

Automated Vehicles, the Hype, the Reality, and Possible Futures

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Reuter's Headline (18 months ago)

Honda: Semi-autonomous features will lead to fully self-driving cars in 4 years



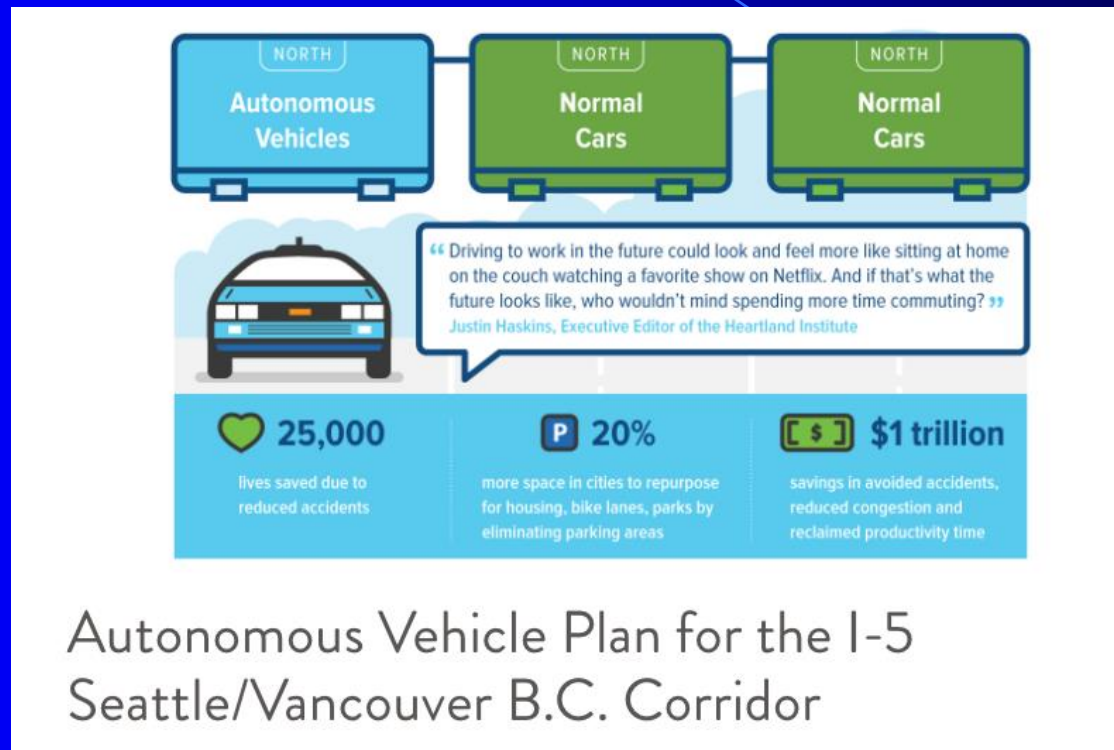
Automated Cars

- AVs are like teenage sex:
 - everyone talks about it,
 - nobody really knows how to do it,
 - everyone thinks everyone else is doing it,
 - so everyone claims they are doing it..."

