Augmented Reality (Group)

(F003774)

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Name	Role	Email Confirmation	Date

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Important Note

You need to use the RE specification macros provided by the “RE_SpecificationMacroTemplate.dotm” (refer to “Utilities” on *page “Specification Templates” in the RE Wiki*) to allow seamless VSEM import of the specification content. **Use only these RE specification macros to create requirements** in this specification. Refer to “How to use the Specification Templates” on how to enable and use the macros and the requirements templates in this specification.

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1 INTRODUCTION

1.1 Document Purpose

The Function (Group) Specification (FS) specifies an individual function / a group of functions.

To get more information about the concept of feature, function and component level abstraction refer to the Ford RE Wiki.

1.2 Document Scope

The following set of functions from the Global Feature & Function List is described in this specification.

Function ID	Function Name	Owner	Reference
See table below in VSEM			

Table 1: Functions described in this specification

1.3 Document Audience

The FS is authored by the owners of the individual functions. All Stakeholders, i.e., all people who have a valid interest in the functions and their behavior should read and, if possible, review the FS. It needs to be guaranteed, that all stakeholders have access to the currently valid version of the FS.

1.3.4 Stakeholder List

For the latest list of stakeholder of the feature and their influence refer to <Put VSEM Link here>.

List of Stakeholders

Name	CDSID /phone	Stake	Contact date	Elicitation response	Review worksheet	Review meeting
Bentley, Sonya (S.D.)	sbentle5	Systems Engineering Manager	11/23/2019	Accepted	Yes	Yes
Yousif, Meisam (M.L.)	myousif	Feature Owner Supervisor	11/23/2019	Accepted	Yes	Yes
Abdelhamid, Mahmoud (M.)	mabdelh1	Feature Owner Lead	11/23/2019	Accepted	Yes	Yes
Alsamarai, Ahmed (A.)	aalsamar	Feature Owner (co-lead)	8/17/2020	Accepted	Yes	Yes
Flores, Luis (L.A.)	lflore70	Feature Owner (co-lead)	8/17/2020	Accepted	Yes	Yes
Ahmed, Fahd	fahmed2	AR Feature Champion / AR Planning Lead	2/10/2021	Accepted	Yes	Yes
Kessler, Chris	ckessle8	Global AR Marketing Lead for Ford and Lincoln	01/25/2021	Accepted	Yes	Yes
King, Anthony (A.G.)	aking6	AR module Product owner Supervisor	8/17/2020	Accepted	Yes	Yes
Langkamp, Ulf (U.K.)	ulangkam	AR module Product owner Engineer	7/31/2020	Accepted	Yes	Yes

List of Stakeholders

Name	CDSID /phone	Stake	Contact date	Elicitation response	Review worksheet	Review meeting
Nachtegall, Debbie (D.E.)	dnachte1	AR ECU D&R - Hardware	8/07/2020	Accepted	Yes	Yes
Keerthivasan, Venkataraman	vkeerth5	AR ECU D&R – Hardware	6/24/2021	Accepted	Yes	Yes
Vootkuri, ChandraSekhar (C.R.)	cvootkur	AR ECU D&R - Software	8/04/2020	Accepted	Yes	Yes
Lazalde, Eric (E.)	elazald1	HMI lead for the core interaction on the panoramic displays- HHDD	2/4/2021	Accepted	Yes	Yes
To, Curtis (C.S.)	cto3	HMI Supervisor, Customer Experience	8/26/2020	Accepted	Yes	Yes
Khanafer, Dima (D.)	dkhanafe	HMI Engineer, Customer Experience	8/26/2020	Accepted	Yes	Yes
Von hausen, Christian (C.)	cvonhaus	HMI Engineer, Customer Experience	8/26/2020	Accepted	Yes	Yes
Van Moen, Lidia	lvanmoen	Core Hardware Engineer / ADAS FWC Camera	9/01/2020	Accepted	Yes	Yes
Zaragoza, Claudia	czarago1	Core Hardware Engineer / FIR Camera	10/29/2020	Accepted	Yes	Yes
Saini, Akriti (A.)	asaini10	Core Hardware Engineer / AR Camera	01/19, 2021	Accepted	Yes	Yes
Rahtz, Timothy (T.A.)	trahtz	AR Nav product owner	12/03/2020	Accepted	Yes	Yes
Check, Laura	lburek	IVI/Phoenix Product Owner	8/18/2020	Accepted	Yes	Yes
White, Melissa	mwhite35	Manufacturing point of contact	9/16/2020	Accepted	Yes	Yes
Civiero, Christian	ccivier1	ASO SME for AR	8/17/2020	Accepted	Yes	Yes
Gehrke, Mark	mgehrke2	GTDS #22423 Lead for FIR Camera Project	10/26/2020	Accepted	Yes	Yes
Hiskens, David	dhiskens	GTDS #22423 Co-Lead for FIR Camera Packaging	9/01/2020	Accepted	Yes	Yes
Diedrich, Jonathan (J.)	jdiedris	GTDS #22423 Co-Lead for FIR Camera Calibration	11/16/2020	Accepted	Yes	Yes
Cauvet, Colleen	ccauvet	GTDS #30199 Lead for (Thermally Enhanced Night vision Features)	8/28/2020	Accepted	Yes	Yes
Dutta, Arun	adutta2	GTDS #30199 Engineer for (Thermally Enhanced Night vision Features)	9/10/2020	Accepted	Yes	Yes
Hurley, Collin	churle15	GTDS #30199 Engineer for (Thermally Enhanced Night vision Features)	9/11/2020	Accepted	Yes	Yes
Farrell, David (D.E.)	dfarre13	Functional Safety SE Lead	9/28/2020	Accepted	Yes	Yes
Dean, Shawn (S.)	sdean44	Functional Safety SE Engineer	9/28/2020	Accepted	Yes	Yes
Balachandran, Vignesh	vbalach4	Functional safety EESE Lead	1/14/2021	Accepted	Yes	Yes
Foresto, Marco (M.P.)	mforesto	Functional architecture	1/14/2021	Accepted	Yes	Yes
Perkins, Steve (S.)	sperki50	Functional architecture	10/21/2020	Accepted	Yes	Yes
Becerra, Alejandro (JABS.)	jbecer16	Feature MBSE Modeler	8/20/2020	Accepted	Yes	Yes

List of Stakeholders

Name	CDSID /phone	Stake	Contact date	Elicitation response	Review worksheet	Review meeting
Ortiz Anguiano, Alejandro	aortizan	Feature MBSE Supervisor	8/17/2020	Accepted	Yes	Yes
Mahmood, Hamid	hmahmoo3	Pre-PS IVI – CoOps Supervisor	10/12/2020	Accepted	Yes	Yes
Rahman, Moshiur	mrahma29	Pre-PS IVI – CoOps Engineer	8/20/2020	Accepted	Yes	Yes
Caballero, Fernando (F.)	fcabal11	FMA Coach Engineer	10/09/2020	Accepted	Yes	Yes
Buchanan, Alan (A.D.)	abuchan1	FMA Coach Lead	1/14/2021	Accepted	Yes	Yes
Fayad, Omar (O.)	ofayad	AR Cybersecurity Requirements	9/11/2020	Accepted	Yes	Yes
Raparthi, Satya (S)	srapart1	AR Cybersecurity Requirements	1/22/2021	Accepted	Yes	Yes
Childers, Chad (C.B)	cchilde1	AR Cybersecurity TARA modeling	9/21/2020	Accepted	Yes	Yes
Kalash, Mohammad (M.)	mkalash	ADAS customer experience	10/28/2020	Accepted	Yes	Yes
Aaron Mills	amills2	AR/DAT point of contact	11/04/2020	Accepted	Yes	Yes
Nath, Nitendra (N.)	nnath	AR/DAT point of contact	8/21/2020	Accepted	Yes	Yes
Sripinyo, Peter (P.P.)	psripiny	Power Mode - Software	2/26/2021	Accepted	Yes	Yes
Affeldt, Matthew (M.D.)	maffeldt	VSEM DAT point of contact	11/05/2020	Accepted	Yes	Yes
Cheng, Gail (L.G.)	gcheng	VSEM IVI point of contact	11/18/2020	Accepted	Yes	Yes
Sun, Jayla	Jsun55	IVI FVSS development engineer	1/17/2021	Accepted	Yes	Yes
Obeidat, Omar (O.A.)	oobeida2	AR GPS (GNSS) Location	10/20/2020	Accepted	Yes	Yes
Schein, Jamey (J.)	jschein2	AR Navigation point of contact	11/17/2020	Accepted	Yes	Yes
Medl, Chris (C.)	cmedl	AR Navigation point of contact	1/19/2021	Accepted	Yes	Yes
Olzewski, Chet	colzewsk	SIM Engineer	6/24/2021	Accepted	Yes	Yes

1.4 Document Organization

1.4.4 Document Context

Refer to the Specification Structure page in the Ford RE Wiki to understand how the FS relates to other Ford Requirements Documents and Specifications.

