The Hype of Geofencing for Autonomous Vehicles
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Geofencing – While the strict definition means operating in a specific location the actual use is broader. In this space it means to cut down on use cases to incrementally develop and field this technology. That usually includes weather, complex road patterns, object types and movement and quantity of data that can be stored on board (mapping etc). As examples Waymo chooses a portion of Phoenix due its lack of precipitation in various forms, gridded and well-lit streets and lack of odd traffic patterns. Tesla chooses highway operations across the entire US and other places. The latter (and the lack of LiDAR) are why Tesla has more accidents and has needlessly killed the most people to date. (6 if the two most recent accidents involved AP).

The reason geofencing is hype is that it is, in most cases, not a significant enough of a subset to significantly reduce the use cases, especially critical ones. Setting aside where these systems run in closed loops or tracks, they still must deal with most of the toughest scenarios and object detection. The problem of course being that the message these companies want to be sent is that the subset is significant. Thus, misleading people and providing false confidence. Whether it be a portion of Phoenix or highways there is still a massive set of accident scenarios and objects as well as degraded objects to properly identify. The two largest problems this technology currently has. Starting with accident cases. Most of them occur in that portion of Phoenix and on highways. What matters here is what scenarios and object types and variations could exist in the locations you are developing and testing it. You could pick a straight portion 100 yards long in each area and encounter most of them. (Clearly vehicle speed is a significant discriminator.) For example, every time of day, almost every vehicle type and people of all sizes, shapes and wearing almost every type of clothing could be there. This means you need to account for a level of possible scenarios, various, objects and object variations including degraded objects for that location to prove the system is 10X or better than a human driver in that “geofence”. I do not know what percentage of the whole US that is, but I bet it’s the majority. With RAND stating it would take 500B miles to be 10X better than a human and Toyota a trillion these geofences do not really solve a thing. Keep in mind that not only do thousands of accident scenarios have to be experienced they have to happen hundreds or thousands of times over to train the system properly. This is no much more possible in these “geofences” than in broader areas. This is born out by the Tesla crashes and deaths. Tesla’s geofence is broader. Yes, not having LiDAR or a competent radar or 3D camera system is to blame for many of them as well. However, with regard to the scenario and object variations it shows what Waymo and almost everyone else is in store for. In the end neither Waymo or Tesla can legitimately graduate from these geofences using public shadow/safety driving for development and testing than they can the rest of the US. The solution here is to replace 99.9% of that public shadow/safety driving with aerospace/DoD/FAA level simulation and systems/safety engineering.

More can be found in my other articles

SAE Autonomous Vehicle Engineering Magazine
End Public Shadow Driving
https://www.nxtbook.com/nxtbooks/sae/ave_201901/index.php

Common Misconceptions about Aerospace/DoD/FAA Simulation for Autonomous Vehicles

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