with apologies to

Dan Ariely, Duke University Professor

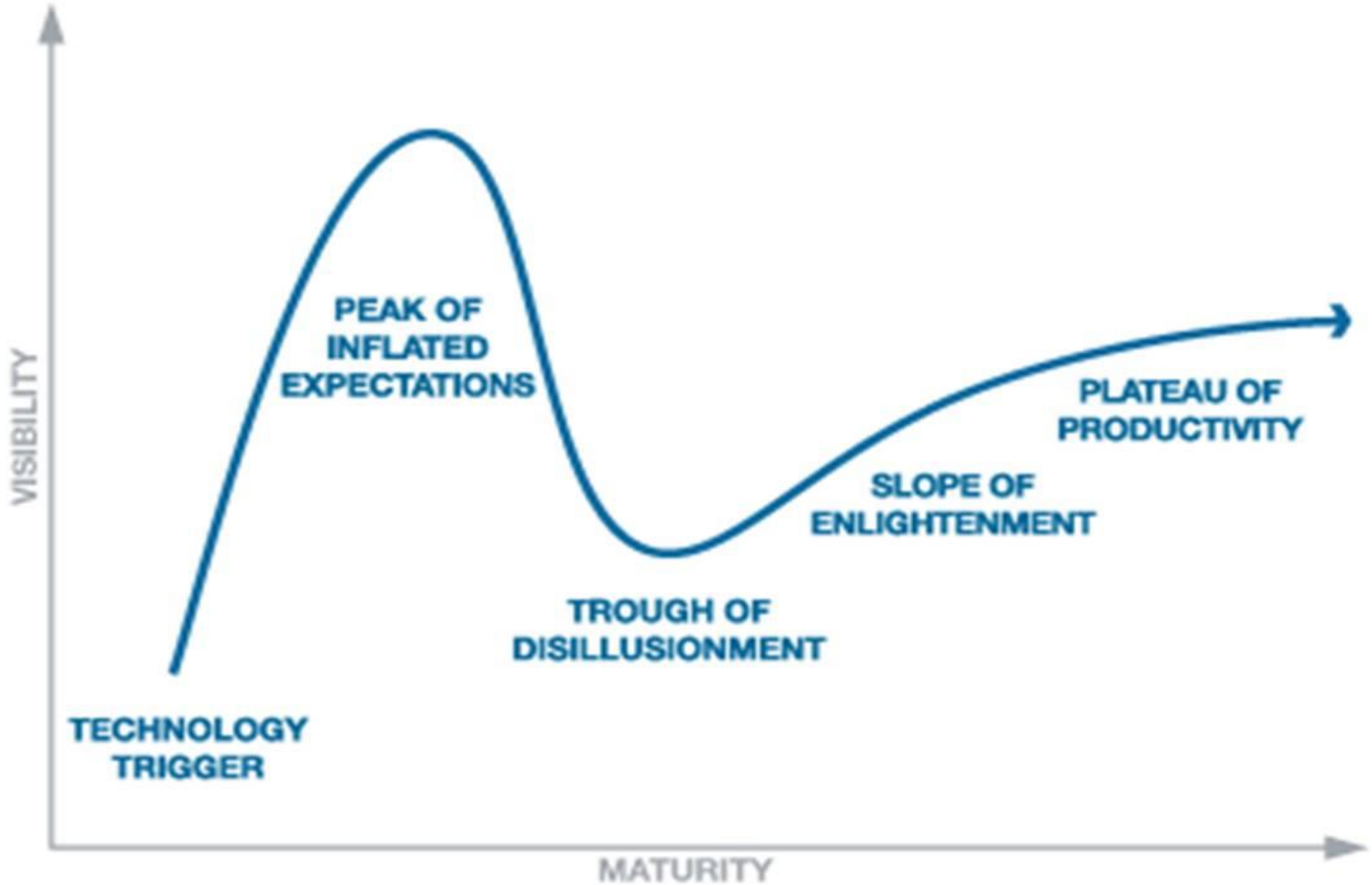
And Many People Expect Utopia to Result



Commentary: On the wings of technology, U.S. suburbs again will take off

Seattle Times

The Hype Curve



Scientific American Headline

AUTOMOTIVE

Deadly Tesla Crash Exposes Confusion over Automated Driving

Amid a federal investigation, ignorance of the technology's limitations comes into focus

By Larry Greenemeier on July 8, 2016 [Véalo en español](#)

Bloomberg News Headline

Tesla readies Autopilot 8.0 following fatal crash



(Win McNamee/Getty Images)

Tesla is preparing to release its Autopilot 8.0 software "if no last-minute issues discovered," CEO and founder Elon Musk tweeted. Changes in the software focus on radar and GPS features that might have saved the life of a man who died in a crash driving a Tesla Model S in May.

