

My name is Michael DeKort. I am a former system engineer, engineering, and program manager for Lockheed Martin. I worked in simulation, as the software engineering manager for NORAD, as a PM on the Aegis Weapon System and lead C4ISR systems engineer for the DHS Deepwater program. I am now CEO/CTO at Dactile.

#### Key Autonomous Vehicle Industry Participation

- Founder SAE On-Road Autonomous Driving Simulation Task Force
- Member SAE ORAD Verification and Validation Task Force
- Member SAE G-34 / EUROCAE WG-114 Artificial Intelligence in Aviation
- Stakeholder for UL4600 - Creating AV Safety Guidelines
- Member of the IEEE Artificial Intelligence & Autonomous Systems Policy Committee

I was also presented the IEEE Barus Ethics Award for by the late Rep. Elijah Cummings. This award was for my efforts to expose the post 9/11 DoD/DHS/Coast Guard Deepwater program issues in 2006. That effort led to my being a lead witness at a congressional hearing, appearing on 60 Minutes, being the first person to use YouTube as a whistleblower, appearing in several books on ethics and in a documentary, movie called "War on Whistleblowers". I am bringing this to your attention because I want you to know I know how to do my homework. This brings us to the issues at hand relating to the approaches autonomous vehicle makers are using to develop their systems.

It is a myth that public shadow and safety driving can create a legitimate autonomous vehicle. And the lives the process takes are necessary and for the greater good. It is impossible to drive the trillion miles or spend \$300B to stumble and restumble on all the scenarios necessary to complete the effort. The process also harms people for no reason. The first safety issue is handover. The time to regain proper situational awareness and do the right thing, especially in time critical scenarios. cannot be provided. Another dangerous area is learning accident scenarios. AV makers will have to run thousands of accident scenarios thousands of times to accomplish this. That will cause thousands of injuries and deaths. The next issues the use of gaming-based simulation technology which has too many technical limitations to facilitate the creation of a legitimate real-world digital twin. The solution is to use DoD simulation technology and shift most of the autonomous system development and testing over to it.

#### The Problems

- Public shadow and safety driving for most development and testing
- Use of Gaming-based Simulation Technology
- Reliance on Deep Learning for object detection and hyper classification
- Bottoms up Agile development
- Hiding Performance and Technical Data as well as avoiding Safety/Testing Standards

#### Symptoms

- Public Shadow and Safety Driving - This approach is wholly untenable. It is a myth that public shadow and safety driving can create a legitimate autonomous vehicle. And the lives the process takes are necessary and for the greater good. It is impossible to drive the trillion miles or spend \$300B to stumble and restumble on all the scenarios necessary to complete the effort. Shadow Driving for gathering data, informing and validated simulation and system intention testing is necessary. The issue is not safety related rather the time and money associated with doing the impossible amount needed to get to L4. Regarding Safety Driving. It is a largely unnecessary and dangerous practice. The process also harms people for no reason. The first safety issue is handover. The time to regain proper situational awareness and do the right thing, especially in time critical scenarios. cannot be provided. Another dangerous area is learning accident

scenarios. AV makers will have to run thousands of accident scenarios thousands of times to accomplish this. That will cause thousands of injuries and deaths. Sometime soon the first child or family will be killed in one of these vehicles needlessly. Likely a Tesla due to how many there are, how poor its sensor and deep learning systems work, as well as it is extremely misleading advertising, CEO hype and a poor driver monitoring system. (The sensor system lacks LiDAR and has a poor lateral fidelity radar that forces stationary and crossing objects to be ignored for fear of false positives. This has led to several accidents and deaths. Including hitting several police cars, a fire truck, street sweeper, tow truck, trailer, passenger cars and a barrier.)

- Deep Learning - It is processor, time, and money intensive, and is too easily confused. This makes the process dangerous.
- Gaming-based Simulation Technology – Yes, the visuals look great. But it has too many technical limitations to facilitate the creation of anything close to legitimate real-world digital twin.
- Hiding Performance and Technical Data – Avoiding Safety/Testing Standards – The public does not trust you. And right now, they should not. Additionally, models being created need to accurately model their sensor, world, objects counterparts properly. This cannot be done if companies make these black boxes. Not only is there a trust issue but there is a liability issue for them as well.

#### The Cure - Do the Opposite

- Switch most Public Shadow and Safety Driving over to Simulation informed and validated by the real-world.
- Build trust by doing the due diligence and proving it using proper simulation (informed and validated by real-world data). Then you make the case for the migrating to real-world testing. After that you introduce the systems to the public. (Proper simulation being DoD/aerospace simulation technology, not gaming based simulation. There are far too many architectural and sensor model engineering issues.)
- Use DoD/aerospace simulation and modeling technology to create a legitimate digital twin by resolving real-time latency, loading model timing and active sensor model fidelity issues with gaming-based systems. This will afford the ability to work on end-state scenarios, the most complex and difficult use cases, on day one.
- Use various levels of Dynamic Sense and Avoidance to limit the use of Deep Learning
- Take a top-down Systems Engineering approach. This includes developing and testing to the hardest and most dangerous scenarios now. Something I can now do because I am using the right simulation technology.
- Create minimal Safety and Testing Standards mapped to sceneries and legitimate geofencing. Prove these capabilities using proper simulation first. (The fidelity of the models used in that simulation need to be proven as well). Then move to test tracks and the public domain. Show the public the right progression of due diligence and take them out of the Guinea pig role. This would also increase competition by setting safety bars no one can skip. Thus, ending the race to the safety bottom.

I would like to add an explanation of why few people voice these concerns or solutions. Unfortunately, the industry is a perfect storm of arrogance, ignorance, and echo chamber dynamics. While clearly intelligent most of these developers have little domain or systems engineering experience. And they think gaming-based simulation is the best that is available. Layer on the propensity for humans to get caught up in hype and echo chambers and we have the root cause. I have been asked to participate in several key air and ground SAE groups, including one on simulation I was asked to create. I assure you that if all the AV company leaders, engineers and industry “experts” were all in a room discussing these issues, it would be very easy to see I am correct.

I would also like to offer my support of the VOICES efforts, particularly the latter. The VOICES process document basically states the same points I do relative to the time, money, and safety issues with the current development approach. As well as the need to shift most of it to simulation. What it gets wrong is that the simulation technology that is needed does not exist and must be developed. We would be glad to explain and demonstrate this technology to USDOT so we can affect the paradigm shift.

Finally, I respectfully request a due diligence review of the material I have presented here as well as a meeting with Secretary Buttigieg on these matters.

Respectfully,

Michael DeKort