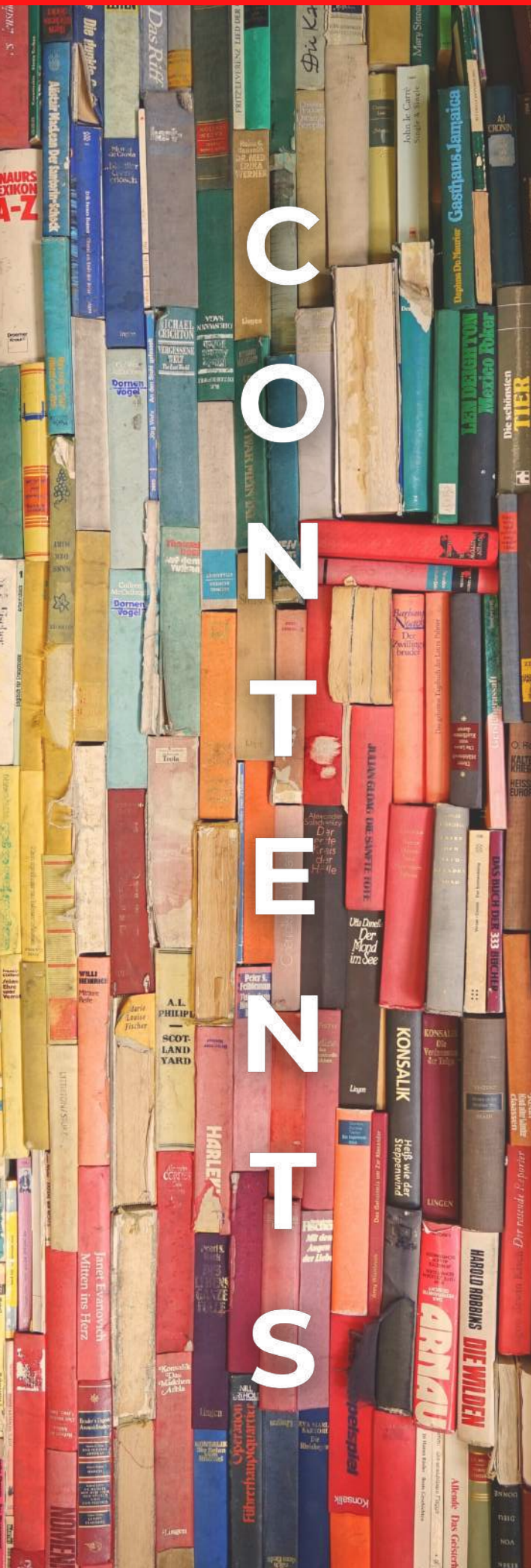
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ACKNOWLEDGEMENT

We feel exhilarated and proud to publish "TECHNIEK", the first tech-oriented newsletter of our college with a motive of sharing ideas and opinions. This newsletter is congregated with all sorts of articles on technical innovations and upcoming technologies that will have immense impact on human race and future world. It will definitely provide a new vision and enlighten us.

We express our sincere thanks and gratitude to our mentor, Dr. Ritesh Kumar Badhai for his continuous support and motivation, authors for their illuminative and insightful articles, and all the members of Technical Club for their role in making this vision possible.

Team TC:EC

MENTOR'S MESSAGE

BY: DR. R. K. BADHAI

Dear Readers,

As quoted by Albert Einstein "It has become appallingly obvious that our technology has exceeded our humanity". The progression in the field of technology has evoked a range of emotions in people from all walks of life. Innovation in this field is the backbone of our present world and we must embrace it for striving and competing in this developing world. Every once in a while, a new technology, an old problem, and a big idea turn into an innovation. What is now proved was once only imagined. As a famous saying goes, technology is best when it brings people together and as we know, learning and innovation go hand in hand.