[Bloomberg](#) (9/16)



Reality Is Setting In

- "It will be a progressive thing, just like computing. If you think about a vehicle that can drive anywhere, anytime, in any circumstance, cold, rain—that's longer than 2021. And every manufacturer will tell you that," Jim Hackett, CEO, Ford, - in Forbes, August 18, 2017

The background is a dark blue gradient. A thin, light blue curved line starts from the top left and curves downwards towards the center. A larger, light blue shape, resembling a quarter-circle or a sector of a circle, is positioned in the lower right quadrant, partially overlapping the main blue background.

So where are automated vehicles
in the development cycle???

95 – 98% of Functionality Needed for Autonomous Cars Exists Already

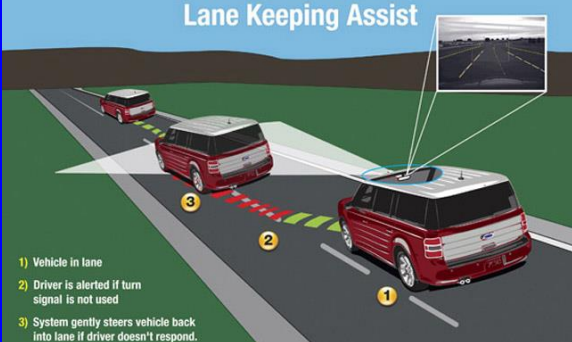
Automated Parking



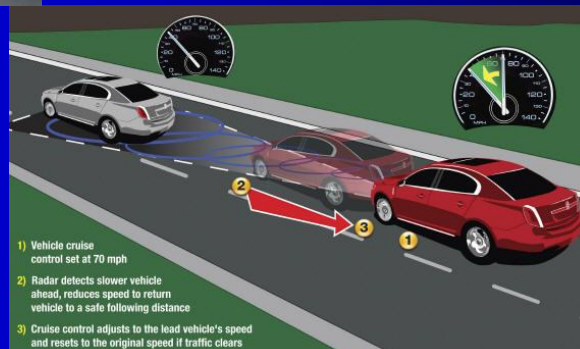
Automated Braking



Lane Keeping Assist



Lane Keeping



Station Keeping

Cruise Control



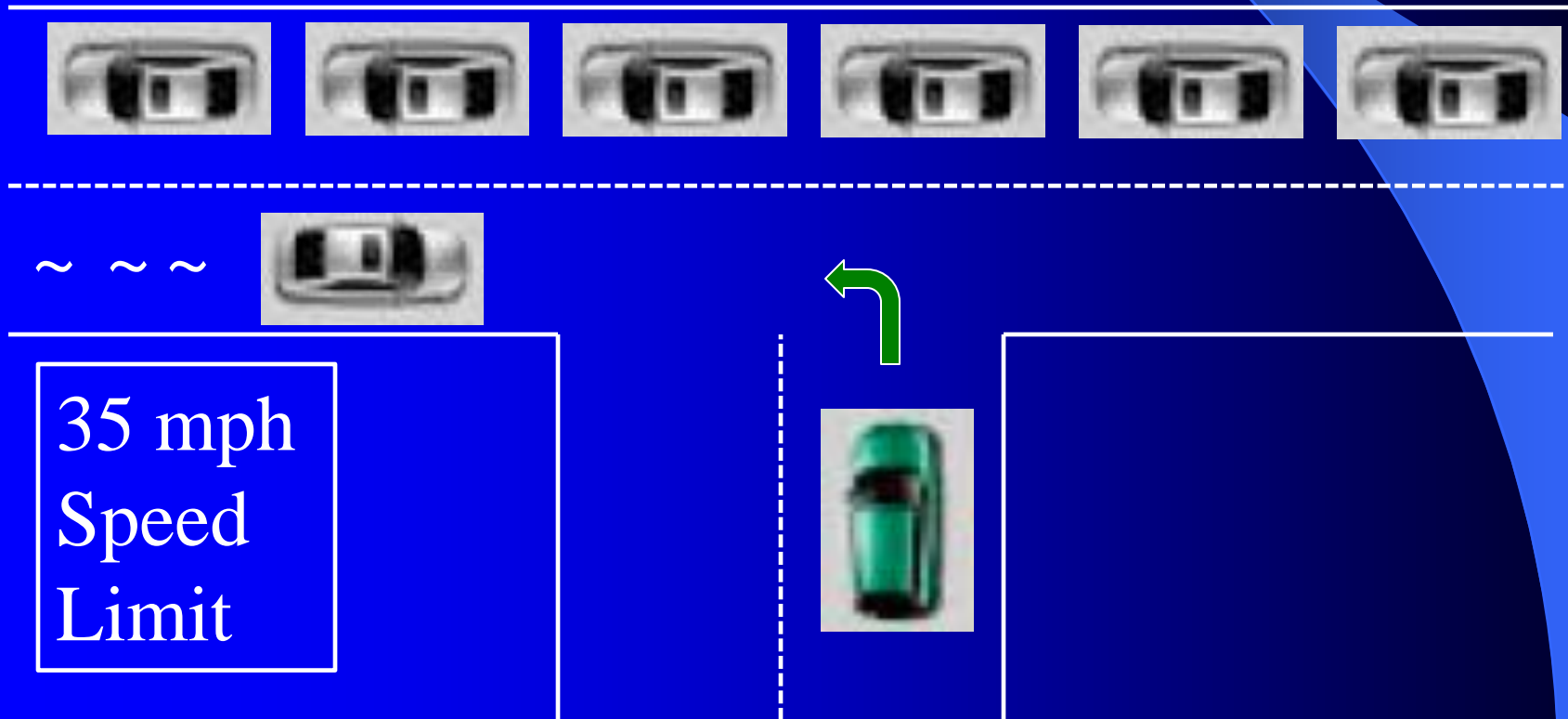
Navigation



BUT

Fully automated cars are still a ways off

How does an automated car make this left turn when no other cars are automated?