1.4.5 Document Structure

The structure of this document is explained below:

Section 1 – Introduction how to use this document including responsibilities and requisite documents. Explains the tterminology. Gives a clarification of the definitions, concepts and abbreviations used in the document.
Section 2 – Function Group Description. Gives an overview and the purpose of the function group.
Section 3 – Functional Architecture: Specifies the overall functional architecture of the function group
Section 4 – Function Specifications: Specifies the logical functions of the function group in detail
Section 5 – List of Open Concerns
Section 6 Revision history including a list of new or modified requirements. The requirements in this document are tagged, and this section contains different types of tables listing all, new, or changed requirements by their title and page no.
Section 7 – Appendix: Presenting additional data mainly in a tabular form, e.g., a data dictionary

1.5 Document Conventions

1.5.4 Requirements Templates

Refer to "How to use the Specification Templates" on how to use the specification templates and the VBA macros to create/edit the requirements in the specifications.

The VBA macro enable the import of the specification to VSEM (refer to "How to import specifications into VSEM as separate requirements").

1.5.4.1 Identification of Requirements

The unique requirement ID given in the headline of any requirement follows the requirement throughout the development process. The requirement ID format follows a well-defined syntax.

All identifiers in a FS shall be composed of 4 parts:

- A leading prefix, which indicates the type of requirement (R=Requirement, UC=Use Case, SC=Scenario, …)
- A prefix, which indicates the abstraction level (F=Feature, FNC=Function, CMP = component).
- Followed by a name, indicating the scope, which the requirement belongs to (e.g. feature or function name)
- Ending with the actual requirement number

Example:

R_FNC_LockArbitrator_00004 This is the fourth requirement on function level for the function Lock Arbitrator.

1.5.4.2 Requirements Attributes

The templates provided by *Specification_Macros.dotm* define a list of attributes for each requirement. This helps to classify the requirement. The attributes are explained at RE Wiki - Requirements Attributes.

1.6 References

1.6.4 Ford Documents

List here all Ford internal documents, which are directly related to the feature.

Reference	Title	Doc. ID	Revision	Document Location
NA				

Table 2: Ford Documents

1.6.5 External Documents and Publications

The list of external documents could include books, reports and online sources.

Reference	Document / Publication
NA	

Table 3: External Documents and Publications

1.7 Glossary

1.7.4 Definitions

Definition	Description
Driver	Entity being presumed to drive the vehicle; target this feature will provide guidance/situational awareness

Table 4: Definitions relevant for "Logical Function"

1.7.5 Abbreviations

Abbr.	Stands for	Description
ADAS	Advanced Driver Assistant System	
APIM PHOENIX	Accessory Protocol Interface Module (Phoenix Domain Controller)	SYNC
AR feature	Augmented Reality feature – Scope of this document	
AR-CAM, ARC	Augmented Reality Camera (visible)	
ARM (AR-ECU)	Augmented Reality Electronic Control Unit (New Hardware)	
BCM	Body Control Module	
CAM	Camera	
ECG	Enhanced Central Gateway	
FIR-CAM	Far Infrared Camera	
FNV3	Fully Networked Vehicle-3; Allows different vehicle domains with a standard interface to allow them to work together.	
FOV	Field of view	
GNSS	Global Navigation Satellite System	
GPS	Global Positioning System (the US GNSS system)	
HHDD	High Head Down Display (Panoramic Display), External display for AR content	
HMI	Human-Machine Interface	
MVP	Minimum viable product	
OEM	Original Equipment Manufacturer	
OTA	Over the Air Updates	
PDB	Power Distribution Box	
POC	Proof of concept	
POI	Point of Interest	
TCU	Telematics Control Unit	

Table 5: Abbreviations relevant for "Logical Function"

2 FUNCTION GROUP DESCRIPTION

The augmented reality AR feature has the following function groups (for highlighted functions please see the comment for each use case).

Fu-Group 1- Process and Perform Augmented Reality – AR ECU

1- Process Video Mode AR Camera vs FIR Camera. (MVP variant).
2- Overlay Turn by Turn Data. (MVP variant).
3- Overlay Street Name Data. TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier.
4- Overlay House Number Data. TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier.
5- Overlay Point of Interest Data. TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier.
6- Overlay Destination Data. (MVP variant).
7- Overlay Blind Spot (BLIS) Data. (MVP variant).
8- Overlay Lane Low Visibility Data. MVP+ variant (ongoing discussion with CIED team if it can be moved to MVP or post <J1>).
9- Overlay Lane level Guidance Data. MVP+ variant (ongoing discussion with CIED team if it can be moved to MVP) or post <J1>, currently not available from Google – pending discussion with alternative map supplier and getting data from ADAS.
10- Overlay Line Biasing Data. MVP+ variant (ongoing discussion with CIED team if it can be moved to MVP or post <J1>)
11- Overlay Highway assist Data. Far variant (ongoing discussion with CIED team if it can be moved to MVP, MVP+, or post <J1>)
12- Overlay Assisted Lane Change. Far variant (ongoing discussion with CIED team if it can be moved to MVP, MVP+, or post <J1>)
13- Perform Calibration. (MVP variant).
14- Perform OTA Update. (MVP variant).

Fu-Group 2- Display Augmented Reality – HHDD (MVP variant).

Fu-Group 3- Customize Augmented Reality Settings- HMI- IVI/SYNC (MVP variant).

1- Select AR Feature.
2- Select Video Background.
3- Select Lane Low Visibility. MVP+ variant (ongoing discussion with CIED team if it can be moved to MVP or post <J1>).

Fu-Group 4- Provide Navigation data – IVI/SYNC. (MVP variant).
Fu-Group 5- Provide DAT related data – DAT. (MVP variant).
Fu-Group 6- Provide AR Camera Data – AR Camera. (MVP variant).
Fu-Group 7- Provide FIR Camera Data – FIR Camera. (MVP variant).
Fu-Group 8- Provide Vehicle Data. (MVP variant).
Fu-Group 9- Provide GNSS Data. (MVP variant).