We, at Technical Club, are proud to bring out our first issue of the newsletter, **TECHNIEK**. This newsletter is jam-packed with articles on a variety of subjects including the advancements in the field of technology and its prospects. We thank all the writers of these articles for their meritorious and sincere efforts in bringing out this newsletter. We hope you will enjoy reading this and perhaps it will give you some new ideas and fresh insights into the technical field.

A Sound of Thunder

The Science of Chaos

By: K. Mangalam

Chaos theory says within the apparent randomness of chaotic systems, there are underlying patterns, interconnectedness, constant feedback loops, repetition, self-similarity, fractals, and self-organization. The butterfly effect, an underlying principle of chaos, describes how a small change in one state of a deterministic nonlinear system can result in large differences in a later state (there is the sensitive dependence on initial conditions).

"A Sound of Thunder" is a science fiction short story by American writer Ray Bradbury, first published in Collier's magazine on June 28, 1952. This story is often credited with the origin of the term Butterfly Effect. The plot of the story goes as in the year 2055, time travel has become a practical reality, and the company Time Safari Inc. offers wealthy adventurers the chance to travel back in time to hunt extinct species such as dinosaurs. A hunter named Eckels pays \$10,000 to join a hunting party that will travel back 66 million years to a guided safari to kill a Tyrannosaurus rex. When the party arrives in the past, Travis (the hunting guide) and Lesperance (Travis's assistant) warn Eckels and the two other hunters, Billings, and Kramer, about the necessity of minimizing the events they change before they go back, since even the smallest alterations to the distant past could snowball into catastrophic changes in history. Travis explains that the hunters are obliged to stay on a levitating path to avoid disrupting the environment, that any deviation will be punished with hefty fines, and that before the hunt, Time Safari scouts had been sent back to select and tag their prey, which would have died within minutes anyway, and whose death has been calculated to have minimal effect on the future. Although Eckels is initially excited about the hunt, when the monstrous beast approaches, he loses his nerve. He panics and runs back to the time machine through the forest. The hunting party then kills the T-Rex and returns to the future. Travis asks the people at the company if everything was ok and they nod in affirmation, but things don't feel the same to anyone, the words of English were spelled differently, the president was someone else. Eckels panics and searches himself for all the things he could have disturbed in the past, that's when he finds in his mud-laden boots a butterfly, beautiful and crushed, but dead. Somehow, the death of this little butterfly has resulted in catastrophic changes in the future. Eckels begs Travis to take him back to the past so he could fix things he ruined, but Travis objects saying it could only result in further more paradoxes. On hearing this Eckels sits down and starts to cry, eyes closed when he hears Travis taking the safety off from his rifle & when he opens his eyes, all he could hear was "a sound of thunder".

The phrase 'A butterfly flaps its wings in Tokyo and a Tornado occurs in Texas' is a common phrase that shows how this theory has fascinated people for generations. **P S Laplace** quotes about predictability:

**'If this intellect were vast enough to submit the data to analysis
Then the future, just like the past would be present before its eyes'**

The butterfly effect showed that the predictability of any chaotic system can only be accurate if the number of variables at play will be very less and the initial condition for each variable is accurate to every single decimal place, and this means accuracy till infinite decimal places, which is practically impossible. This is the reason why it is easier to predict the motion of celestial bodies than it is to predict the weather on the planet for 1 week, there are just too many variables at play, say pressure, moisture, wind speed, particulate presence, etc.

Chaos Theory, however, tells us that if chaotic systems are left to repeat themselves over time, we would notice the underlying patterns, fractals, and deterministic properties, which can be predicted by taking the correct initial conditions over the right time scale. The butterfly effect and chaos theory together somewhat makes the possibility of Time Travel be possible in the future just a fantasy.

But still, humans are a very young species, may in the future acquire the skills for producing all the variables with perfect accuracies and found a way to break the 2nd Law of Thermodynamics, to make time travel possible. Until then, humans must find a way to keep their civilization going and chaos theory will keep serving us in the same way it is now, in cryptography algorithms, biological sciences, and so on.

