

Purpose of this document : ARAI has established this document to facilitate and record its work in progress. Contents of this document may change in accordance with ARAI decisions

### Introduction:

A data-driven method is used to analyze the safety of Automated Vehicles (AVs) before deployment, and scenarios are key to this process. The use of specific test scenarios for the quantitative evaluation of an AV using physical and virtual safety validation is suggested in. Real-world driving data is utilized to represent various on-road scenarios, including traffic participant maneuvers, common road and infrastructure layouts, and weather and lighting conditions. There are two main abstraction levels that may be taken into consideration, the first of which qualitatively defines the scenarios and the second of which, utilizing parameters and models, quantitatively characterizes the situations. The AV can also be stated in a way that makes it possible to determine the pertinent test cases.

The collection of scenarios needs to cover the variety of what an AV can encounter in real traffic. As a result, many different scenarios are considered. This Report focuses on identification of scenarios that an AV might encounter while driving in INDIA.








Classification : The identified Scenarios are classified according to the geometric features of the roads or driveway types that encountered in majority in India and are listed below.

- Straight Road
- Curved Road
- Signalized Junction
- Non Signalized Junction
- Roundabout

The above mentioned road types are alone not capable to fully classify a scenario and distinguish it from others, therefore scenarios are further classified according to the dynamic behavior and type of traffic under each road type and the classification types are listed below.

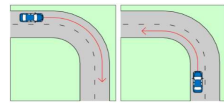
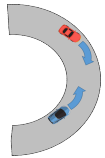
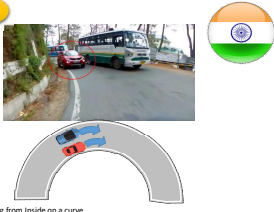


- Oncoming Traffic
- Following Traffic
- Backing up
- .U-Turn
- Overtaking Traffic
- Non priority Road
- Lane change to right
- Lane change to left
- 10.Vehicle driving in fornt
- Traffic Jam
- Swing out
- Leaving Parking
- Parking Vehicle/ Broken down vehicle
- Vehicle Door opening
- Pedestrian Encounter
- Bicycle Encounter
- Animal Encounter
- Road infrastructure
- Pedestrian Encounter with or without Sight Obstruction
- Priority road
- Objects on road

Representation : The Scenarios need to be represented in a format that can be read and understood easily, and lets the reader know about vehicle environment. The easiest way to represent this is by describing the scenario in a picture that shows the vehicles intended path as well as the surrounding conditions. Therefore a pictorial representation of the scenarios was chosen. The following table describes meaning of each picture used in the document.

	EGO Vehicle
	Actor Vehicle
	Pedestrian
	Railway Crossing
	Traffic Signal
	Unique INDIA SPECIFIC Scenarios
	Wait Sign

Scenarios on straight road

1. Single vehicle	2. Following traffic	3. Decelerating traffic	4. Merging up	5. Stop	6. Decelerating traffic	7. Rear-end collision	8. Lane change to right	9. Lane change to left	10. Wrong vehicle	11. Traffic jam	12. Road sign	13. Road sign	14. Road sign	15. Road sign	16. Road sign	17. Road sign	18. Road sign	19. Road sign	20. Road sign	21. Road sign	22. Road sign	23. Road sign	24. Road sign	25. Road sign	26. Road sign	27. Road sign	28. Road sign	29. Road sign	30. Road sign	31. Road sign	32. Road sign	33. Road sign	34. Road sign	35. Road sign	36. Road sign	37. Road sign	38. Road sign	39. Road sign	40. Road sign	41. Road sign	42. Road sign	43. Road sign	44. Road sign	45. Road sign	46. Road sign	47. Road sign	48. Road sign	49. Road sign	50. Road sign	51. Road sign	52. Road sign	53. Road sign	54. Road sign	55. Road sign	56. Road sign	57. Road sign	58. Road sign	59. Road sign	60. Road sign	61. Road sign	62. Road sign	63. Road sign	64. Road sign	65. Road sign	66. Road sign	67. Road sign	68. Road sign	69. Road sign	70. Road sign	71. Road sign	72. Road sign	73. Road sign	74. Road sign	75. Road sign	76. Road sign	77. Road sign	78. Road sign	79. Road sign	80. Road sign	81. Road sign	82. Road sign	83. Road sign	84. Road sign	85. Road sign	86. Road sign	87. Road sign	88. Road sign	89. Road sign	90. Road sign	91. Road sign	92. Road sign	93. Road sign	94. Road sign	95. Road sign	96. Road sign	97. Road sign	98. Road sign	99. Road sign	100. Road sign