3 FUNCTIONAL DECOMPOSTION AND ARCHITECTURE

3.1 Description

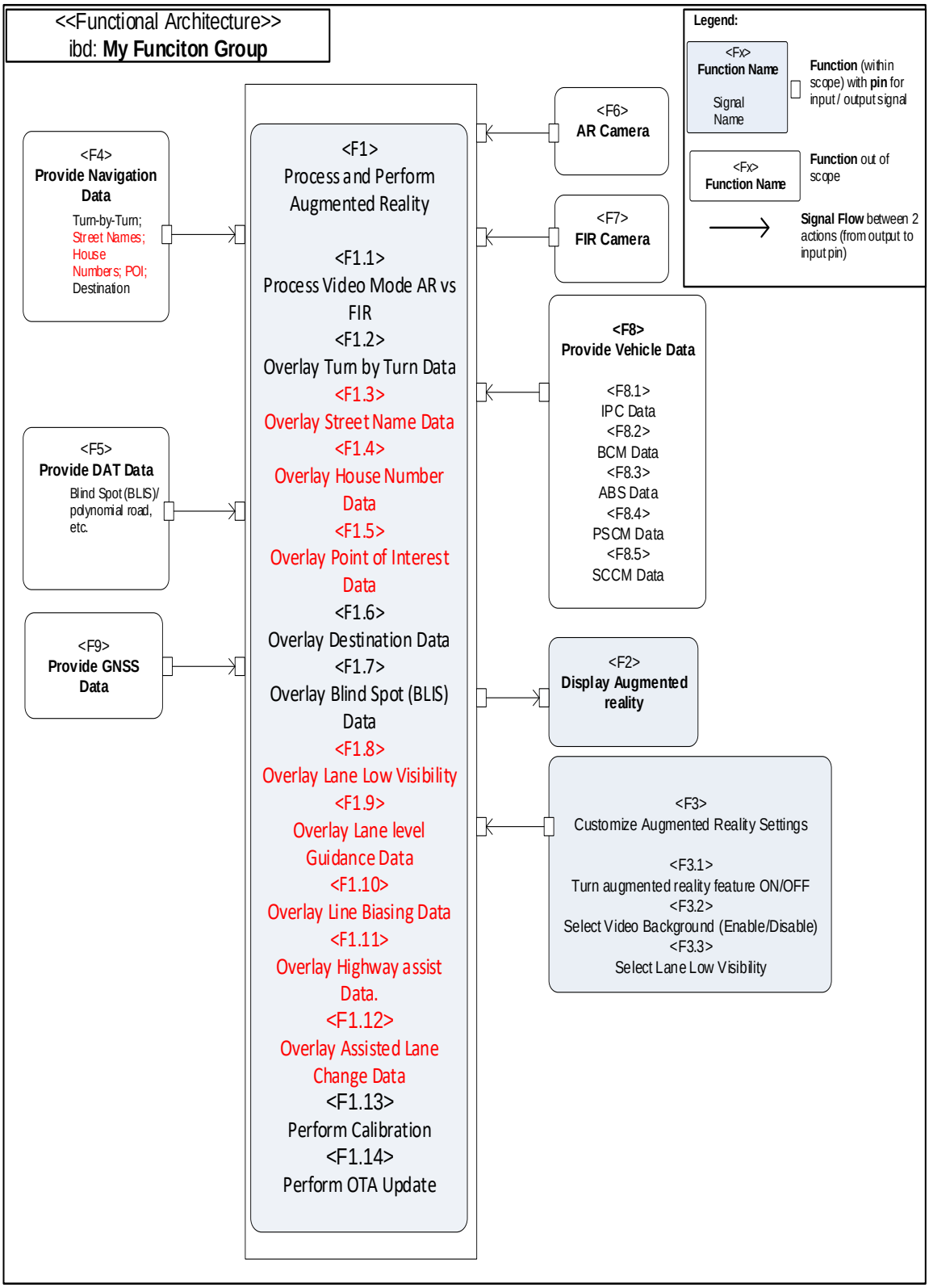


Figure 1: Functional Architecture of Function Group "Augmented Reality"

3.2 Function List

Function ID	Function Name	Function Description	ASIL
F1	Process and Perform Augmented Reality	Process the received data and Perform the AR overlay functions required by the feature.	QM
F1.1	Process Video Mode	Process video mode AR camera vs FIR camera	QM
F1.2	Overlay Turn by Turn Data	Turn by turn Data received from NAV will be overlaid on the video feed from the cameras.	QM
F1.3	Overlay Street Name Data	Street names Data received from NAV will be overlaid on the video feed from the cameras.	QM
F1.4	Overlay House Number Data	House numbers Data received from NAV will be overlaid on the video feed from the cameras.	QM
F1.5	Overlay Point of Interest (POI) Data	POIs Data received will be overlaid on the video feed from the cameras.	QM
F1.6	Overlay Destination Data	Destination icons Data received from NAV will be overlaid on the video feed from the cameras.	QM
F1.7	Overlay Blind Spot Data	BLIS warning will be rendered spatially correct to the neighboring lane.	QM
F1.8	Overlay Lane Low Visibility	Lane Low Visibility Data received will be overlaid on the video feed from the cameras.	QM
F1.9	Overlay Lane level Guidance Data	Lane level Guidance Data received will be overlaid on the video feed from the cameras.	QM
F1.10	Overlay Line Biasing Data.	Line Biasing Data received will be overlaid on the video feed from the cameras.	QM
F1.11	Overlay Highway assist Data.	Highway assist Data received will be overlaid on the video feed from the cameras.	QM
F1.12	Overlay Assisted Lane Change	Assisted Lane Change Data received will be overlaid on the video feed from the cameras.	QM
F1.13	Perform Calibration	Perform calibration for AR/FIR cameras.	QM
F1.14	Perform OTA Update	Receive and perform OTA updates.	QM
F2	Display Augmented Reality	Display the AR video to the HHDD display (TBT, POI, Street Name, House Number, Destination, and Blind Spot)	QM
F3	Customize AR Settings	Provide the user the ability to customize the feature.	QM
F3.1	Select AR Feature	Turn AR feature (ON/OFF)	QM
F3.2	Select Video background	Select video background (Enable/Disable)	QM
F3.3	Select Lane Low Visibility	Turn Lane Low Visibility feature (ON/OFF)	QM
F4	Provide Navigation Data	Provide the required data from NAV to support the overlay functions.	QM
F5	Provide DAT Data	Provide the required data from DAT to support the overlay functions.	QM
F6	Provide AR Camera Data	Provide the video feed from AR camera.	QM
F7	Provide FIR Camera Data	Provide the video feed from FIR camera.	QM
F8	Provide Vehicle Data	Provide the required vehicle data from different ECUs.	QM
F8.1	Provide IPC Data	Provide fuel level status	QM
F8.2	Provide BCM Data	Provide ignition status	QM
F8.3	Provide ABS Data	Provide vehicle speed status	QM
F8.4	Provide PSCM Data	Provide steering angle status	QM
F8.5	Provide SCCM Data	Provide turn light signal status	QM
F9	Provide GNSS Data	Provide GNSS data	QM

Table 6: List of Logical Functions

3.3 Signal List

The highlighted signals are currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier

Refer to the Data Dictionary - Logical Signals.

Signal Name	Description
Navigation Status	Navigation status (ON/OFF)
lane count info	Number of lanes available on the road.
Speed limit value	Value of speed limit on current part of road.
Route geometry	Shape of the route, polynomial description of the road in front, e.g. to determine what part is in sight to align street signs to turn to the road orientation. Also, to visualize road restrictions to prevent turns.
Elevation data / 3D Road Geometry	A set of point along the route with height data (road or route profile). It is needed to adjust AR object created in the distance to upcoming slopes/hills.
Distance to next maneuver	Distance value to the next turn in the routing. Only w/ routing active.
Maneuver intersection geo location	lat/lon- GPS points. Size of the crossroad. Type of Cross road (T/X shaped).
Maneuver street name	Name of the next street to turn on in the active route. Can also be general direction e.g. off a highway towards a city. Only w/ routing active, not required for "free driving".
Maneuver phases from navigation system	Map Tile - graph of road links around Ego vehicle Roundabout radius/Geometry Detailed information about Round about exits.
Road network geometry and topology (roundabout geometry)	Physical layout of the road and roads connected. Dimensions and positions of the roads e.g. connected to a roundabout.
Following maneuver info	Maneuvers followed in close distance, used only in situation like "turn left, then right and right again". Only w/ routing active, not required for "free driving".
Road links street names	Street names passing along the route but not to turn. Just for info, not turn advise of active route.
Buildings position and address	GPS point of house/ building address.
House number via navigation predicted route for Inactive route	House number via navigation predicted route if route not active
House number via voice command for Inactive route	Provide house number via voice command if route not active
House number via voice command for active route	Provide house number via voice command if route active
Name of building/business	Name of building/business (i.e. mall, restaurant.)
Define common houses	Logic to define common houses instead of numbers (e.g., friend house), so we show name of the house instead of house number?
Destination position and address	GPS point of destination address.
Distance to destination	Value of distance to the destination.
Road restrictions (e.g. school, no entry, etc.)	Road segment restrictions to avoid action of driver.
Points of interest info: location, type, description	GPS location of location. Additional info required depending on UX requirement and availability on the map.
Conditional signals (for conditional POIs)	POI info categories that are required for the "smart selection" or personalization of POIs. Depends on what filters are required for the conditional POIs. No active routing required.

