

Driver Drowsiness Detection System

Group 2

Test Case Report

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Objective of the Test Case Report

The primary objective of this test case report is to validate the functionality and performance of the driver drowsiness detection system. This involves assessing the system's ability to accurately detect indicators of drowsiness using computer vision techniques, and to initiate appropriate alerts or actions in response. The report will cover several key aspects:

1. Accuracy: Measuring how accurately the system identifies drowsiness compared to actual data obtained from observations and annotations by human experts.
2. Reliability: Ensuring the system performs consistently under various conditions such as different lighting conditions, facial orientations, and occlusion.

Flags which have been used for indication purpose:

Drowsiness Detected	Green
NOT Detected	Red

1. Testcases for the Eye Aspect Ratio (EAR) Model

1.1. Threshold > 0.25

Test Cases for the Driver Drowsiness Detection System – Group 2

<i>How far the camera was placed?</i>	<i>Placement of Camera</i>	<i>Eye Position</i>	<i>Lighting</i>	<i>Drowsiness detection Flag</i>	<i>Working as expected or not</i>
Close to the face	At an angle, Eye level (approx. 0 deg.)	Wide open, looking straight at the camera	Day Light - bright		Yes
Close to the face	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking towards the left	Day Light - bright		Yes
Close to the face	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking towards the right	Day Light - bright		Yes
Close to the face	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking down	Day Light - bright		Yes
One arm distance	At an angle, Eye level (approx. 0 deg.)	Wide open, looking straight at the camera	Day Light – bright		Yes
One arm distance	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking towards the left	Day Light – bright		Yes
One arm distance	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking towards the right	Day Light – bright		Yes
One arm distance	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking down	Day Light - bright		No
Close to the face	Towards the right	Wide Open, looking towards the right	Day Light - bright		Yes
Close to the face	Towards the right	Wide Open, looking towards the right - down	Day Light - bright		Yes
Close to the face	Towards the left	Wide Open, looking towards the left	Day Light - bright		Yes
Close to the face	Towards the left	Wide Open, looking	Day Light - bright		Yes

Test Cases for the Driver Drowsiness Detection System – Group 2

		towards the left-down			
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1.2. Threshold < 0.25

Test Cases for the Driver Drowsiness Detection System – Group 2

<i>How far the camera was placed?</i>	<i>Placement of Camera</i>	<i>Eye Position</i>	<i>Lighting</i>	<i>Drowsiness detection Flag</i>	<i>Working as expected or not</i>
Close to the face	At an angle, Eye level (approx. 0 deg.)	Wide open, looking straight at the camera	Day Light - bright		Yes
Close to the face	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking towards the left	Day Light - bright		No
Close to the face	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking towards the right	Day Light - bright		No
Close to the face	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking down	Day Light - bright		Yes
One arm distance	At an angle, Eye level (approx. 0 deg.)	Wide open, looking straight at the camera	Day Light – bright		Yes
One arm distance	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking towards the left	Day Light – bright		No
One arm distance	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking towards the right	Day Light – bright		No
One arm distance	At an angle, Eye level (approx. 0 deg.)	Wide Open, looking down	Day Light - bright		No
Close to the face	Towards the right	Wide Open, looking towards the right	Day Light - bright		Yes
Close to the face	Towards the right	Wide Open, looking towards the right - down	Day Light - bright		Yes
Close to the face	Towards the left	Wide Open, looking towards the left	Day Light - bright		Yes
Close to the face	Towards the left	Wide Open, looking	Day Light - bright		Yes

Test Cases for the Driver Drowsiness Detection System – Group 2

		towards the left-down			
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2. Testcases for Mouth Aspect Ratio (MAR) with threshold > 0.51:

SI.NO	Objective	Test Condition	Expected Result	Result
1	Verify MAR calculation across facial orientations.	Run the algorithm on images/videos with the subject's face at various angles to the camera (slightly turned, looking up/down)	Accurate face detection and MAR calculation for a reasonable range of facial orientations	<ul style="list-style-type: none"> 45 degrees to the left and right drowsiness detected but not at 90 degrees. Looking straight towards the camera, face right up drowsiness detected, but when looking down does not detect.
2	Assess performance with different facial expressions.	Introduce images/videos of subjects with varying facial expressions (smiling, frowning, neutral)	Correct identification of faces and computation of MAR, demonstrating adaptability to different mouth shapes	At times it works at times it doesn't
3	Test for multiple faces in the frame	Present images/videos with more than one person in view	Accurate detection of each face and individual MAR computation,	<ul style="list-style-type: none"> When looking towards the camera, the facial landmarks its getting detected.

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				<ul style="list-style-type: none"> • 45 degrees towards the left and right facial landmarks are getting detected. • 90 degrees towards the left and right the facial landmarks are not getting detected.
4	Evaluate system performance with face obstructions	Use images/videos where the subject's mouth or part of the face is partially obscured (e.g., hand over mouth, wearing glasses/mask)	System attempts to detect the face and calculate MAR, with an understanding that accuracy may decrease with significant obstruction	Transparent glasses – the facial landmark for eyes is getting detected.

3. Testcases for Neural Network Model with multiple dense layers:

Placement of Camera	Eye Position	Drowsiness Detection Flag	Working as expected or NOT
At an angle, eye level, 0 deg.	Wide open, looking straight at the camera		Yes
At an angle, eye level, 0 deg.	Wide open, looking towards the left		Yes
At an angle, eye level, 0 deg.	Wide open, looking towards the right		Yes
At an angle, eye level, 0 deg.	Partially open, looking straight at the direction of the camera		Yes
At an angle, eye level, 0 deg.	Partially open, looking toward the left		No

Test Cases for the Driver Drowsiness Detection System – Group 2

At an angle, eye level, 0 deg.	Partially open, looking towards the right		No
At an angle, eye level, 0 deg.	Looking down		Yes

4. Testcases for Neural Network Model (second iteration) which includes dropout layers and batch normalization:

<i>Placement of Camera</i>	<i>Eye Position</i>	<i>Drowsiness Detection Flag</i>	<i>Working as expected or NOT</i>
At an angle, eye level, 0 deg.	Wide open, looking straight at the camera		Yes
At an angle, eye level, 0 deg.	Wide open, looking towards the left		Yes
At an angle, eye level, 0 deg.	Wide open, looking towards the right		Yes
At an angle, eye level, 0 deg.	Partially open, looking straight at the direction of the camera		Yes
At an angle, eye level, 0 deg.	Partially open, looking toward the left		Yes
At an angle, eye level, 0 deg.	Partially open, looking towards the right		Yes
At an angle, eye level, 0 deg.	Looking down		Yes