Scenarios on Curved Road						
22. Single Vehicle	23. Oncoming Traffic	24. Overtaking Traffic	25. Pedestrian Encounter	26. Bicycle Encounter	27. Animal Encounter	28. Objects on road
<p>22.1</p>  <p>Ego Vehicle on Curve road</p>	<p>23.1</p> 	<p>24.1</p>  <p>Overtaking from inside on a curve</p>	<p>25.1</p>  <p>1901. Pedestrian stationary at road side</p>			
			<p>25.2</p>  <p>1902. Pedestrian walking along the road</p>			

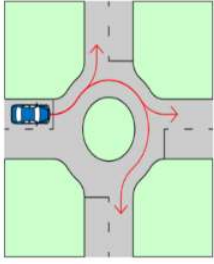
Scenarios on Signalized junction						
29. Single Vehicle	30. Following Traffic	31. Oncoming Traffic	32. level crossing	33. Pedestrian Encounter	34. Bicycle Encounter	35. Traffic rule violation
<p>29.1</p>  <p>Ego vehicle approaching amber traffic light</p>		<p>31.1</p>  <p>Oncoming vehicle turns right at signalized junction</p>	<p>32.1</p>  <p>Railway crossing at junction without gate</p>	<p>33.1</p>  <p>pedestrian running a red light</p>	<p>34.1</p>  <p>Cyclist at right turn at signalized junction</p>	 <p>vehicle running red traffic light</p>
<p>29.2</p>  <p>Ego vehicle approaching green traffic light</p>		<p>31.2</p>  <p>Ego vehicle turns right with oncoming vehicle at signalized junction</p>	<p>32.1</p>  <p>Railway crossing without gate on signal road</p>	<p>33.2</p>  <p>Traffic Vehicle at Turning Signals towards right as pedestrian from two points cross</p>	<p>34.2</p>  <p>Cyclist at left turn at signalized junction</p>	 <p>Stop Sign Not ben Followed</p> 
<p>29.3</p>  <p>Ego vehicle approaching red traffic light</p>		<p>31.3</p>  <p>Turning Signals towards Left as other vehicle passes by</p>	<p>32.1</p>  <p>Railway crossing at junction with gate</p>	<p>33.3</p>  <p>Ego Vehicle at Turning Signals towards left as pedestrain from two points cross</p>	<p>34.3</p>  <p>Cyclist crossing from right side at signalized junction</p>	 <p>Giving wrong turning Signal by Actor at junction</p> 
<p>29.4</p>  <p>Ego turning right with simultaneous crossing from both side</p>		<p>31.4</p>  <p>Actor Parked on junction</p> 	<p>32.1</p>  <p>Railway crossing with gate on signal road</p>	<p>33.4</p>  <p>Ego Vehicle at Turning Signals towards left as pedestrain from two points cross</p>	<p>34.4</p>  <p>Cyclist crossing from left side at signalized junction</p>	
<p>29.5</p>  <p>Ego turning right with simultaneous crossing from both side</p>		<p>31.5</p>  <p>Ego turning right, Actor is coming infront</p>				



**On Roundabout**

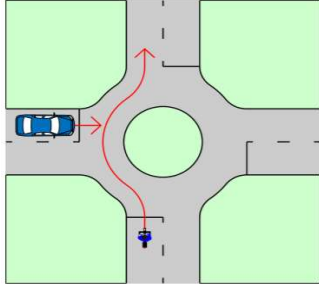
**46. Roundabout**

46.1



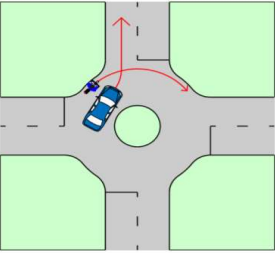
**Navigating on an empty roundabout**

46.2



**Entering a roundabout with a cyclist**

46.3



**Leaving a roundabout with a cyclist**

46.4



Ego enter in, while there is rash driving at roundabout