BUFFALO PRINCIPLES TO ADVANCE AUTOMATED VEHICLE TECHNOLOGY

The IoT Next Industrial Revolution is transforming mobility and creating endless possibilities for how to get from point A to point B in the fastest, safest way. As self-driving cars soon become part of everyday life, the profound opportunity to eliminate traffic congestion, accidents, or wasting space on parking, has generated considerable interest in automated vehicle (AV) technology as a mobility solution. But why can't we enter any vehicle, tell it where to go, then take a nap until we safely arrive?

Despite the hype, very few have succeeded in overcoming the barriers to AV deployments. Although the elements of Level 5 technology are mature, we haven't yet achieved Level 5 under real-world conditions. Based on learnings from an AV deployment that we led, we offer the Buffalo Principles as a practical pathway to achieve Level 5. When applied, these support the sustainable, real-world deployments necessary to advance AV technology.

Two over-looked obstacles that impede real-world AV deployments beyond the known hurdles of cost, access to technology and need for data, are: overlapping governments and outdated regulations. The first over-looked obstacle is the multitude of overlapping layers of government posed by the federal government, 50 state governments and 90,000 local governments, all of whom are experts in the needs of human driving but lack understanding of computer perception and control.

The second is outdated regulations. In the 50 years since the Federal Motor Vehicle Safety Act was passed, federal, state and local governments have added hundreds of regulations to support safe human driving. One example is requiring hands on the steering wheel. While quite practical for humans, it's not applicable to computer driving. Simply put, outdated rules and regulations make Level 5 impossible to implement on a large scale. The "Buffalo Principles" overcome these.

Principle #1: Identify private roads. Parking lots and campus roads are exempt from federal, state and local laws. They never fit in with the levels of government so they were left out of surface transportation rules and regulations. But they are in the real-world and encompass all real-world scenarios.

Principle #2 Determine slow-speed routes. Routes on campuses are slow speed to protect pedestrians and other users. Training automated vehicles at slow speeds means a crash results in a scratch, not death.

Principle #3 Record data. Automated vehicles produce terabytes of data per day. That data is priceless. We need to collect and share non-proprietary data to enable technological progress.

Principle #4 Integrated simulation. With real-world automated vehicle data, we can safely simulate limitless higher-speed and more complex scenarios to advance the technology. Similar to Image-net, whose 10 million images are used to test and validate perception algorithms which made facial recognition software possible, those following the Buffalo Principles will produce millions of public domain AV datasets, open and available to all. With integrated simulation, combined with closed-track testing and open-road testing, the test architecture is available to truly advance automated vehicles in a sustainable manner.

Finally, we quantify desired outcomes along four dimensions of safety as a basis of performance: Tactical Maneuver Behaviors; Operational Design Domain; Object and Event Detection and Response; and Fail Mode Behaviors. This process is a repeatable and scalable methodology to achieve the Level 5 technology we envision.

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