Footprint, number of levels, for façade highlighting	Building outline to support visualization of POIs. Footprint of building on lot and heights of building. No active routing required, bt can be used for destination too.
POI_ Voice Command (Active Route)	voice command (e.g., show me gas station; show me Italian restaurant, etc.)
POI_ Voice Command (Inactive Route)	voice command (e.g., show me gas station; show me Italian restaurant, etc.)
Current lane position/direction	Current lane position/direction data
Ego vehicle in-lane offset	Ego vehicle in-lane offset data
HD lanes block	HD lanes block data
Lane markings type	Lane markings type data
Height Map/Elevation	Height Map/Elevation data
Target lane position/direction	Target lane position/direction data
Object collision warning signal	Object collision warning signal data
Distance to object	Distance to object data
Object position	Object position data
Object size	Object size data
BLIS_Right_Status	Blindspot to the right status
BLIS_Left_Status	Blindspot to the left status
Wheel Speed	Get Wheel Speed
Acceleration	Get Acceleration data
Ambient Light	Get Ambient Light status
Distance to Empty	Get Distance to Empty status
Fuel Level	Get Fuel level status
Yaw/Roll Parameters	Get Yaw/Roll Parameters
Vehicle Mode	Get Vehicle Mode status

4 FUNCTION SPECIFICATIONS

4.1 Logical Function “Process Video Mode Visible (AR Cam) vs FIR Cam”

4.1.1 Function Overview

4.1.1.1 Function Description

The function will select between the AR camera (Visible) or the FIR camera video feed to be used as an input to the overlay functions.

4.1.1.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.1.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 7: Input Requirements/Documents

4.1.1.4 Assumptions

Refer to Feature document.

4.1.2 Function Scope

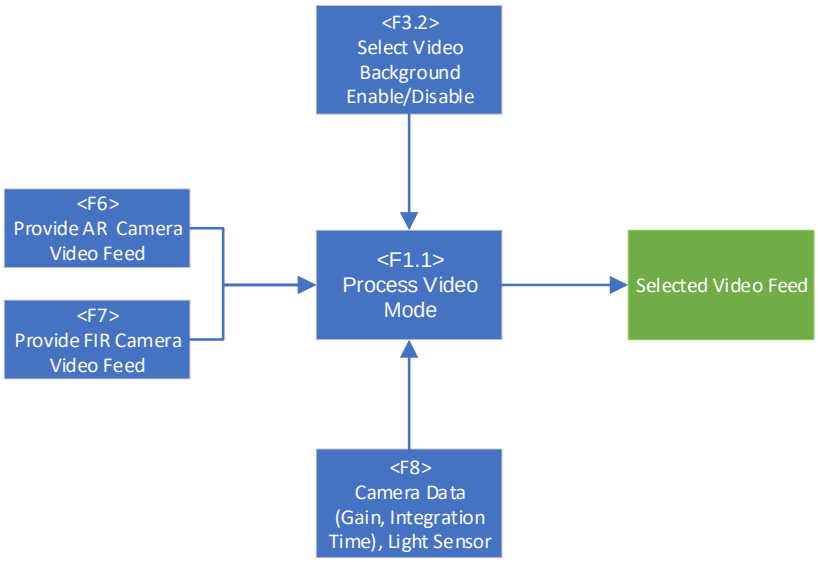


Figure 2: Context Diagram of Function Process Video Mode

4.1.3 Function Interfaces

4.1.3.1 Logical Inputs

Signal Name	Description
AR Camera	Augmented reality camera video feed
FIR Camera	Far Infrared (Night vision) Camera video feed
AR Camera Gain	AR Camera Gain
AR Camera Integration Time	AR Camera Integration Time
Light Sensor Data	Day/Night sensor data
Select Video Background (Enable/Disable)	HMI Setting. Enable (default) – camera switches to FIR camera when “low” levels of light are detected. Disable – use AR camera only.

4.1.3.2 Logical Outputs

Signal Name	Description
Selected Video Feed	Video feed selected for overlay functions.

4.1.3.3 Logical Parameters

Parameter Name	Description
The gain from AR camera	
The integration time from the AR camera	

4.1.4 Function Modeling

4.1.4.1 Activity Diagrams

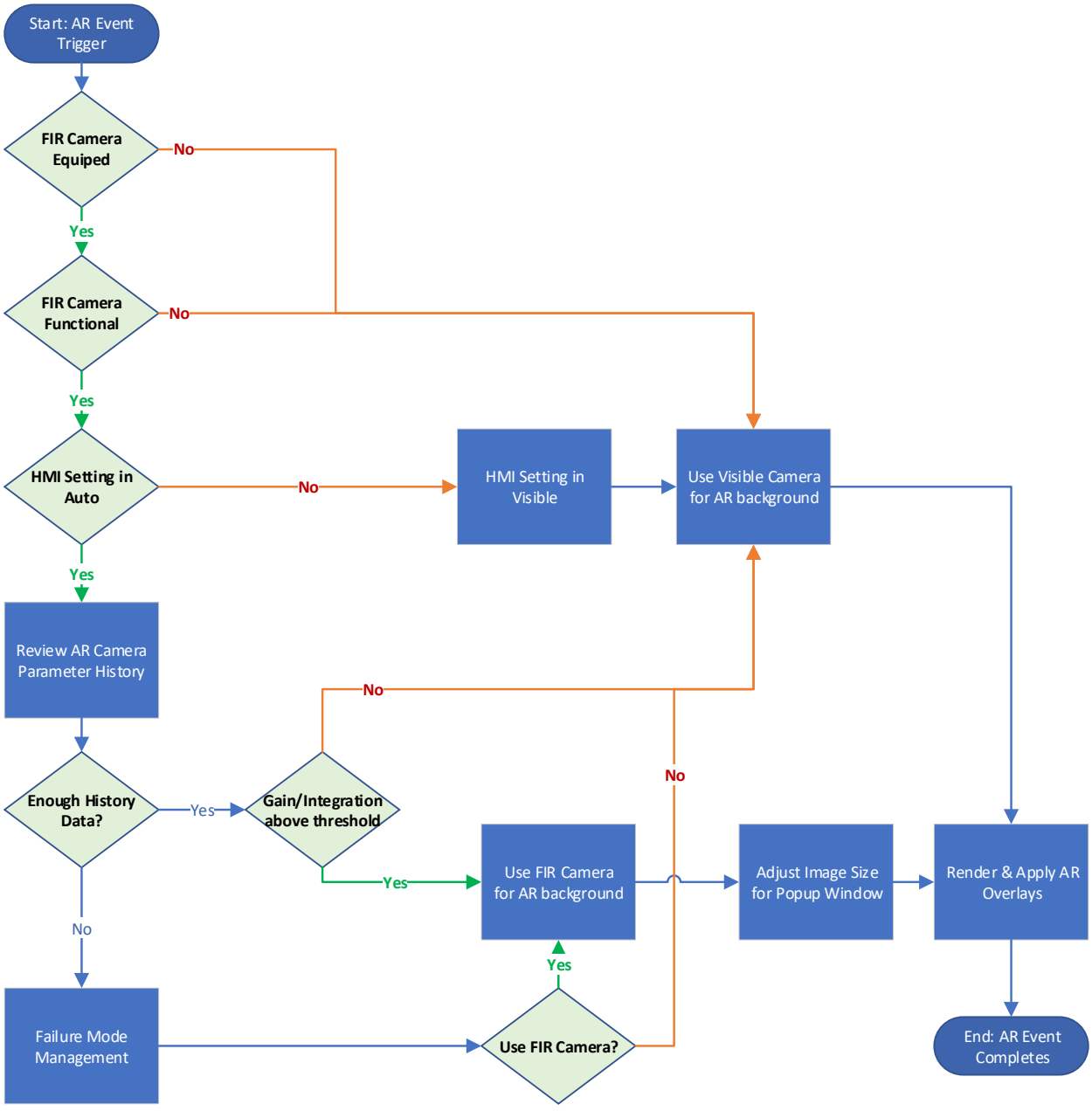


Figure 3: Flow Chart of process video feed

4.1.5 Function Requirements

4.1.5.1 Functional Requirements

4.1.5.1.1 Normal Operation

###R_FNC_AR_00001### FIR Camera Feed (if vehicle is equipped with FIR Camera)

The AR Process video mode function shall set the FIR camera view background to **black hot**. Black hot images are images show hotter elements in the image as darker while **white hot** images are images show hotter elements in the image as brighter.
The AR ECU shall be configurable with the ability to switch the camera view between **white hot** and **black hot**. This capability is not needed as an End-of-Line parameter.

End of Requirement

###R_FNC_AR_00002### FIR /AR Camera Feed Presentation (if vehicle is equipped with FIR Camera)

The AR Process video mode function shall accommodate FOV, resolution, aspect ratio, camera location differences between AR and FIR video feed to render the AR elements.