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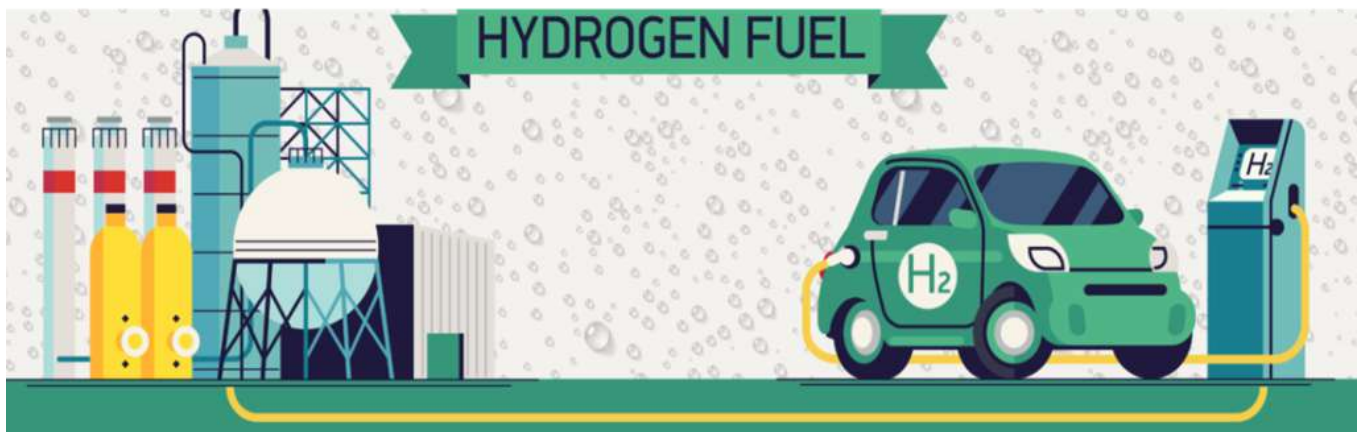


Hydrogen

Next Generation Fuel

By: [Harshit Kumar](#)

The Burning of fossil fuels is the largest source of air pollution. Motorized vehicles, running on petrol and diesel release a huge amount of "Greenhouse gas" hydrogen is emerging as a fuel of next generation. Although, hydrogen is not fuel, yet electricity is an efficient carrier of energy.



A simulation exercise by NITI Aayog shows that clean hydrogen could cut up to 34% of global greenhouse gas emissions.

Types of Hydrogen.

1. Grey Hydrogen- Hydrogen produced from fossil fuel.
2. Blue Hydrogen- Hydrogen produced from fossil fuel, with carbon and storage.
3. Green Hydrogen- Hydrogen produced using renewable electricity.

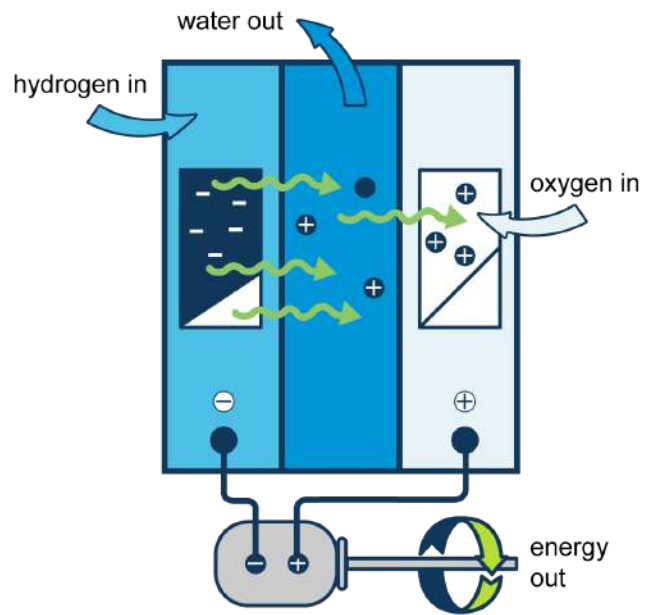
Grey hydrogen production technologies are mature, many green hydrogen technologies are still at a stage of emergence.