Vehicle Technology Issues

- How do you hand control back to a driver?
- How much time is needed for that action?



But we WANT Autonomous Vehicle Technology

- Benefits to both users and agencies



Autonomous Technology

- Road agency benefits
 - Remove human reactions and stupidity
 - Safety
 - No or limited crashes
 - Less harmful crashes if they do occur
 - Efficiency
 - Double freeway capacity
 - Lower energy use



Autonomous Vehicles

- Do they operate independently or cooperatively?

Connected and Automated Vehicles

Autonomous Vehicle

Operates in isolation from other vehicles using internal sensors



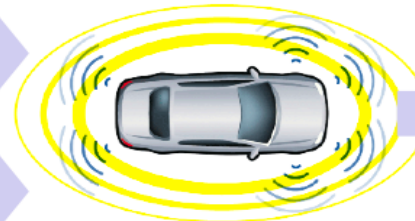
Connected Vehicle

Communicates with nearby vehicles and infrastructure



Connected Automated Vehicle

Leverages autonomous and connected vehicle capabilities



Connected Vehicles

- Can be done with and without automation
 - Provides driver warnings if not automation
 - Auditory
 - Sensory (shakes the steering column)
- A big question with Connected Vehicles
 - What is the Business Plan?
 - Who pays for the infrastructure?
 - Who pays for the operational cost of the communications?

