Designing A Driverless World: The Future is Now!

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Urban Land Institute Minnesota and the Science Museum of Minnesota

John Eddy, Arup San Francisco
What Changes?
Safety: Cars don’t hit people; people do
A Working Definition of the Autonomous World

- Mobility as a Service
- Fleet Size Reduction

- More Wireless
- Dynamic Traffic Control
Access to Mobility: A chauffeur for all
Capacity Improvements?

Diagram showing the average safe inter-vehicle distance (m) vs. vehicle speed (km) and highway capacity vs. vehicle speed (vehicles/hour/lane) for different types of vehicles: 100% manual vehicles, 100% vehicles with sensors, and 100% communicating vehicles. The graph indicates a significant increase in capacity with the use of communicating vehicles, with a factor of 3.7 shown as a zoomed-in section.
Road Network Form: Road Diet
Reimagining the Urban Highway
Blurring the Road Hierarchy
Blurring the Road Hierarchy
The Urban Intersection

Second and Mission, San Francisco, California
The Urban Intersection

Second and Mission, San Francisco, California
The City Street

Travel Time Predictability
The City Street
Efficiency: The flock of cars
Efficiency: The flock of cars

Will the multi-level interchange disappear?
Watch-It: Sprawl

Heaven
Less Sprawl

or

Hell
More Sprawl
“Designing a Driverless World” event
February 6, 2014, in San Francisco
Efficiency: Repurposing land

“In San Francisco, streets consume 25% of the city’s land area, more than all of the parks combined.”

– John Rahaim, Planning Director, City and County of San Francisco
Land Value: Increasing density

“In a suburban environment, about half of developed land is car storage, so that opens up great opportunity for infill development.”

– Hans Larsen, Director of Transportation, City of San Jose
The Good and the “Watch-Its”

The Good
- Safety
- Cost of Mobility
- Capacity
- Availability of Mobility
- Repurposing Land

The “Watch-Its”
- Security
- More Traffic?
- Longer (Distance) Commutes?
- Privacy
- Jobs/Labour
Watch-It: Labour
Watch-It: Social Justice
Decreasing Cost of Mobility

2012

Privately Owned Vehicle

59¢

Future

Shared Autonomous Vehicle

15¢
Uber CEO, Travis Kalanick

"when there's no dude (driving) the car, the cost of taking an Uber anywhere becomes cheaper than owning a vehicle ... and car ownership goes away."
70% reduction in operating costs
When?

1908
2015
2020
2018
2025
User Experience: What will you do?
Questions?
Thoughts?
Levels of Autonomy

0. **No Automation**
The human driver is in complete control of all functions of the car

1. **Function-specific Automation**
The human driver is in complete control of all functions of the car

2. **Combined Function Automation**
More than one function is automated at the same time, but the driver remains attentive

3. **Limited Self-Driving Automation**
Driving functions are sufficiently automated — the driver can safely engage in other activities

4. **Full Self-Driving Automation**
The car is self-driving — no human driver required

Autonomous vehicle technology can be viewed using a five-part continuum suggested by the National Highway Traffic Safety Administration (NHTSA)
Residential Form: Is the garage extinct?
Safety: Cycling gets safer
Imagining a Future with Driverless Cars

- Full autonomy
- Full take-up
- Mobility will be a service; overall fleet size will decrease
- Use existing infrastructure (except much more wireless)
- Increased road capacity
- Electric, quiet, non-polluting
- Data is public
- Goods delivery is automated
- Vehicles collect and share data
- Emergency response is autonomous
- All modes of transportation will continue to exist
- Pricing and incentives balance demand
- Centralized Traffic Flow Control
Who is in the Game?

- All Major Car Makers, Continental, Autoliv Inc., Bosch, Apple, Google, Qualcomm
- In 2010, four electric autonomous vans successfully drove 8000 miles from Italy to China.