At the country level, Japan has been at the forefront of developing hydrogen technologies, recently Japan opened the largest green hydrogen plant, with a 20 MW solar array feeding a 10 MW electrolyzer plant (Electrolyzer uses electricity to break water into hydrogen and oxygen this process can produce ultra-pure hydrogen in a non-polluting manner).

According to the emission gap report (EGR), fossil CO₂ emission accounts for most greenhouse gas (GHG) emission fossil CO₂ emission reaches a record 38.0 Gt CO₂ in 2019, emission share 2010-2019 = 65%

To reduce such emission, interest is also growing in European union, US, Australia, India, etc. to develop a serious plan for the deployment of hydrogen technology in the sector of shipping, steel, etc, even SAE BAJA also promote electric vehicle by organizing eBAJA event and providing various types of offers and concession for those teams who are willing to participate in this event.

Hydrogen fuel cell



Source: Adapted from National Energy Education Development Project (public domain)

Some companies are also initiated in developing hydrogen engines such as TATA, MSI, Hyundai, Toyota, etc.

Toyota motor corporation is developing a hydrogen engine. It has installed the engine on a racing vehicle based on Toyota's Corolla Sport, which it will enter in competition under the ORC ROOKIE Racing banner starting with the Super Taikyu Series 2021 Powered by Hankook Round 3 NAPAC Fuji Super TEC 24 Hours Race.

Fuel cell electrified vehicles (FCEVs) such as Toyota's Mirai use a fuel cell in which hydrogen chemically reacts with oxygen in the air to produce electricity that powers an electric motor. Meanwhile, hydrogen engines generate power through the combustion of hydrogen using fuel supply and injection systems that have been modified from those used with gasoline engines. Except for the combustion of minute amounts of engine oil during driving, which is also the case with gasoline engines, hydrogen engines emit zero CO₂ when in use.

Nowadays technology is at such a height, we are not in the state to take a step back and due to the increase in competition, we have to develop and innovate such things so that we can't lag while considering the future and nature.

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Lifi

The Next Wifi?

By: Akanksha Sinha

In the era of day-to-day advancing technology, are you still frustrated with your slow Wi-Fi speed? Imagine your household LED bulb producing extremely high speed, environment friendly, and secure data communication than you have ever experienced. Sounds unreal, right? Well, that's where LiFi comes with endless possibilities and tremendous opportunities.

“LiFi” or “light fidelity” is the wireless communication technology in which transmission of data occurs through illumination over visible light, ultraviolet, and infrared spectrums. In its present state, only LED lamps are used for the transmission of data in the visible light range. LiFi was first introduced in 2011, by a scientist named Harold Haas from the UK. The design's main aim is to overcome the disadvantages of Wi-Fi. “PureLiFi” is the first one in the market to showcase a Li-Fi system known as “the Li-1st”.

So, what makes LiFi different from Wi-Fi? Well, for starters, it can attain speed up to 224 Gbps, approximately 100 times faster than Wi-Fi as noted by researchers during lab tests. And since the visible light range has a much larger bandwidth making its capacity to be unlimited. Now, coming to the security offered since the light waves cannot pass opaque spaces thereby making it less prone to hacking. Li-Fi can also be used in electromagnetic sensitive areas such as in aircraft cabins, hospitals, and nuclear power plants as it does not cause electromagnetic interference. Hence, LiFi technology is cost-effective, low-maintenance, eco-friendly, and can be integrated into existing LED lighting infrastructure.

