Research Institute of Economy, Trade and Industry (RIETI)

RIETI BBL Seminar Handout

"Autonomous Vehicles, Infrastructure Policy, and Economic Growth"

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Speaker: **Clifford Winston**

https://www.rieti.go.jp/jp/index.html

Autonomous Vehicles, Infrastructure Policy, and Economic Growth

Clifford Winston
Brookings Institution

Preliminaries

- It is useful to think about the broader economic effects of a transportation system. Consider the Stone Age and a lack of transportation.
- The current US system is riddled with inefficiencies from mispricing, suboptimal investment, inflated production costs, and the time costs to build—work zones and regulatory delays.
- Expenditures on an inefficient system will be compromised.
- Efficient pricing is critical: signals efficient investment and generates many benefits

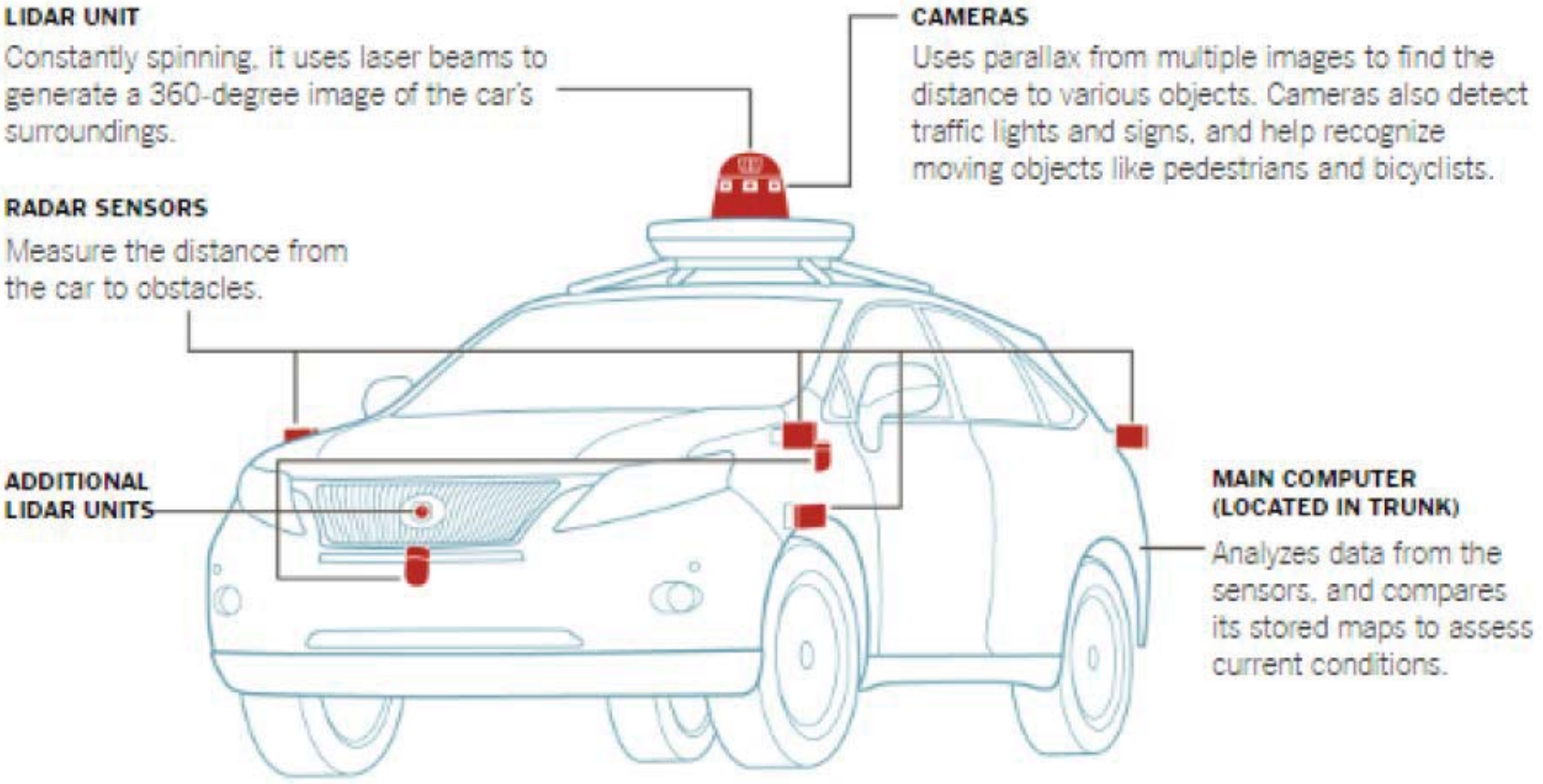
Motivation for AVs: Markets Addressing Government Failure