End of Requirement

~~###R_FNC_AR_00003### AR View Duration (Removed)~~

~~The AR Process video mode function shall send AR view with FIR/AR camera background only in the duration of the trigger of the AR event.~~

End of Requirement

###R_FNC_AR_00004### No AR Video Background Change During AR Event

The chosen camera for the AR background shall keep the selected video feed without change if an event display started (i.e., do not switch camera backgrounds in the middle of an AR event).

End of Requirement

###R_FNC_AR_00005### Camera Selection

The AR Process video mode function shall send the AR video stream resized accordingly to fit the AR HMI display.

End of Requirement

###R_FNC_AR_00006### Camera Selection Parameters

The AR view with Visible or FIR background shall be based on

1. The gain and integration time of the AR camera parameters unless it is overwritten by the customer' HMI setting.
2. The sun load sensor (in case of AR camera parameters unavailable)

End of Requirement

###R_FNC_AR_00007### AR Camera Gain and Integration Time

The AR Camera gain and integration time shall be configurable parameters.

End of Requirement

4.1.5.1.2 Error Handling

4.1.5.2 Non-Functional Requirements

4.1.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**

Table 8: FSRs satisfied by Logical Function

4.1.5.4 Other Requirements

4.1.5.4.1 Design Requirements

4.2 Logical Function “Overlay Turn by Turn Data”

4.2.1 Function Overview

4.2.1.1 Function Description

The function will overlay turn by turn navigation information on the video feed from AR or FIR camera. In an active route based upon the signals received from SYNC-Navigation, the data is processed by AR ECU in order to present graphic overlay of turn by turn instructions in real time.

4.2.1.2 Function Variants

Variant Name	**Variant Description**	**Variant Condition** (optional)
N/A		

4.2.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	**Section/Requirement**	**Description**	**Derived Requirement** (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			

Table 9: Input Requirements/Documents

4.2.1.4 Assumptions

Refer to Feature document.

4.2.2 Function Scope

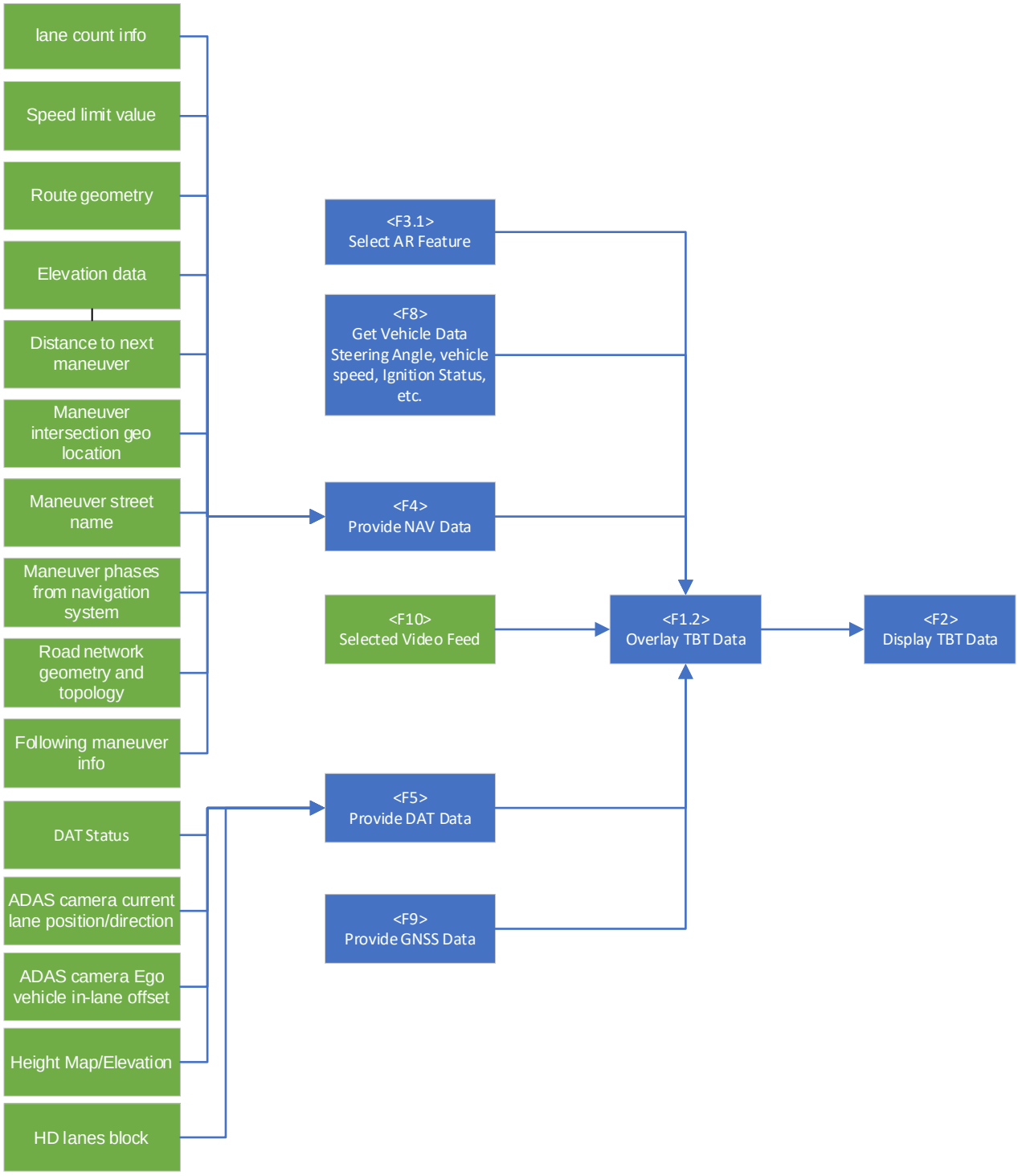


Figure 4: Context Diagram of Function Overlay Turn by Turn Data

4.2.3 Function Interfaces

4.2.3.1 Logical Inputs

Highlighted signals currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier

Signal Name	Description
AR Feature Status	AR Feature Status (ON/OFF).
Navigation Status	Navigation status (ON/OFF).
Vehicle Data	Vehicle data (Steering Angle, vehicle speed, Ignition Status, etc.)
lane count info	Number of lanes available on the road.
Speed limit value	Value of speed limit on current part of road.
Route geometry	Shape of the route, polynomial description of the road in front, e.g. to determine what part is in sight to align street signs to turn to the road orientation. Also, to visualize road restrictions to prevent turns.
Elevation data / 3D Road Geometry	A set of point along the route with height data (road or route profile). It is needed to adjust AR object created in the distance to upcoming slopes/hills.
Distance to next maneuver	Distance value to the next turn in the routing. Only w/ routing active.
Maneuver intersection geo location	lat/lon- GPS points. Size of the crossroad. Type of Cross road (T/X shaped).
Maneuver street name	Name of the next street to turn on in the active route. Can also be general direction e.g. off a highway towards a city. Only w/ routing active, not required for “free driving”.
Maneuver phases from navigation system	Map Tile – graph of road links around Ego vehicle Roundabout radius/Geometry Detailed information about Round about exits.
Road network geometry and topology (roundabout geometry)	Physical layout of the road and roads connected. Dimensions and positions of the roads e.g. connected to a roundabout.
Following maneuver info	Maneuvers followed in close distance, used only in situation like “turn left, then right and right again”. Only w/ routing active, not required for “free driving”.
Road links street names	Street names passing along the route but not to turn. Just for info, not turn advise of active route.
DAT Status	ADAS Status (ON/OFF).
Current lane position/direction	Current lane position/direction from ADAS
Ego vehicle in-lane offset	Ego vehicle in-lane offset from ADAS
HD lanes block	HD lanes block from ADAS
Lane markings type	Lane markings type from ADAS
Height Map/Elevation	Height Map/Elevation from ADAS
Target lane position/direction	Target lane position/direction from ADAS
Object collision warning signal	Object collision warning signal from ADAS
Distance to object	Distance to object from ADAS
Object position	Object position from ADAS

Object size	Change points of lanes geometry e.g. change from a 2-lane road to 3 lane road
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.2.3.2 Logical Outputs

Signal Name	Description
Overlaid TBT Data	Data overlaid on video feed
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.2.3.3 Logical Parameters

Parameter Name	Description
NA	

4.2.4 Function Modeling

4.2.4.1 Use Cases

4.2.4.2 State Charts

4.2.4.3 Activity Diagrams

4.2.4.4 Sequence Diagrams

4.2.4.5 Decision Tables

4.2.5 Function Requirements

4.2.5.1 Functional Requirements

4.2.5.1.1 Normal Operation

###R_FNC_AR_00008### Overlay Turn by Turn Data

The AR overlay turn by turn function shall receive the logical input signals as shown in section 4.2.3.1

End of Requirement

###R_FNC_AR_00009### Overlay Turn by Turn Data on FIR/AR Camera Feed

The AR overlay turn by turn function shall overlay TBT data on video feed received from AR camera or FIR camera.

