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User Cases Outline

User Case 1	Description
User need	To know the fuel level and how far the car can travel at current speed.
User interaction	The user requests fuel information from the dashboard while driving.
Product response	The car displays the current fuel level and the estimated distance that the car can continue travel on current fuel level. If the GPS system is on, the car displays the distance on the map before refuel is required. If the tank is less than 20% full, the GPS map shows nearby petrol stations for the user's convenience.

User Case 2	Description
User Need	To update directions on the Navigation System: 1. Navigation – The user updates the GPS direction either by syncing information from a smartphone or a computer to the car's integrated GPS-like system, or by manually inputting the address. 2. To locate nearby businesses – This function will potentially benefit both the user and the carrier. The user can find the service that he is searching for, and the carrier has a revenue stream for premium listings for businesses that want to be ranked high on the search lists. 3. To recognize new location – The system knows if it has been shut off, and turns back on when the user drives into a new location.
Summary of the GPS Navigation System	The GPS Navigation System has persistent Internet connection and provides information on maps, traffic flow, accident updates, multiple-point routing, and lane assistant with junction view. This information guides the user through busy highway interchanges, pedestrian routing options and eco-Route to find the most fuel-efficient route.
User interaction	The user is searching for a restaurant nearby and uses the GPS Navigation System to find driving directions to the restaurant. The user inputs the information while the car is stationary: • The user may sync the information from a smartphone or a computer with the Navigation System; • Or the user may input the address into the head-up display from

	the center stack or the steering wheel. If the car is in motion and the driver needs to update the driving directions, the driver can press a button the steering wheel – an arrow-like button that can be pushed up or down – to display alternative driving routes to the same destination, or directions to similar places in a different destination. Only one or two options will be displayed while the car is in-motion, while more options will be available for selection when the car is stationary.
Product response	The GPS Navigation may provide voice options to the driver. The Navigation System will use the Internet to provide the most updated directions to any desired destination.

User Case 3	**Description**
User Need	To know the updated traffic flow on the current route.
Summary of the traffic flow alert	A colored arrow will be displayed on the right side of the windshield as part of the head-up navigation system. Due to persistent Internet connection, the Navigation System receives fresh updates on the zone's traffic conditions, and the color of the arrow will indicate whether there is traffic congestion on the route where the driver is driving. A green arrow indicates low and smooth traffic, a yellow arrow indicates medium level of traffic flow, and a red arrow indicates congested traffic.
User Interaction	The user drives on a route that has heavy traffic flow, then make a turn onto an alternate route where the traffic flow is low.
Product Response	The arrow on the windshield is initially red. Once the user drives onto a different road that has low traffic, the arrow turns green.

User Case 4	**Description**
User Need	To know the speed limit in the current speed zone.
Summary of the speedometer	The Navigation System receives updates from the Internet and displays the current speed limit on the dashboard. In situations when the user plans to drive at a slower pace, such as pulling a trailer with the car, the user can set a customized speed limit on the dashboard.
User Interaction	The user drives over the speed limit of the speed zone.
Product Response	The navigation system responds with a vibration alert on the steering wheel to caution the user. The vibration turns off when the user reduces his speed, or when the user manually turns off the vibration, or automatically after 5 seconds. The vibration alert serves as a safety feature for users who want to be reminded of the route's speed limit.

User Case 5	Description
User Need	To know whether the road surface is safe as according to the weather.
Summary of the road surface alert	The Navigation System receives fresh weather update on the zone, and interprets the road surface based on the weather information. If the zone is currently snowing or just experienced snow, a snow flake symbol will appear beside the traffic arrow on the windshield to indicate frosty road condition. Likewise, a raindrop symbol indicates slightly wet road surface from light rain, whereas a lightning symbol indicates dangerously wet road surface from heavy storm. If the zone did not experience any snow or storm, no symbol will be displayed as indication to dry road surface.
User Interaction	The user drives on a route where a lightning storm just occurred. The user then drives into a zone that is dry.
Product Response	The lightning symbol appears beside the traffic arrow, and the speedometer suggests a recommended speed limit (that is lower than the route's legal limit) to encourage the user to drive at a slower pace that is appropriate for the wet road surface. When the user enters a dry zone, the lightning symbol disappears from the windshield, and the speedometer displays only the route's legal limit so that the user knows that it is safe to drive faster.

