THE FUTURE IS SELF-DRIVEN

Autonomous vehicles are poised to redefine the global automotive and aerospace industries, among others. But designing these complex products for the required level of safety and reliability represents an engineering challenge without precedence.

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Who doesn't get excited about the prospect of self-driving cars, aircraft and robotic vehicles? Once the stuff of science fiction movies and Saturday morning cartoons, autonomous vehicles are already becoming a reality — and will soon become commonplace.

Experts believe that the emergence of safe autonomous driving technology will completely reinvent the global automotive industry, replacing millions of privately owned cars with fleets of robo-taxis, similar to today's Uber and Lyft — but completely electric and self-driving.

While 2020 is the generally agreed-upon target for the first commercial release of autonomous cars, technology experts at RethinkX recently predicted that by 2030 — just 10 years later — a full 95 percent of U.S. passenger miles will be served by autonomous electric vehicles owned by companies providing Transportation as a Service (TaaS).[1]

Similarly, unmanned aerial vehicles, or UAVs, are expected to revolutionize the shipping industry, as Amazon, UPS, Domino's Pizza and other businesses aggressively invest in drone delivery capabilities.[2] A recent report from Interact Analysis estimates that there will be a six-fold increase in drone shipments by 2022 to meet this demand, resulting in industry revenues that will grow from $1.3 billion in 2016 to $15 billion in 2022.[3] Amazon has stated an ambitious goal: to eventually drone-deliver packages to consumers within 30 minutes of order placement.[4]

While these are exciting predictions, the world's engineers are tasked with the real, hands-on work of making this vision a reality in just a few short years. The design challenges associated with autonomous vehicles are unparalleled in the history of the transportation industry — and the bar for safety and reliability has never been set higher.

For example, consider the problem of weather conditions. How can self-driving cars sense highway lanes, other vehicles and pedestrians when thick fog or snow obscures their "vision" — i.e., their cameras, radar and lidar systems? How can drones sense and respond to the unexpected wind shifts that are typical of urban landscapes as they attempt to make deliveries?

Before they can be successfully launched onto real-world highways and into actual skies, autonomous vehicles must be exhaustively tested and certified for safe operation. But how can this rigorous testing take place for such complex products, while still meeting ambitious deadlines — and delivering a healthy profit margin?

The answer is engineering simulation. To capture the market opportunity — and with human lives at stake — only simulation combines a high degree of speed and cost-effectiveness with a high degree of product confidence. Multiphysics software from ANSYS enables companies to replace years of physical testing with simulations that replicate every aspect of autonomous vehicle performance under thousands of operating scenarios — all in a risk-free virtual environment.

As just one example, simulation allows product developers to view what sensors can actually "see" under a variety of real-world weather conditions — instead of waiting months or years to conduct physical testing under every possible weather scenario.

By developing and testing critical components such as software, electronics and sensors in a risk-free virtual world, ANSYS customers are among the leaders in the global drive toward vehicle autonomy. This issue of *ANSYS Advantage* highlights some of the advanced applications for simulation that are making the dream of autonomous vehicles a reality.

While it will be a few more years until our roads and skies are filled with self-driving cars and autonomous aircraft, these companies are shaping the future with their important product development work. Whatever your industry or product focus, we hope you will be inspired by the high-impact simulations they are performing to solve the most challenging problems related to vehicle autonomy.

References:

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