



QUARTERLY AV TESTING REPORT

4th QUARTER 2017

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BACKGROUND

nuTonomy develops software for autonomous vehicles (AVs). Our mission is to radically improve the safety, efficiency, and accessibility of transportation in cities worldwide. In November, we joined forces with Aptiv, a global mobility technology company. We have been testing our AVs in Singapore and, since January 2017, on the public roads of Boston. The City of Boston and nuTonomy jointly developed a phased Test Plan, in which nuTonomy agreed to report on our progress in testing each quarter.

This report covers the Fourth Quarter of 2017. During this Quarter, we conducted two pilot demonstrations of our AV technology: the nuTonomy Pilot (Phase C3) and the nuTonomy-Lyft Pilot (Phase C4). In the nuTonomy Pilot, we gave invited guests rides in our AVs in autonomous mode. In the nuTonomy-Lyft Pilot, we demonstrated how an AV ridehailing service could work. Passengers hailed a ride through the Lyft app, and were taken to their destination in a nuTonomy AV.

In the nuTonomy Pilot, we carried passengers in our AVs along a fixed route in the Seaport. At the end of each trip, our user research team conducted detailed interviews with each passenger about their experience riding in our AV. Our passengers included six seniors and one person with visual impairment. They gave us valuable feedback on how to adapt our technology for a diverse user base.

In the nuTonomy-Lyft Pilot, we gave rides to passengers along multiple user-selected routes. The passengers hailed their nuTonomy ride from the Lyft app. While in the vehicle, passengers were able to view an electronic display that showed the vehicle's planned trajectory and key obstacles around the vehicle. After each ride, passengers completed a questionnaire on the ride-hailing app and in-car display.

The passenger response to both Pilots was enthusiastic. The Pilots confirmed our belief that Bostonians would be interested in a fully autonomous ridehailing service. Our goal for testing in 2018 is to bring that service closer to reality.



SUMMARY

Miles Driven

There were no additional miles-based requirements for Phases C3 and C4. As we stated in our Third Quarter Report, nuTonomy has exceeded the 600 autonomous miles required for Phases B1, B2, C1, and C2 of the Test Plan. As always, it is important to note that our autonomous driving in Boston represents a small fraction of the total amount of our autonomous miles driven globally, due to the larger fleet, operations team, and testing area we have available in Singapore. But we view our Boston testing as high leverage—each mile on the Seaport’s complex and traffic-dense roadways provides significant technical feedback for developing our AV software.

Locations Driven

There were no changes to our locations driven in the Fourth Quarter. We continue to operate on Drydock Avenue, Summer Street, Dorchester Avenue, Congress Street, D Street, Tide Street, Northern Avenue, Black Falcon Avenue, and various small connector streets. Additionally, we conduct safety testing of our AVs in a closed course environment on a private test track.

Crash Reports

We have not produced any crash reports, because our AVs have not been involved in any collisions during our testing in Boston.

Failures with Autonomous Mode

We did not experience any unanticipated failures with or disruptions while driving in autonomous mode. As we explain below in greater detail, in certain traffic scenarios our safety drivers take over manual control because of known limitations of the current state of AV technology.



SUMMARY

Takeovers

nuTonomy's safety drivers take over manual control in any situation in which they feel uncomfortable or unsafe. During the Fourth Quarter, our safety drivers took over manual control of our AVs in the following situations:

1. in certain situations when pulling over to the curb for (actual) passenger pickup or dropoff;
2. when emergency vehicles were in active operation (e.g., sirens and lights activated) in the roadway;
3. when law enforcement officers were manually directing traffic in intersections through which our AVs were travelling;
4. in certain situations in which construction vehicles were obstructing our lane of travel;
5. in certain situations in which oncoming vehicles violated lane boundaries; and,
6. when other vehicles were exhibiting erratic behavior near our AVs.

As always, it is worth noting that a safety driver's decision to take over manual control in a given situation does not necessarily indicate that continued autonomous operation in those situations would be unsafe. Because we instruct our safety drivers to err on the side of caution, we expect that takeovers will occur in many situations in which the AV would have handled the situation without incident. We are continuously improving our AV software, and we are confident that our AVs will be able to handle each of these situations without a takeover after further development.