User Case 6	Description
User Need	To detect vehicles and pedestrians at the user's blind spot.
Summary of the blind-spot radar technology	The radar system has sensors that detect the wide radius from the side to the back of the car, and it can differentiate between mobile and stationary objects. The radar system warns the user via visual (lighting the warning indicator on the head-up display) and audio alerts.
User Interaction	The user sets his blinker to signal that he is merging lanes.
Product Response	The blind-spot radar is activated once the blinker is activated. If there is an object within the radar's radius, a warning light corresponding to the lane is displayed on the head-up display. When the car changes its angle, the radar system is also activated (this function is customizable).

User Case 7	Description
User Need	To know the tire pressures.
User Interaction #1	The user is driving the car and the left hind tire has low tire pressure.
Product Response	A small red circle and the text "Low Tire Pressure" appears on the right

#1	side of the dashboard display. After 8 seconds, the visual alert changes to display a dimmer version of only the red circle without text.
User Interaction # 2	The user is in the car, in park. The left hind tire has low tire pressure.
Product Response # 2	At stationary, all alerts expand to display the red/yellow circles along with the alerts' text. An icon of the car and the tire pressures of all 4 tires (in PSI) will be shown. The left hind tire on the icon will light up in red, and the red circle of the alert will display "Low Tire Pressure".
User Interaction # 3	The user requests tire pressure information from the dashboard.
Product Response # 3	When the car is stationary, an icon of the car and the tire pressures of all 4 tires will be displayed. Because the tire pressures are normal, the yellow alert will light up with the text "Tire Pressure OK." Once the car is in motion, the alert and the icon are removed from the display. The driver can use the toggle switch on the steering wheel for the icon to return to the display.

User Case 8	**Description**
User Need	To know when an oil change is necessary and to review a current alert that has been hidden from the dashboard display.
User Interaction #1	The user drives the car for 3,000 miles since the previous oil change, and an oil change is needed soon.
Product Response #1	A small red circle and the text "Change oil soon" appears on the right side of the dashboard display. Simultaneously, a slight vibration of the steering wheel occurs to notify the user about the need for an oil change. After 8 seconds, the visual alert displays only a dimmer version of the red circle without the text.
User Interaction #2	The user presses a button on the steering wheel.
Product Response #2	All current alerts expand to display the red/yellow circles along with the alerts' text. Because the oil change is not an immediate concern, the yellow alert lights up and appears on the list below the red-colored alerts. The alerts remain active for 10 seconds before resuming to the dim, textless version.

User Case 9	**Description**
User Need	To know the mileage based on different road paths (eg. high way, city path).
User Interaction	User is in the car, in park. Because the car is stationary, all elements of the dashboard display are visible. User presses the 'mileage' button on the screen beneath the mileage display.
Product Response	The car's digital odometer reads 23,000 miles. After pressing the mileage button, the display switches to show the highway/city mileage breakdown: 13,000 miles highway/10,000 miles city.

User Case 10	Description
User Need	To reduce display clutter on the dashboard.
User Interaction	The user slides a toggle switch on the bottom right of the dashboard display to manage the display elements. The close button [x] appears on the upper-left of every editable element, whereas the minimize button [–] appears on the upper right of the elements. The user first presses the [x] button on the tachometer, then the [–] button on the engine temperature and the odometer elements.
Product Response:	When the switch is toggled to "on," buttons appear on the upper right and the upper left of all the editable elements. When the user presses the [x] button on the tachometer, the element is removed from the display. When the user presses the [–] button on the engine temperature and odometer elements, they are set to toggle "off" once the car is in motion.