End of Requirement

###R_FNC_AR_00010### Overlaid Turn by Turn Data to HMI Display

The AR overlay turn by turn function shall send the TBT Overlaid Data to the HMI display.

End of Requirement

###R_FNC_AR_00011### Overlaid Turn by Turn Data Trigger point

The AR overlay turn by turn function shall display the Navigation path only when the next turn by turn distance d_{TBT_city} is 0.1 mile for city and d_{TBT_hwy} is 0.2 mile for highway and the turn within the camera FOV.
If the turn by turn maneuver not within FOV, the AR video shall not be triggered.

End of Requirement

###R_FNC_AR_00012### Overlaid Turn by Turn Data Trigger point – Configurable

The turn by turn distance for city and highway (d_{TBT_city} and d_{TBT_hwy}) shall be configurable parameters and the value will be based on the available data from navigation.

End of Requirement

###R_FNC_AR_00013### Overlaid Turn by Turn Data Display Street Name Not Available (Google do not support string)

The AR overlay turn by turn function shall display the street name at the point of turn pointing towards the direction of the turn.
The turn by turn function shall have these 2D static info 2D (2D street name + distance to maneuver + turn icon).

End of Requirement

###R_FNC_AR_00014### Overlaid Turn by Turn Data Pointed Arrow Centered on Road/Street

The AR overlay turn by turn function shall center a pointed arrow on the road/street (appeared centered to the vehicle). If an object is in front of the host vehicle (car, pedestrian, bike, motorcycle, etc.) then the pointed arrow shall start fading in such a way that it does not cover the object on the path of driver.

End of Requirement

###R_FNC_AR_00015### Overlaid Turn by Turn Data Pointed Arrow Direction

The AR overlay turn by turn function shall show the pointed arrow attributes pointing towards the direction of the turn to enhance lane marking biased towards the turn and angled to show which lane to be at.

End of Requirement

###R_FNC_AR_00016### Overlaid Turn by Turn Data Pointed Arrow Color

The AR overlay turn by turn function shall change the Blue color (color: #669df6) of the 3D arrow if the speed of the vehicle is over the expected speed limit (from NAV) the arrow color shall change to Amber color (color: #ff8c00) in order to warn driver to slow down.

- Path arrow color (or texture) changes to amber (color[1]: #ff8c00) to communicate the need to reduce speed to comfortable complete the maneuver or check speed relative to a detected object (e.g., pedestrian).

End of Requirement

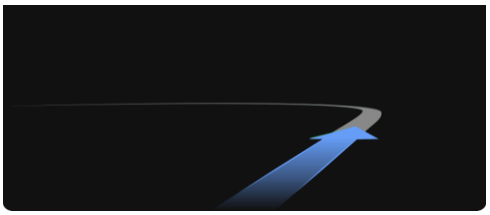
###R_FNC_AR_00017### Overlaid Turn by Turn Data Trigger End

The AR overlay turn by turn function shall stop showing turn by turn If the maneuver is completed and the next maneuver is not within d_{TBT} d_{LLG} of the current maneuver (trigger from NAV). AR view fades out in 2 seconds and 2D map view fades in.

End of Requirement

###R_FNC_AR_00018### Overlaid Turn by Turn Data Following Next Turn

If a following next turn is within the FOV then the following next turn white path shall grow out of the next turn path. White extended path for 2 back-to-back maneuvers, white path to be "connected" to Blue (color[1]: #669df6) path to match the coordinates and correlate with environment, for near NAV. See figure below for more info.



Turn by Turn path connected to white following next turn path

End of Requirement

4.2.5.1.2 Error Handling

4.2.5.2 Non-Functional Requirements

4.2.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**

…	

Table 10: FSRs satisfied by Logical Function

4.2.5.4 Other Requirements

4.2.5.4.1 Design Requirements

4.3 Logical Function "Overlay Street Name Data"- TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier

4.3.4 Function Overview

4.3.4.1 Function Description

The function will overlay street name navigation information on the video feed from the AR or FIR camera.
The function shall process any street names data received from the navigation system in order to position the names based upon the GPS coordinates. Street name is only showed when there is a trigger from NAV and when relative to route, as coincidence with turn by turn point.

4.3.4.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.3.4.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			

Table 11: Input Requirements/Documents

4.3.4.4 Assumptions

Refer to Feature document.

4.3.5 Function Scope

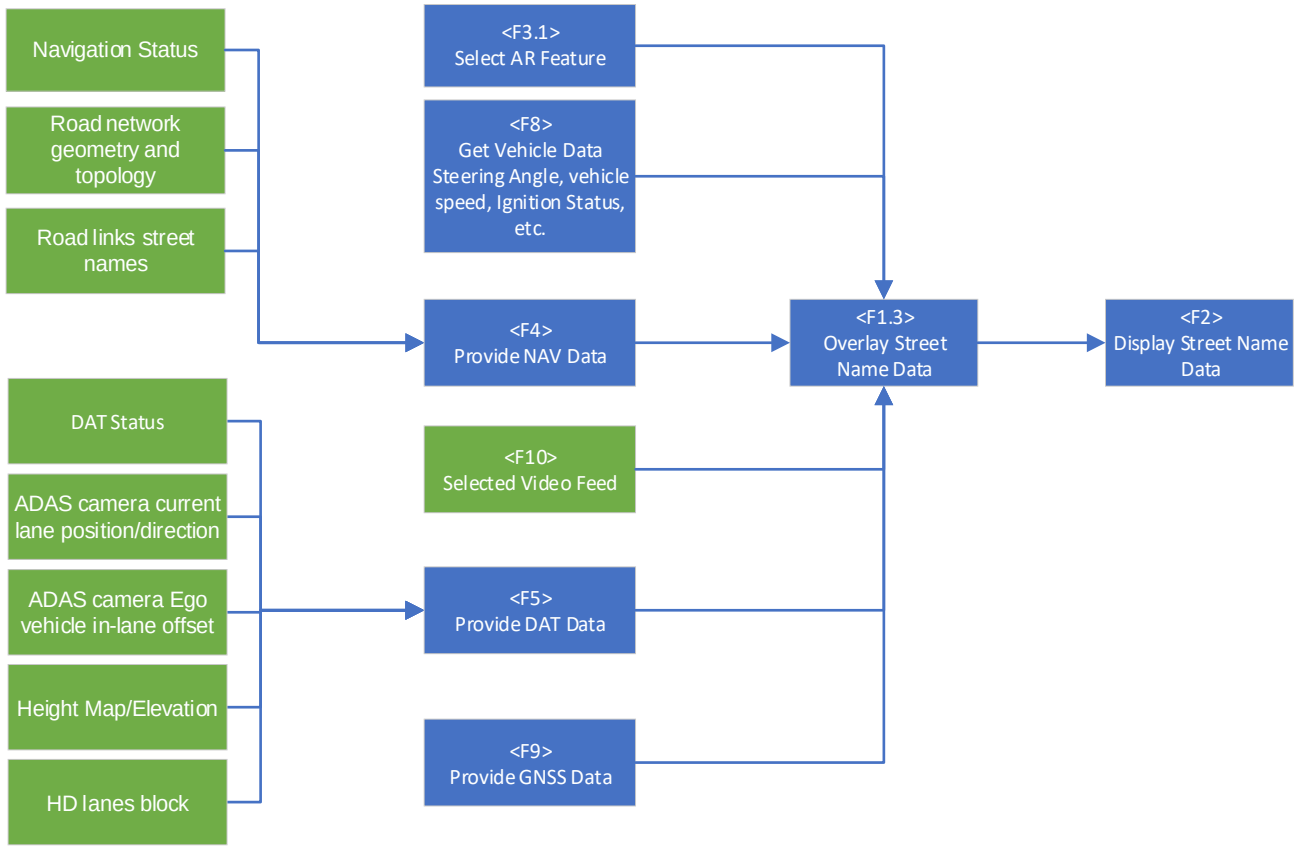


Figure 5: Context Diagram of Function Overlay Street Name Data

4.3.6 Function Interfaces

4.3.6.1 Logical Inputs

Signal Name	Description
AR Feature Status	AR Feature Status (ON/OFF).
Navigation Status	Navigation status (ON/OFF).
Road network geometry and topology	Physical layout of the road and roads connected. Dimensions and positions of the road.
Road links street names	Street names passing along the route but not to turn. Just for info, not turn advise of active route. (Note: TBD if required for first implementation)
DAT Status	ADAS Status (ON/OFF).
ADAS camera current lane position/direction	Lane the ego vehicle is in when road has several lanes
ADAS camera Ego vehicle in-lane offset	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane
Height Map/Elevation	Vertical geometry, slope detection