- **Significant concerns about highway system performance—delays, deterioration, and safety**
- **Autonomous vehicles (AVs) can greatly improve roads by improving safety, reducing delays, and improving reliability**
- **Technical and legal issues being resolved as adoption evolves**
- **Critical economic issue to be addressed before adoption**
- **The symbiotic relationship between this technical advance and policymakers' policy response will determine whether the US fully realizes the potentially large benefits from AVs**

Outline

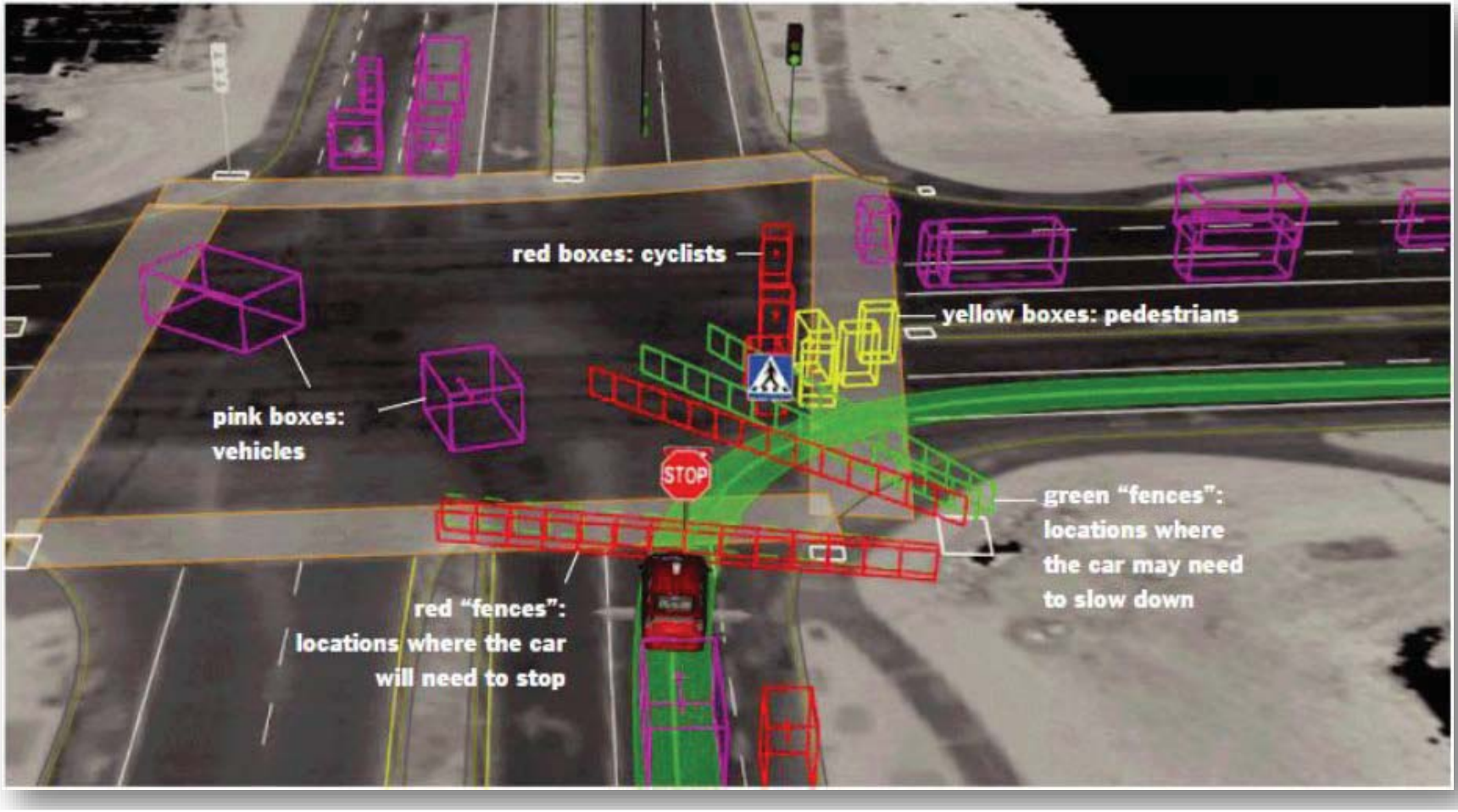
- **AV operations and adoption**
- **Benefits to the transportation and other sectors**
- **Further considerations in the assessment**
- **Efficient government policy responses before AVs are adopted**
- **Why might this time be different?**

AV Operations and Adoption: How a Car Drives Itself



By Guilbert Gates | Source: Google | Note: Car is a Lexus model modified by Google.