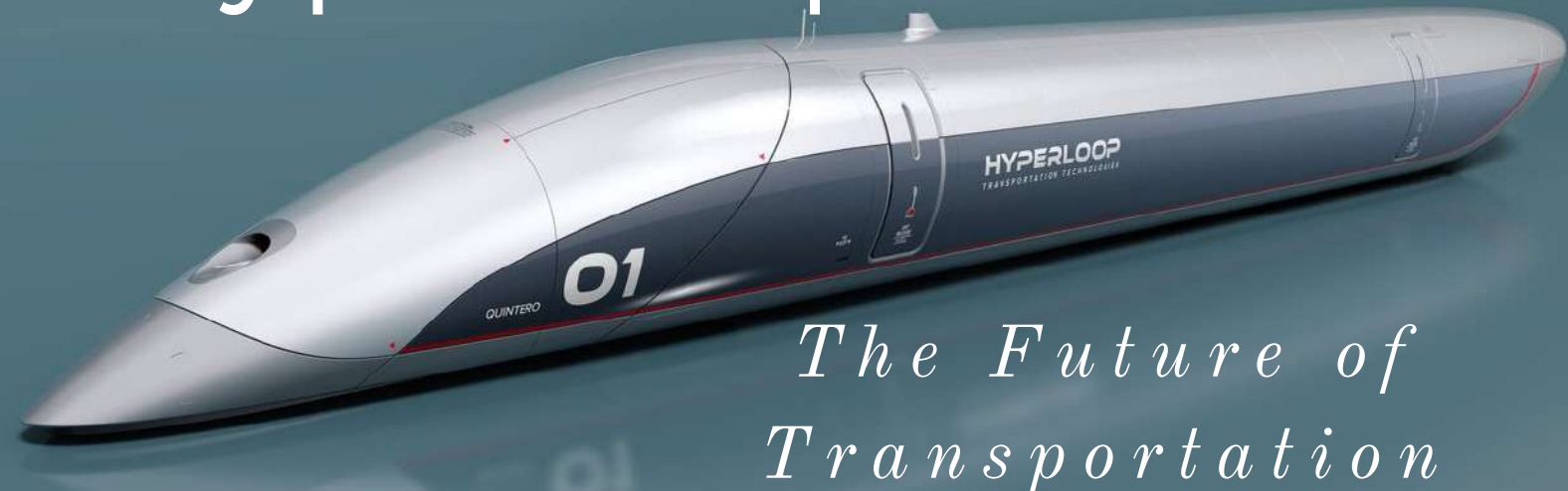
However, high installation costs and being susceptible to light interference still are major shortcomings.

LiFi is a powerful technology that can revolutionize the world of wireless communication. It cannot completely replace Wi-Fi. Instead, these two technologies can be used together to achieve a more efficient and secure network. Many organizations and universities have already started working on the research and development of LiFi which can ultimately become a game-changer in the arena of wireless communication.

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Hyperloop



The Future of Transportation

By: Rohan Kumar

Hyperloop uses the technology of magnetic levitation bringing a great change in the mode of transportation. The passenger pod in the Hyperloop transportation system travels at a speed of 760 miles per hour. Elon Musk who proposed this idea dreams of the Hyperloop being the fastest, safest, and most convenient mode of travel in the world.

“HYPERLOOP MAY CHANGE HOW AND WHY WE TRAVEL”

Could we have imagined earlier that it would take one and half hours to cover a distance of 760 miles? No, but it became possible after the evolution of airplanes. Now with the advancement of the Hyperloop, the same distance of 760 miles could be covered in just one hour.

