Hands Free Driving System Prototype

Follow links below to enact use cases:

Engage  Active  Configure  All
Select from available actions:

- **Push “On” Button**
  Pressing button will turn on the sensors

- **Engage Diagnostics and Configuration Mode**
  Enter administrator mode

**System Off**
Starting Point for Engage Use Case
Continuously monitor vehicle conditions and user engagement.

Vehicle conditions: road conditions, system integrity, vehicle location relative to path, lane position, and follow distance.
Driver Override
Driver Engaging with the vehicle controls will disengage the system.

Vehicle Control System Command Issued
System has detected the necessity of issuing commands to some combination of brakes and steering or accelerator and steering.

Commands Complete
Return to system active.

Invalid Conditions
Due to interior or exterior conditions, system cannot continue to operate safely.

Vehicle Control System Command Received
Continue to monitor vehicle and environmental conditions while performing actions dictated issued by subsystem. The continuous monitoring may result in more commands being issued.
Upon Entry, perform system diagnostics

- Diagnostic Tests Pass
  Continue engaging system

- Diagnostic Tests Fail
  Display failure details

Validate System
Upon Entry, validate current location and trajectory correspond to LiDAR mapped road.

Engage Path Prediction System

Path valid
Continue engaging system

Path Invalid
Return to system off
Upon Entry, validate Driver engagement

Driver Attention Check

Driver Engaged
Continue to system active

Driver Disengaged
Return to system off
Driver Attention Warning

Warn driver to pay more attention to the road in an escalating manner. If threshold for warning is surpassed, disable system.
Upon entrance, display interface system settings and input interface for making changes.
System Administration

Upon entrance, display user interface for administration functions.

Exit Admin Mode
Return to system off state

Run Tests
Enter testing interface

Configure Settings
Allows setting up system parameters
Testing Suite

Upon entrance, display interface for performing tests.
Display Diagnostics Results

Upon entrance, display results of tests.
In this use case, we are driving along with the system engaged when someone in front of us brakes. The system slows the car down using the brake to compensate while continuing to monitor road and vehicle conditions. The driver starts texting, and the system repeatedly warns them to engage with the road before handing off control.
Select next action for use case:

**System Active**

*Continuously monitor vehicle conditions and user engagement.*

Vehicle conditions: road conditions, system integrity, vehicle location relative to path, lane position, and follow distance.

In this use case the vehicle remains in active until it detects that the vehicle in front of it is too close. At this point, the system will begin issuing braking commands to the vehicle control system.

**Vehicle Control System Command Issued**

System has detected the necessity of issuing commands to some combination of brakes and steering or accelerator and steering.
Vehicle Control System Command Received

Continue to monitor vehicle and environmental conditions while performing actions dictated issued by subsystem. The continuous monitoring may result in more commands being issued.

In this use case the vehicle applies brakes while continuing to monitor the car ahead of it. Once adequate spacing is achieved, the vehicle sets the new cruise control speed and returns to passive monitoring.
Continuously monitor vehicle conditions and user engagement.

Vehicle conditions: road conditions, system integrity, vehicle location relative to path, lane position, and follow distance.

Once vehicle commands are exhausted, the system returns to a passive monitoring state until it detects that the user is not paying attention to the road.
Below Warning Threshold
Return to system active

Driver Attention Warning
Warn driver to pay more attention to the road.
Continuously monitor vehicle conditions and user engagement.
Vehicle conditions: road conditions, system integrity, vehicle location relative to path, lane position, and follow distance. The system returns to a passive monitoring state until it detects that the user is not paying attention to the road a second time.
Driver Attention Warning

Warn driver to pay more attention to the road.
Continuously monitor vehicle conditions and user engagement.

Vehicle conditions: road conditions, system integrity, vehicle location relative to path, lane position, and follow distance. The system returns to a passive monitoring state until it detects that the user is not paying attention to the road a third time.
Driver Attention Warning

Handoff control of the vehicle to the driver after alerting them and waiting an interval.
System Off
System has been disabled, end of use case.
In this use we begin with the Hands-Free Driving System not active. The driver toggles a button to engage the system, and then a series of checks are performed before the system is engaged. The link in lower left begins use case.
Validate System

Upon Entry, perform system diagnostics
Engage Path Prediction System

Upon Entry, validate current location and trajectory correspond to LiDAR mapped road. In this use case, everything checks out.
Driver Attention Check

Upon Entry, validate Driver engagement.
In this use case, the driver is paying attention.
System Active

Continuously monitor vehicle conditions and user engagement.
Vehicle conditions: road conditions, system integrity, vehicle location relative to path, lane position, and follow distance.

End point for Engage System use case.
Select next action for use case:

Push “On” Button
Pressing button will turn on the sensors

System Off
Starting Point for Engage System Use Case
Select next action for use case:

System Off
Starting Point for Configuration Use Case
System Administration

Upon entrance, display user interface for administration function. Use this menu to enter configuration settings.
Configure Settings

Upon entrance, display interface system settings and input interface for making changes. Once changes are made, click save to make them permanent.
System Administration

Upon entrance, display user interface for administration functions.
System Off
End Point for Configuration Use Case
System Configuration

In this use case an administrator is going to configure system settings and then return the system to an idle state. The link in lower left begins use case.
In this use case a driver or administrator chooses how to engage with the system, beginning with the system disengaged. The link in lower left begins use case.