What the Car Sees



Private Sector Motivation

- **Urmson Equation: 3 Annual Trillion VMT* $0.10/mile= $300 billion per year**
- **The $0.10 per mile charge could be larger creating a larger industry**
- **Competition from: US and foreign automakers, technology companies, as well as interest throughout the world**

Public Sector Interest

- House of Representatives passed the Self-Drive Act unanimously
- Senate is expected to eventually pass the Act
- Act makes clear that federal safety regulations preempt state level rules
- Act allows car and technology companies to raise the number of vehicles it puts on the road with exemptions for testing purposes
- DOT will determine final rules that will allow the sale of self-driving vehicles for use on the road
- State/local authorities responsible for licensing and registration and for preparing their road systems for AVs.

How Long Before AVs Are Adopted?

- Once federal testing approval is finalized, the auto and technology companies will test their vehicles, identify problems, and develop solutions.
- Once DOT is convinced that AVs are safe and there is agreement on the standards that sellers have to meet, then AVs can be sold to and used by the public.
- This could take as long as 7 years, depending on the problems that are uncovered in tests.
- Adoption will proceed slowly as AVs replace non-AVs and the public becomes convinced that AVs are safe.
- This could also take 7 years.

Benefits of AVs to the Transportation Sector

- **Virtual elimination of some 40,000 fatalities, millions of injuries, and $billions in vehicle damage from accidents**
- **Eliminating the cost of vehicle insurance**
- **Significantly reducing the annual cost of congestion delay and unreliable travel times**
- **Note even if there are more vehicles on the road, AVs will eliminate incident delay**
- **Estimates of the annual benefits > $200 billion**

Benefits of AVs to Other Sectors of the Economy from Less Delay

- **Labor Sector: Improve workers access to and choices of employers and employers' choices of workers could increase employment**
- **Urban Sector: Firms and residents benefit from spatial concentration of activities, known as agglomeration economies.**
- **Trade Sector: Travel distance and time contribute to the cost of international, intercity, and intracity trade.**
- **Industrial Sector: Firms and industries reduce their inventories and improve productivity**
- **Estimates of large macro stimulative effects: annual GDP growth = 1.4 percentage points and 2 million jobs**

Estimating AV Benefits to Other Sectors

- The study was based on travel activity in California
- The basic model estimated the effect of congestion delay on employment, wages, productivity, and trade flows in California counties
- Because congestion is endogenous, I used as an instrument self-help county tax legislation. The taxes require 2/3 voter approval and allocate modest funds for projects that can reduce congestion.
- Based on the models that estimated the effect of congestion on the economic performance variables, I simulated the effect on those variables of reducing congestion delay by 50% and then extrapolated the findings for the US.

Further Considerations in the Assessment

- **Vehicle Safety—steep learning curve and careful introduction**
- **Induced Demand—Downs's Law can be repealed only by congestion pricing**
- **Urban Spatial Structure—again, use pricing to address sprawl and downtown parking**
- **Urban roads—suboptimal durability and traffic signaling call for efficient policy**
- **Effects on other modes and workers**

Efficient Highway Policy and AVs Performance

- **Congestion pricing: address induced demand, sprawl, and parking search costs. It will also discourage inefficient land use policies**
- **Pavement wear pricing and optimal investment in durability: address potholes and excessive maintenance costs**
- **Optimal highway design with less lane width and no breakdown lane will expand capacity**
- **Signaling and speed limits based on real time traffic flows will reduce travel times**

Summary of Benefits of Policy Reforms

Action	Effects on Travel Conditions
Pricing	
Pavement-wear (axle-weight) pricing of trucks	● Reduce pavement damage and disruptions to the traffic flow because of potholes and uneven pavement
Congestion pricing of cars and trucks	● Discourage induced demand that offsets time savings from autonomous vehicles
Investment	
Increase pavement durability	● Reduce pavement damage and disruptions to the traffic flow because of potholes and uneven pavement
Increase number of traffic lanes and make breakdown lane available for vehicle use	● Expand highway capacity and improve travel times and reliability
Technology adoption	
Optimize traffic signaling that accounts for real-time traffic flows	● Improve traffic flows and travel times
Include a warning signal to reduce start-up delays	● Improve traffic flows and travel times
Implement variable speed limits that account for real-time traffic flows	● Improve traffic flows and travel times

Conclusions

- **AVs could improve highway travel and provide large benefits to the broad public**
- **But AVs must operate on a road system that enhances their technology, instead of the current system that has compromises non-autonomous vehicles**
- **Efficient highway policies would enhance AVs**
- **Why might policymakers respond this time?**

Conclusions continued

- **Travelers are likely to share instead of own vehicles and will be used to charges per use**
- **Government revenues will increase and policymakers can use them to finance investments in road capacity and technology**
- **Congress would have little reason to pass a large infrastructure spending bill**
- **General public will experience benefits from AVs and the costly failure to adopt efficient policies would be more transparent**
- **Billion dollar bills may be left on the sidewalk**