

Rapid Transportation System

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1 Introduction

Being computer science enthusiasts, we are always trying to optimize things to the absolute extreme: the pursuit for reducing 20 clock cycles, gaining 5% power efficiency, or perhaps achieving twice the compression rate are the reasons why computers have become the most ubiquitous and powerful tool today.

But looking at the physical world we live in, the transportation we heavily rely on is a hot mess: local traffic congestions, accident rate and cost efficiency make traveling a chore. A trip on an airplane from my college in Philadelphia to my home town of Huzhou (a city near Shanghai) typically takes 24-30 hours in total, but nearly half of the time is spent in local transportation, layover and customs check. Not to mention the thousand dollar ticket price and the unpleasant experience throughout the trip.

However there lies tremendous opportunities for us to revolutionize the way we travel: I see 3 emerging factors that have the potential to enable the next big advancement in transportation: 1. The non-stopping increase of parallel computing power, 2. the embracing of open source concept, and 3. the inevitable unification of international policies.

Take the example above: My international trip can be abstracted into 3 stages: 1) local transportation, 2) long range transportation and 3)

customs and security scanning. If we can tackle all 3 challenges then we'd have invented a new way of travel. I call it the **rapid transportation system**.

2 Challenges

2.1 Challenge 1: Local Transportation

With the rise of self driving, electrification and sharing economy of cars[1], we are closest to this goal. A optimized future of cars eliminates the need for traffic lights. The time cost of traveling to airport roughly equals the euclidian distance between the two divided by the top speed of cars. High performance of local transportation comes with benefits like: zero emission, near zero accident rate and less infrastructure spending. (traffic signs, traffic lights, policing force etc.)

2.1.1 Some Issues

Issue 1: Initial resistance from owner of traditional cars

Possible solutions: a) Start with small scale deployment in cities. b) Care for personalization for new vehicles. c) Government subsidies

Issue 2: Lack of coordination between manufactures and nations

Possible solution: Open source all related patents, source code and protocols. The business model should work out with governmental funding, donation and name attribution. International lobbying is also important.

2.2 Challenge 2: High Speed Long Range Transportation

Elon Musk envisioned Hyperloop[2] as a form of long range transportation. It is designed to achieve results like 30-minute travel time from New York to DC. However, to meet the need for rapid inter continental travel, there are more issues we need to address

2.2.1 Some Issues

Issue 1: Top Speed and Acceleration

The current top speed of 1200 km/h is not enough for long range travel. I propose a continuous acceleration of 5 minute at roughly 1 g to achieve a top speed of 10000 km/h. That way, for example, a trip from San Francisco to Shanghai can be cut from 13 hour to 1 hour.

Possible solutions: a) A centralized and replaceable propulsion source, i.e. we can start with electricity but can later replace it with fusion energy. b) a comfortable cushioned rotatable seat for countering brief acceleration deceleration.

Issue 2: Optimization

It's easy to implement a few Hyperloop lanes connecting a handful of cities. But it's a different story to make it accessible to global citizens.

Possible solution: Abstraction and Layering: A fast high throughput cross-continent/ cross-ocean lane and a lower top speed, more flexible lane. e.g. Build big high speed lanes through hub cities like London - NY - SF - Tokyo - Shanghai - Moscow - Dubai lane and Johannesburg - Melbourne - Wellington - Santiago - Rio lane. Slower secondary hyper loop spanning from those hub stations to regional stations offers possibilities for more connection points. e.g.

London as a hub station connects to Paris, Berlin, Rome, Oslo, and Helsinki. It's like a subway system for the world. Integration with local transportation is also crucial for eliminating layover time.

Issue 3: Cost

Possible solution: Mega infrastructure projects are traditionally largely funded by governments, but innovative financing approach can yield organic outcomes. For example: sell shares of the rapid transportation system in a stock market-esque place, but instead of dividends, share holders receives transportation privileges.

2.3 Challenge 3: Policy and Security

Visa approval, customs and security wait time can and should be vastly improved to near instant processes.

2.3.1 The Diplomatic Approach

States need to reach out to each other when the benefits of openness clearly outweighs the drawback. Multi-cultural elements like pop star, entertainment or translation technologies can be a surprising force towards the next level of openness.

2.3.2 The Technological Approach

Some sort of technological breakthrough needs to happen before we can implement a safe and efficient security insurance mechanism. I don't yet have concrete ideas on how to achieve that goal, but my bet will be on future breakthrough sensor technology along with novel statistic approaches.

3 Ramifications

Engineering is sexy and exciting, but why should we implement this system? What happens when we achieve this seemingly impossible project?

3.1 Shift in the Middle Class

Billionaires can travel any place in the world with ease for many decades now, but the superiority of the few doesn't translate to the greatness of humanity. By implementing a cost effective rapid transportation system, there is another significant shift for the middle class awaits.

Imagine when we have the capability of a low cost 30-minute commute from NY to London, or a 1-hour commute from San Francisco to Shanghai. A resident in China can go shopping in Stockholm for the weekend, fresh fruit from Mexico can be delivered to Tanzania in hours, a professor in the US can commute from home in Edinburgh daily. Families, artists, intellectuals in the future can all travel like billionaires today to spread their love, their work and their thoughts.

3.2 Perspectives

Obviously huge surges in economical growth through rapid transportation are always welcomed, but something more profound is also at stake: Once citizens of the world from different culture can travel anywhere with ease, people will inevitably communicate more. With more intercultural communication, people will start to gain new perspective and understand each other's concerns. There are immensely greater chances of building cross culture compassion that's necessary for world peace.

I remember when I first came to the US as a 19 year-old Chinese born-and-raised. I feared

the potential misfit largely because of the enemy rhetoric between the two states. However, after I spent a few months in the city of brotherly love, I learned Americans are like Chinese in almost every major ways: we all long for peace, we all enjoy Hollywood style entertainment, we all care about children's education, and most important of all, we all drive cars on the right side. (Yes) That got me thinking: If arch nemesis like Americans and Chinese aren't so different after all, why is the rest of world full of conflicts? I believe compassion is the key to a peaceful world and affordable rapid transportation can be a firm first step.

Again, Technology and engineering should always serve the need of humanity.

References

1. *Tim Cook Says Apple Focused on Autonomous Systems in Cars Push*. Alex Webb, Emily Chang. Bloomberg. Website
2. *Hyperloop Alpha*. Elon Musk. 2013. Website. www.spacex.com/sites/spacex/files/hyperloop_alpha-20130812.pdf