Policy Memo

Autonomous vehicles and land use

June 11

To: Scott Haggerty, chair of governing Commission of Bay Area Metropolitan Transportation Commission

From: Shen Qu, Policy Advisor

Date: 6/11/2019

RE: How Bay Area should be planning for autonomous vehicles?

Summary

This memo is one of the series of policy analysis about autonomous vehicles for Bay Area. It trys to answer how the autonomous vehicles will affect urban land use, and What the MPO and cities should be planning to seize this opportunity and address the challenges.

Background: Explains the current and projected status of AVs.

Technology: The history of exploring autonomous vehicles can date back to late 1950s (**???**). Since DARPA ran the Grand Challenge in 2004, the autonomous vehicle technologies entered a "critical juncture." (Docherty, Marsden, and Anable 2018) In the fields of automation control systems, some critical hardwares like processors and sensors are having the ability of undertaking more complex tasks. The improving softwares and algorithm are becoming more fledged. According the definition and taxonomy by (international 2018), the existing technologies are achiving from the Level 3 - Conditional Driving Automation to Level 4 - High Driving Automation.[1]

Industry: Since 2009, Google had conducted a series of tests for AVs over 10 million miles on real-world roads in California, Texas, and other states. Waymo, a company founded by Google, hold the only testing permit for driverless testing by California DMV and committed to providing a ride-hailing services in Arizona in 2018. In 2019, Waymo announced their

[1]SAE defines the concept of AV as ADS-DV (ADS-Dedicated Vehicle), "A vehicle designed to be operated exclusively by a level 4 or level 5 ADS for all trips within its given Operational Design Domain (ODD) limitations." ADS means "The hardware and software that are collectively capable of performing the entire Dynamic Driving Task (DDT) on a sustained basis, regardless of whether it is limited to a specific ODD; this term is used specifically to describe a level 3, 4, or 5 driving automation system."

Level 4 AV will be assembled in Detroit. Almost all big automakers such as Ford, General Motors, Volkswagen, etc., are investing heavily in this field.[Fagnant & kockelman, 2015] The leading transportation network companys (TNC) like Uber and Lyft are making up a term of transportation-as-a-service (Taas) to change current travel modes by AVs.

Academia: Many scholars start working on the reaserch of AVs with lots of energy. Gandia et al. (2019)'s reserch found 10580 published papers in this field from 1945 to 2018. Since 2012, the number of articles have an exponential growth with 39% growth rate while 8-9% average growth rate in science. Although a large amount of the research are from the perspective of systems control, computer science, robotics, engineering, there are more and more articls that start to focus on the AVs' impact on transportation and Land use.

Governavce: In 2011, the Nevada Department of Motor Vehicles issued a first license to google's experimental AVs. Currently, "33 states have passed legislation related to AV." "15 states enacted 18 AV related bills." (State Legislatures n.d.) In 2016 and 2017 the U.S. Department of Transportation (U.S.DOT) and the National Highway and Transportation Safety Administration (NHTSA) published two federal guidelines for Automated Driving Systems (ADS is the definition by SAE). The latest guidances advocate industry, state and local government to support the AVs' development.

California is playing a leading role in this field. Until January 2019, California DMV has issued AV Testing Permits (with a driver) to 62 companies on public roadways.

What are the crutial effects? What are the crutial response for land use?

Changes: Discusses how AVs could influence demand for transportation and, in turn land use. For this analysis, use both theory and research.

focus on relevant changes

(Milakis, Van Arem, and Van Wee 2017) Many substantial implications of autonomous vehicles are not considered in this memo, such as safety, liability, and etc. [riple effects]. This analysis focus on the impact on land use, wich have short-term and long-term influences. The short-term influences include che change of parking, urban design, affected by travel demand and behavior

Diamond of Assembly by(Milakis, Van Arem, and Van Wee 2017) and feedback cylce by [soteropoulos2019impacts]

The long-term influences include the reconstructure of urban forms and spatial distributions.

essence

Four stage

Theory: bid-rent theroy, utility maximize.

Research: Identifies the benefits and costs of these possible outcomes.

focus on Characteristic:

cut off labor cost,

round-the-clock services.

full ridesharing by realtime matching

Time cost (Singleton 2019)

Methodology

high risk in use sufficient principle, and likelihood principle. another option is convariance principle.

Internet, Air Transport system, TNC

inference:

Behavior and land use (Soteropoulos, Berger, and Ciari 2019)

(Hawkins and Nurul Habib 2019)

previous reaserch had give many estimation of the change on road capacities, parking lots, curve space.

use cost and transaction costs - full match

deals fail

The short-term Respose

(Legacy et al. 2019)

Presents policy and planning options for mitigating or otherwise addressing the possible land use effects.

designating pilot area

housing,

parking,

urban design

The strategic planning

long-term effects (Milakis 2019)

Discusses how the MPO and cities may need alter the tools and analyses they use to consider AVs.

Zoning, Division, and partion, not uniform

Conclusion

overestimated and under estimate

from link to node

CA should play a leading role. responsibility

Notes

References

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