Benefits

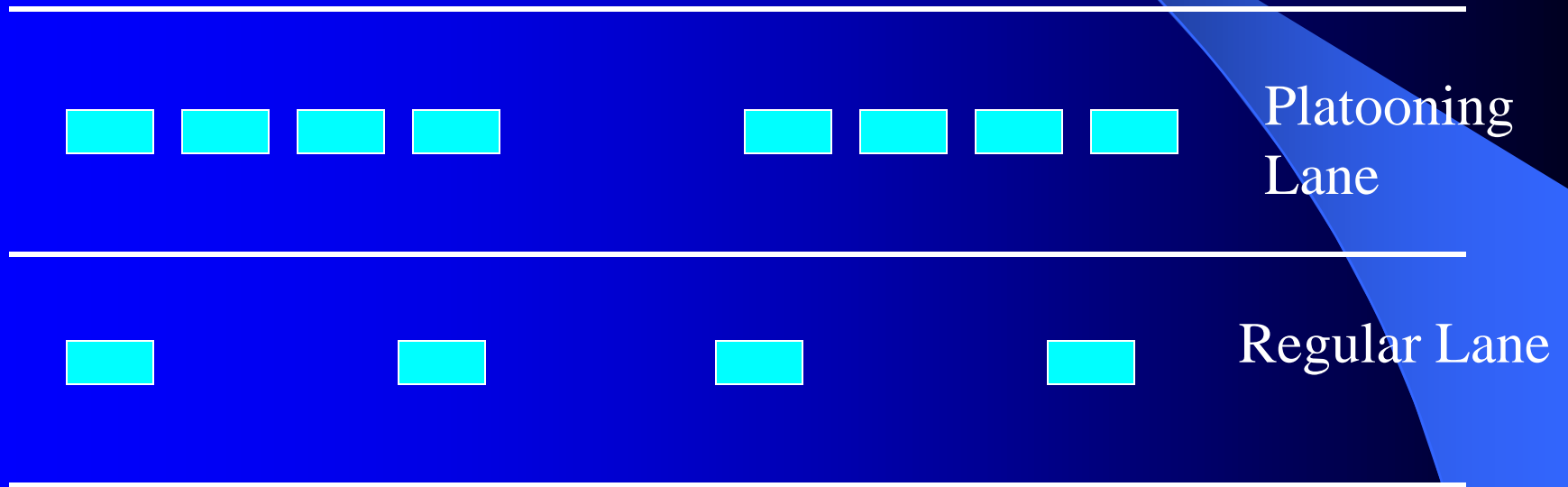
- Connected vehicles allow platooning

Save gas

- 4% lead vehicle
 - 10% following vehicles
 - 15% if all trucks
- A financial incentive to pay for communications



Platooning also allows a significant increase in roadway capacity, as much as doubling capacity



Platooning Faces Deployment Issues

- Where do you put that lane?
 - Left side?
 - Right side?
 - Exclusive facility?
 - (where in Seattle?)



- How do cars weave into/out of those lanes?
- What happens when they reach downtown?

User Benefits Drive Demand for AV

- Driving time becomes “productive” time



- Lowered cost of some travel
 - No one pays for parking downtown

User Benefits Drive Use of AVs

- People without driver licenses can get around town
- Who needs school buses?
- Pizza delivery without the charge!



Travel Is An Economic Good

- The cheaper travel is, the more people travel
- The more expensive, the less they travel
- “Costs” are not limited to money, e.g.,
 - The cost of something is what you give up to get it
 - Time (that could have been used how else?), money, safety, reliability,
- What matters are perceived costs, not actual costs

Dramatic reduction in costs
results in a dramatic increase in
use

Vehicle miles traveled (VMT)

(this could be a really bad thing)

Automated Vehicle Deployment

- Lots of non-technical issues must be solved before deployment
 - Policies
 - Regulations
 - Laws
 - Liability, insurance, ownership, access
- The outcome of those non-technical issues will determine the effects / impacts

For example...

- Do private citizens own automated cars? or
- Does Google own them, and run an Uber like service?

Vehicle Technology

- If you own them, VMT goes up



- If Google owns them, VMT goes down

Are Autonomous Vehicles Coming?

Yes

A large, abstract shape in a lighter shade of blue is positioned in the lower right quadrant of the slide. The shape is roughly triangular, with its top-left corner pointing towards the center of the slide. The background is a dark blue gradient that transitions from a lighter blue at the top left to a darker blue at the bottom right.

When and where will they be available?

In limited applications, with a “driver” available,
very soon.

Long haul trips (Seattle – Spokane)

Campus settings (Google’s Mt. View campus)

When and where will they be available?

But universal availability of vehicles without a driver are still many years away
(5 to 10 years)

And more likely 10...

When and where will they be available?

95% of vehicles sold in 2040 will be AVs
(study by Loup Ventures)

Will they eliminate traffic congestion?

No

They could easily make it far worse

They are unlikely to make it better,
unless we regulate the roads to
remove conventional cars, or directly
price/regulate use of all vehicles