



## Supplement to 2017 Annual Report of AV Mode Disengagements

At the time of a disengagement, our trained Safety Operators, leave objective feedback noting the cause of the disengagement. Post testing, our engineers carefully analyzes the data and isolate the root cause of each disengagement. For this reason, we published our 2017 Disengagement Report with our post-test disengagement classification.

**Perception Discrepancy:** No object detection or misclassification of perception objects

**Unwanted maneuver:** The planner behavior was not appropriate for the scenario

**Planning discrepancy:** The planned behavior was excessive

**System Fault:** An error from the computer system

**Control discrepancy:** Vehicle control created undesired behavior

**Map discrepancy:** High Definition Map build caused an undesired behavior

**Localization discrepancy:** The lane placement of the vehicle was not accurate causing undesired behavior

	October 2016
Total Autonomous Miles	7.7
Qualifying Disengagements	1
Disengagement Information	
Date	Causal Factors
10/16/2016	Steer control profile undesirable

	November 2016
Total Autonomous Miles	14.9
Qualifying Disengagements	4
Disengagement Information	
Date	Causal Factors
11/04/2016	System Fault
11/10/2016	System Fault
11/17/2016	System Fault
11/18/2016	System Fault



<b>December 2016</b>	
<b>Total Autonomous Miles</b>	14.3
<b>Qualifying Disengagements</b>	1
<b>Disengagement Information</b>	
<b>Date</b>	<b>Causal Factors</b>
12/07/2016	Perception discrepancy for an object with vehicle close behind caused undesired brake

<b>January 2017</b>	
<b>Total Autonomous Miles</b>	26
<b>Qualifying Disengagements</b>	3
<b>Disengagement Information</b>	
<b>Date</b>	<b>Causal Factors</b>
01/11/2017	Localization error caused drift
01/13/2017	Perception discrepancy for an object caused braking with traffic behind
01/27/2017	Planning discrepancy caused steering maneuver

<b>February 2017</b>	
<b>Total Autonomous Miles</b>	5.1
<b>Qualifying Disengagements</b>	2
<b>Disengagement Information</b>	
<b>Date</b>	<b>Causal Factors</b>
02/12/2017	System Fault
02/22/2017	Planning discrepancy caused brake jabs



<b>March 2017</b>	
<b>Total Autonomous Miles</b>	132.63
<b>Qualifying Disengagements</b>	7
<b>Disengagement Information</b>	
<b>Date</b>	<b>Causal Factors</b>
03/03/2017	Misclassification of traffic light detection
03/13/2017	Braking upon engaging system
03/14/2017	Perception discrepancy caused no yield for cross traffic
03/14/2017	Planning discrepancy caused delayed braking for car that cut in and slowed quickly
03/15/2017	Perception discrepancy caused delayed yield at intersection
03/15/2017	Perception discrepancy caused proceeding during right on red with cross traffic
03/30/2017	Perception discrepancy for a pedestrian in crosswalk caused braking with traffic behind

<b>April 2017</b>	
<b>Total Autonomous Miles</b>	70.04
<b>Qualifying Disengagements</b>	3
<b>Disengagement Information</b>	
<b>Date</b>	<b>Causal Factors</b>
04/05/2017	Undesired map build caused steering oscillation with vehicle in adjacent lane
04/10/2017	Delayed perception for pedestrian walking into the street
04/27/2017	Undesired planning caused delayed braking for lead vehicle



	<b>May 2017</b>
<b>Total Autonomous Miles</b>	151.47
<b>Qualifying Disengagements</b>	7
<b>Disengagement Information</b>	
<b>Date</b>	<b>Causal Factors</b>
05/10/2017	Perception discrepancy for lead vehicle slowing to turn into a parking lot
05/10/2017	Delayed perception for pedestrian at crosswalk during right turn
05/19/2017	Misclassification of traffic light detection
05/26/2017	Undesired planning path took right turn too wide with traffic in the adjacent lane
05/26/2017	Undesired planning near large bush on right caused braking with traffic behind
05/31/2017	Perception discrepancy for bicyclist that was slightly outside road edge
05/31/2017	Misclassification of traffic light detection

	<b>June 2017</b>
<b>Total Autonomous Miles</b>	122.15
<b>Qualifying Disengagements</b>	9
<b>Disengagement Information</b>	
<b>Date</b>	<b>Causal Factors</b>
06/01/2017	Delayed perception for lead vehicle caused delayed braking
06/02/2017	Misclassification of traffic light detection
06/06/2017	Undesired planning caused delayed yield for cross traffic during right on red
06/08/2017	Perception discrepancy for lead vehicle caused braking with traffic behind
06/13/2017	Perception discrepancy for lead vehicle caused delayed braking
06/21/2017	Perception discrepancy for bicyclist passing in front of our lane
06/21/2017	Planning discrepancy caused no yielding for lead vehicle slowing to turn into driveway
06/28/2017	Undesired planning for not nudging far enough for vehicle stopped in bike lane
06/28/2017	Delayed perception for pedestrian running into street



July 2017	
<b>Total Autonomous Miles</b>	31.91
<b>Qualifying Disengagements</b>	3
<b>Disengagement Information</b>	
<b>Date</b>	<b>Causal Factors</b>
07/06/2017	Uncomfortable steering oscillation
07/06/2017	Perception discrepancy for lead vehicle
07/06/2017	Uncomfortable steering oscillation

November 2017	
<b>Total Autonomous Miles</b>	1323.78
<b>Qualifying Disengagements</b>	9
<b>Disengagement Information</b>	
<b>Date</b>	<b>Causal Factors</b>
11/10/2017	Perception discrepancy caused vehicle to drift out of lane
11/10/2017	Perception discrepancy caused vehicle to drift out of lane
11/13/2017	Perception discrepancy caused vehicle to drift out of lane
11/14/2017	Perception discrepancy caused sudden movement towards adjacent lane
11/20/2017	Perception discrepancy caused vehicle to drift out of lane
11/21/2017	Perception discrepancy vehicle to drift out of lane
11/22/2017	Perception discrepancy caused vehicle to drift out of lane
11/28/2017	Perception discrepancy caused vehicle to drift out of lane
11/30/2017	Planning discrepancy during right on red caused nudge towards vehicle making U-turn