Q1
2018

AUTONOMOUS VEHICLE TESTING

PROGRESS REPORT

Quarterly update for the City of Boston on Optimus Ride's autonomous vehicle testing program.

OPTIMUS RIDE

Optimus Ride Inc. is a self-driving vehicle technology company. Emerging from Boston's vibrant robotics ecosystem, we carefully bring together the promise of self-driving technologies with real-world considerations. We design our software to enable efficient, sustainable, and equitable mobility systems and solutions.

Summary

Optimus Ride began testing our vehicles on public roads last year in the Raymond Flynn Marine Park within the Innovation District. During the first quarter of 2018, we were pleased to graduate to Phase C1 - the "inclement-weather" phase - of autonomous testing set by the City of Boston. This allowed us to test our vehicles in autonomous mode without passengers at nighttime and during inclement weather, defined as precipitation at 2.5mm/hour – 7.5mm/hour.

As our vehicles drive in the Seaport, we collect valuable data on our software's performance in inclement weather. This information then translates into improvements to our self-driving technology specific to inclement weather conditions. Thus, advancing to this phase enables us to enhance the safety and efficiency of our self-driving capabilities.

Miles Driven

Given our unique private indoor test track, the miles driven on public roads in Boston represent only a portion of autonomous driving miles. Furthermore, we have accumulated many more data collection miles beyond Boston as we prepare for our commercial pilot at Union Point, an LSTAR development in South Weymouth, MA.

Optimus Ride vehicle operating at Union Point, in South Weymouth, MA

Safety

We have no incidents to report.
In the next section, we will elaborate on safety lessons gained during our first New England winter.

Research Achievements: Navigating Wintry Roads

This is the first winter we've experienced as a Boston-based company testing on public roads. We strongly believe that having inclement weather readily accessible helps the overall development of this technology, making Boston an ideal testing area. In the preceding months, our cars have experienced snow, ice, heavy wind, rain storms, fog, and subsequently street flooding. Each weather condition enables us to test and collect data so we can learn how our vehicles perform in those circumstances. For example, snowy days expose our system to numerous variables that test our software's capabilities. These variables include fluctuating rates of snow accumulation and whether the snow 'stuck', potentially obscuring road signs and street markers. As these weather events occurred, we began instructing our cars to address winter-specific driving situations -- like how to recognize and circumvent snow banks.

Much like human drivers approach driving in the snow with caution, inclement weather creates unique challenges for our cars' ability to understand and respond to road conditions, like reduced visibility and icy roads. Even for human drivers, navigating roads in winter weather conditions is difficult. Consequently, this season has given us the opportunity to ensure self-driving technology can be just as safe - or safer - than a human driver.

Examples of snow accumulations obstructing lane markings, crosswalks, and stop-lines.
(LEFT) Ballard Way facing Drydock, *(RIGHT)* Ballard Way and Fid Kennedy.

Infrastructure and Maintenance Improvement Opportunities

While conducting winter weather testing we were able to identify a few opportunities for infrastructure improvement. For example, in snowy weather, snow removal is critical. Unplowed snow obscures lane markings, which makes it difficult for vehicles to know that they are within the lanes, much like a human driver. Also, when there is a lot of snow it is natural for snow banks to accumulate. However when snowbanks accumulate immediately next to road curbs, snow masses displace the vehicle's turning radius. Given their reflectivity, snowy curbs often make the vehicle believe it doesn't have enough room to turn, though that may not be the case.

In icy weather, the ice's reflectivity sometimes leads our vehicles and safety drivers to suffer from a sort of sun-blindness, much like direct eye-sun contact. This affects our vehicle's understanding of the visual landscape, so we are gathering data on these issues to improve our vehicle's response.

Thank you

We are thankful to the State of Massachusetts and the City of Boston for supporting the development of the autonomous vehicle industry. As the only Boston-based startup in the autonomous vehicle technology industry, we are excited to grow our operations in the state and continue pursuing efficient, sustainable, and equitable mobility systems and solutions.