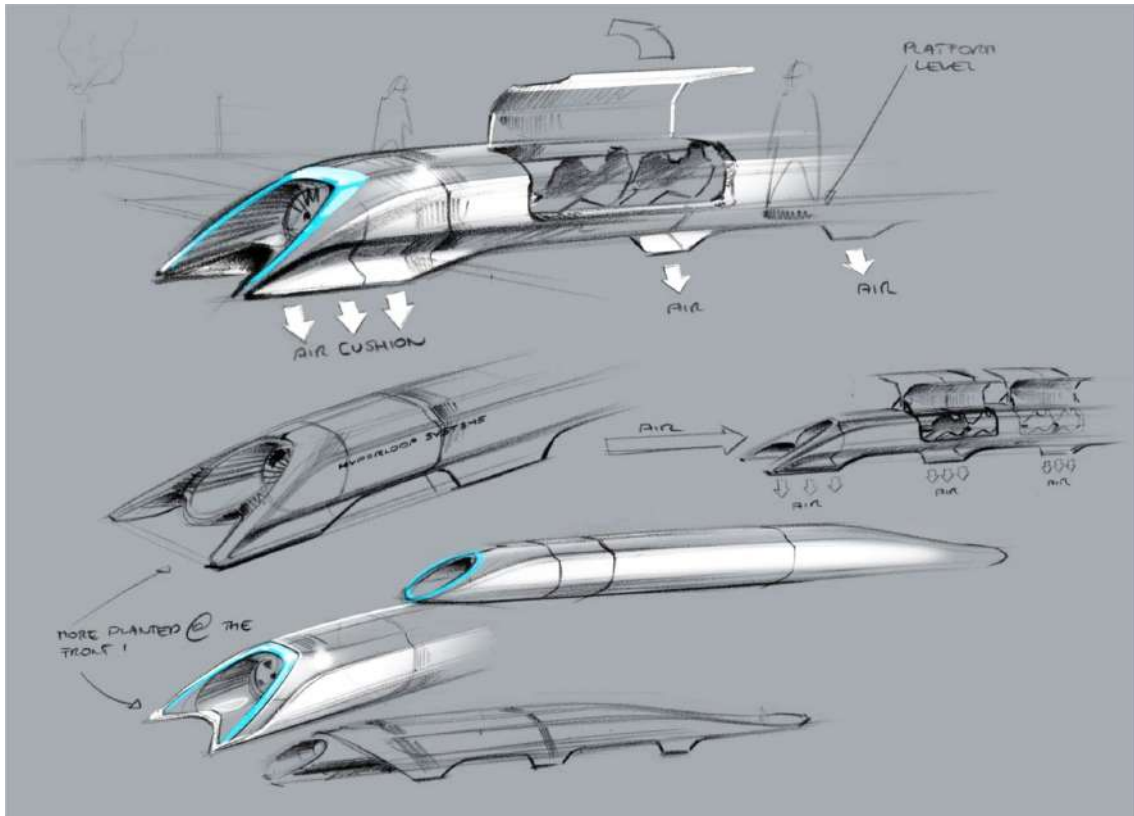
The Hyperloop is a high-speed transportation system that travels at a speed of 760 miles per hour. Till now we were using four modes of transportation i.e. Roadways, ships, airways, and railways. Now to add to this we have the fifth mode of transportation i.e. Hyperloop.

Hyperloop was originally proposed in 2012 by the high-tech entrepreneur Elon Musk. He declared it as open-source. In 2012 this idea was only on paper but later in 2013-2014, he created the firm Hyperloop. A 3 km prototype was created in Nevada for testing his idea and the result was positive.

There will be a total of 2600 routes in 90 countries for the Hyperloop. While 35 routes have been confirmed 4 routes are included in India.

The Hyperloop transportation consists of two main components, a tube (with the minimum amount of air present inside) and a capsule. The capsules will be powered by solar panels that would be generating a power of 120 watts/sq meter. Magnets will be fitted below the capsule and inside the tube so that it levitates the capsule using magnets.

Two tubes will be welded together side-by-side configured to allow the capsules to travel in both directions. The tube tracks are designed to be immune to weather and earthquakes. It is also designed to be self-powering and unobstructed.



The pillars raising the tubes above the ground have a small footprint and can sway in the case of an earthquake.

Two types of resistances that any vehicle has to overcome in moving from one place to another are air resistance and friction.

Friction is vanquished with the help of air bearings. Air bearings are essentially meter and a half long paddles that use the air around them to create pressurized cushions of air on which the capsule can ride. To overcome air resistance capsules are mounted with compressor fans at the front sending the air to the air bearings. The speed of the capsule is controlled using the compressor fans.

Human trials have been conducted successfully with a positive result. As the technology is improving day by day, with the implementation of Artificial intelligence we could be also seeing autonomous Hyperloop soon.

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