HD lanes block	Change points of lanes geometry e.g. change from a 2 lane road to 3 lane road
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.3.6.2 Logical Outputs

Signal Name	Description
Overlay Street Name Data	Street Name Data overlaid on video feed
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.3.6.3 Logical Parameters

Parameter Name	Description
NA	

4.3.7 Function Modeling

4.3.7.1 Use Cases

4.3.7.2 State Charts

4.3.7.3 Activity Diagrams

4.3.7.4 Sequence Diagrams

4.3.7.5 Decision Tables

4.3.8 Function Requirements

4.3.8.1 Functional Requirements

4.3.8.1.1 Normal Operation

###R_FNC_AR_00019### Overlay Street Name Data

The AR overlay Street Name function shall receive the logical input signals as shown in section 4.3.3.1 (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00020### Overlay Street Name Data on FIR/AR Camera Feed

The AR overlay Street Name function overlay Street Name data on video feed received from AR camera or FIR camera. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00021### Overlay Street Name Data to HMI Display

The AR overlay Street Name function shall send the overlaid Street Name Data to the HMI Display (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00022### Overlay Street Name Data Trigger – Active Route

The AR overlay Street Name function shall be triggered as a coincidence with turn by turn function. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00023### Overlay Street Name Data Trigger – Inactive Route

The AR overlay Street Name function shall be triggered via voice command when inactive route. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00024### Overlay Street Name Data Arrow Flag

The AR overlay Street Name function shall provide a colored and angled flying flag/square highlight on the top center part to communicate an upcoming street to the driver relative to the maneuver point. The flying flag/square shall have the 3D transition property to meet such alignment upon the street on the drive route. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

4.3.8.1.2 Error Handling

4.3.8.2 Non-Functional Requirements

4.3.8.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**

Table 12: FSRs satisfied by Logical Function

4.3.8.4 Other Requirements

4.3.8.4.1 Design Requirements

4.4 Logical Function "Overlay House Number Data"- TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier

4.4.4 Function Overview

4.4.4.1 Function Description

This function will overlay house number navigation information on the video feed from the AR camera or FIR camera.

4.4.4.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.4.4.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			

Table 13: Input Requirements/Documents

4.4.4.4 Assumptions

Refer to Feature document.

4.4.5 Function Scope

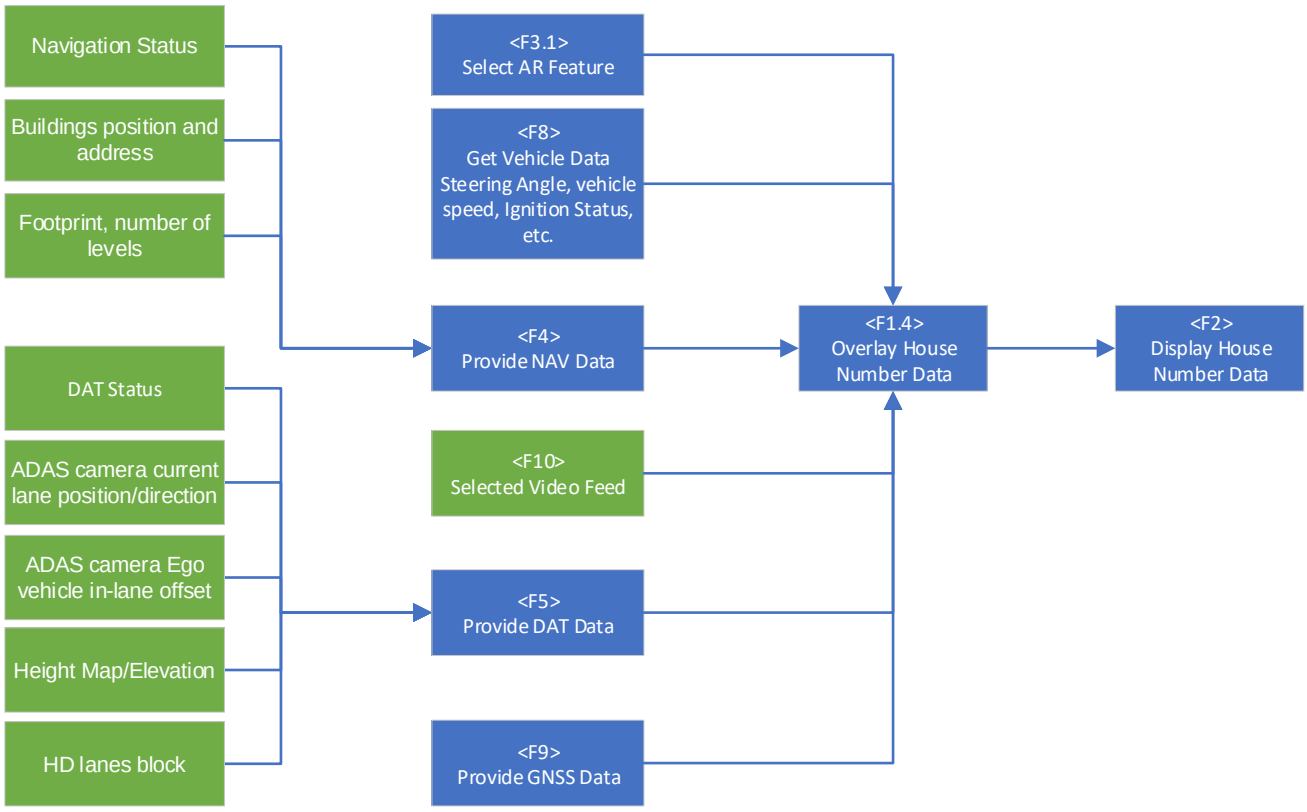


Figure 6: Context Diagram of Function Overlay House Number Data

4.4.6 Function Interfaces

4.4.6.1 Logical Inputs

Signal Name	Description
AR Feature Status	AR Feature Status (ON/OFF)
Navigation Status	Navigation status (ON/OFF)
Vehicle Data	Vehicle data (Steering Angle, vehicle speed, Ignition Status, etc.)
Buildings position and address	GPS point of house address of houses along the road, could just be center of the road at the middle of lot or more precise. Could be position of the building on the lot, distance from the road to place house number right at the building. Does not require active route. House number via navigation predicted route if route not active Prioritize the name of building/business (i.e. mall, restaurant...) Define common houses instead of numbers (e.g., friend house), so we show name of the house instead of house number
House number via navigation predicted route if route not active	House number via navigation predicted route if route not active

House number via voice command if route In- active	Provide house number via voice command if route not active
House number via voice command if route active	Provide house number via voice command if route active
Name of building/business	name of building/business (i.e. mall, restaurant...) , so we can prioritize it
Define common houses	Logic to define common houses instead of numbers (e.g., friend house), so we show name of the house instead of house number?
DAT Status	ADAS Status (ON/OFF).
ADAS camera current lane position/direction	Lane the ego vehicle is in when road has several lanes
ADAS camera Ego vehicle in-lane offset	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane
Height Map/Elevation	Vertical geometry, slope detection
HD lanes block	Change points of lanes geometry e.g. change from a 2 lane road to 3 lane road
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.4.6.2 Logical Outputs

Signal Name	Description
Overlay House Number Data	House number data overlaid on video feed
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.4.6.3 Logical Parameters