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LEARNING

What We Have Learned

During the Fourth Quarter, our learning came from observing passengers in our Pilots interact with our AVs and listening to their feedback. We have excerpted some of their responses, both compliments and critiques, below:

1. Passengers Feel Safe in AVs: “Interesting to see how [the AV] responds to the people/cars around it. Car functioned rather cautiously, so that made me feel safe. Really cool to see how it detects the various random happenings on the street.”
2. The Safety Driver Increased Confidence: “I didn’t realize there were going to be humans standing by to operate the vehicle. Knowing that would have reduced my anxiety.”
3. Passengers Impressed with AV Functionality: “Very exciting to see the car actually drive itself in non-trivial scenarios. It was fascinating to see the vehicle speed up and slow down, turn automatically, and interpret traffic signals.”
4. Main Complaint--We Drive Too Slowly: “The ride was fine. It felt a bit more sluggish than a human driver would drive. But, it worked and I felt safe, so if the option was available and I wasn’t in a rush, there’s a good chance I’d hop in one for a normal ride.”
5. Pickup Coordination Remains a Challenge: As anyone who frequently uses ridehailing services knows, finding an exact location for passengers and vehicles to meet can be challenging. The more precise localization of AV software can help. But making the pickup seamless remains a work in progress.

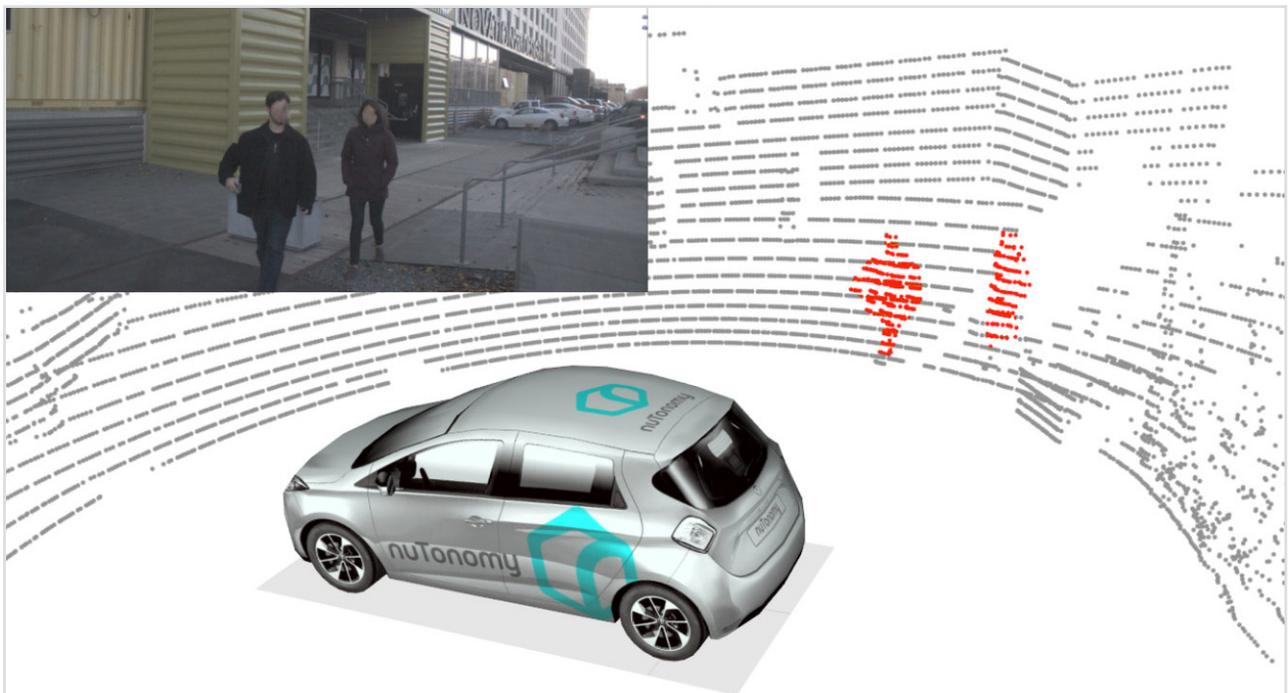
We thank Governor Baker and Mayor Walsh for their support, which was critical to making 2017 a successful year of AV testing in Massachusetts. We look forward to deepening our partnership with the City and the Commonwealth in 2018.

IMAGES



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Recording the feedback of a passenger after the ride



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LiDAR Points and Image of two passengers approaching AV