Parameter Name	Description

4.4.7 Function Modeling

4.4.7.1 Use Cases

4.4.7.2 State Charts

4.4.7.3 Activity Diagrams

4.4.7.4 Sequence Diagrams

4.4.7.5 Decision Tables

4.4.8 Function Requirements

4.4.8.1 Functional Requirements

4.4.8.1.1 Normal Operation

###R_FNC_AR_00025### Overlay House Number Data

The AR overlay house number function shall receive the logical input signals for active and inactive route as shown in section 4.4.3.1 (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00026### Overlay House Number Data on FIR/AR Camera Feed

The AR overlay house number function overlay house number data (active and inactive route) on video feed received from AR camera or FIR camera. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00027### Overlay House Number Data to HMI

The AR overlay house number function shall send the overlaid house number data (active and inactive route) to the HMI. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00028### Overlay House Number Data Trigger- Inactive Routing

With navigation routing disabled, the overlay house number function shall display a series of 4 House Numbers when approaching target house (house within FOV) and the vehicle speed is below 25 mph or below current residential speed limit. The trigger to this action is via a navigation predicted route (through adaptive vehicle workstream) if it is available or voice command (e.g., show me house number). (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00029### Overlay House Number Data Trigger End- Inactive Routing

With navigation routing disabled, the overlay house number function shall end display after TBD (e.g., time, distance, etc). (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00030### Overlay House Number Data Trigger- Active Routing

With navigation routing enabled, the overlay house number function shall display like a destination location POI. House number to be triggered by navigation as with any destination as the destination house within FOV. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00031### Overlay House Number Data Trigger End- Active Routing

With navigation routing enabled, the overlay house number function shall end display If the set or predicted destination house is approached reached. The checkered pattern near the house shall be displayed when reaching the destination, and the AR screen shall fade in 100ms and fade away after 4 seconds. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00032### Overlay House Number Data Display

The AR overlay house number function shall display the house number If destination house within FoV as follows.

1- 3D House POI starts appearing accompanied with TBT maneuvers.
2- The transition from a static small icon that gets bigger and gets more prominent and spatial as approaching the house.
3- If route is enabled 2D static info appear (2D Distance to House (with number) + 2D Street name +Next turn icon). Image to be added, not merged with AR screen but with map shifted and camera feed appears. Transition: fade out (TBD)

No screen trigger shall be required If house is not within the FoV or occluded by environmental elements.
(TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

4.4.8.1.2 Error Handling

4.4.8.2 Non-Functional Requirements

4.4.8.3 Functional Safety Requirements

FSR ID (from Feature Doc)	Requirement Title
…	

Table 14: FSRs satisfied by Logical Function

4.4.8.4 Other Requirements

4.4.8.4.1 Design Requirements

4.5 Logical Function "Overlay Point of Interest Data"- TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier

4.5.4 Function Overview

4.5.4.1 Function Description

This function will overlay POI navigation information on the video feed from the AR camera or FIR camera. Any POIs active in the navigation system are shown in the AR view. All POI related driver voice commands which are received from the navigation system will be displayed through AR view.

4.5.4.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.5.4.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			

Other Sources			

Table 15: Input Requirements/Documents

4.5.4.4 Assumptions

Refer to Feature document.

4.5.5 Function Scope

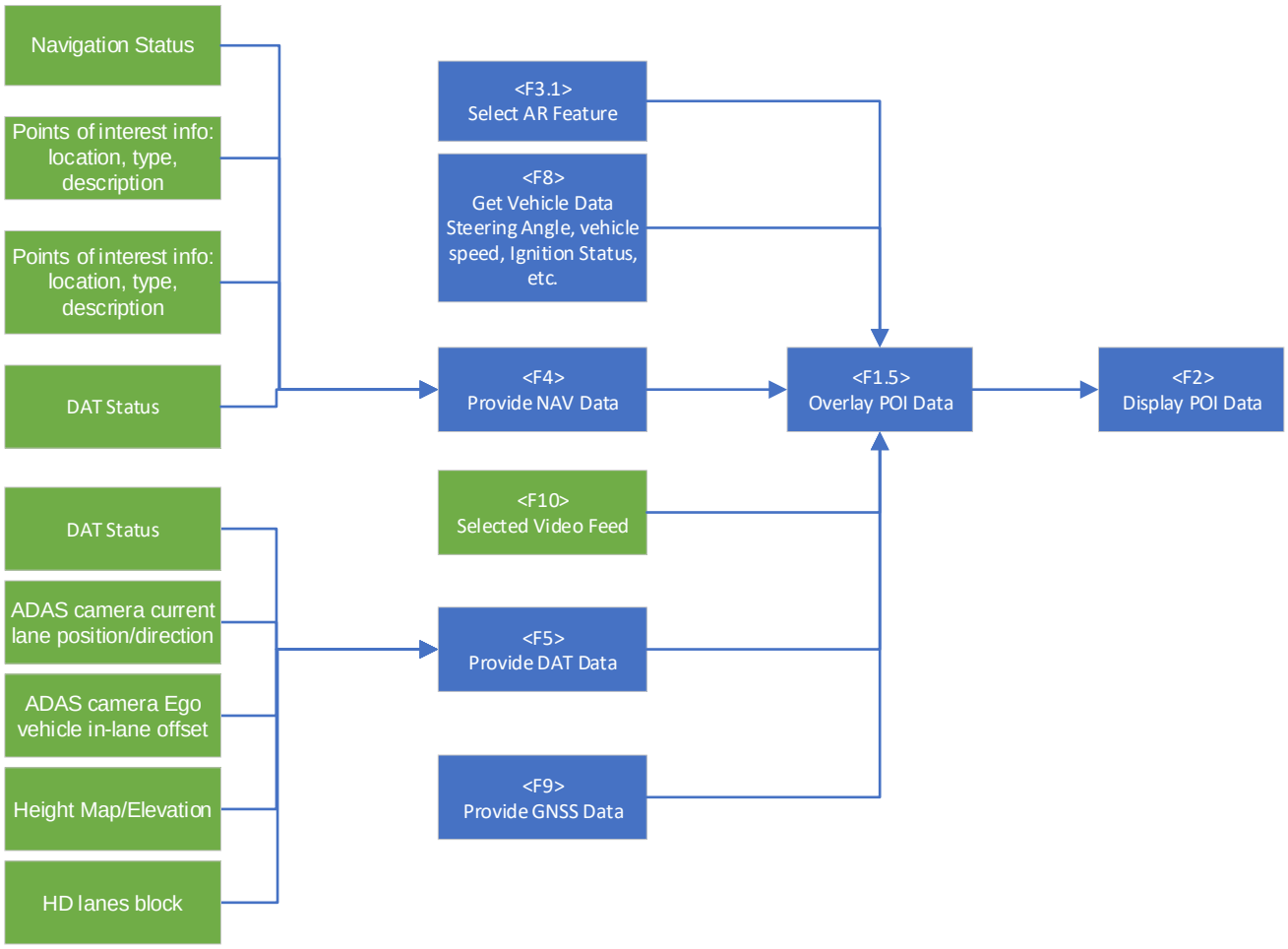


Figure 7: Context Diagram of Function Overlay POI Data

4.5.6 Function Interfaces

4.5.6.1 Logical Inputs

Signal Name	Description
AR Feature Status	AR Feature Status (ON/OFF)
Navigation Status	Navigation status (ON/OFF)
Vehicle Data	Vehicle data (Steering Angle, vehicle speed, Ignition Status, etc.)
Points of interest info: location, type, description	GPS location of location. Additional info required depending on UX requirement and availability on the map.
Conditional signals (for conditional POIs)	POI info categories that are required for the “smart selection” or personalization of POIs. Depends on what filters are required for the conditional POIs. No active routing required.
Footprint, number of levels, for façade highlighting	Building outline to support visualization of POIs. Footprint of building on lot and heights of building. No active routing required, it can be used for destination too.
POI_ Voice Command (Active Route)	voice command (e.g., show me gas station; show me Italian restaurant, etc.)
POI_ Voice Command (Inactive Route)	voice command (e.g., show me gas station; show me Italian restaurant, etc.)
DAT Status	ADAS Status (ON/OFF).
ADAS camera current lane position/direction	Lane the ego vehicle is in when road has several lanes
ADAS camera Ego vehicle in-lane offset	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane.
Height Map/Elevation	Vertical geometry, slope detection
HD lanes block	Change points of lanes geometry e.g. change from a 2 lane road to 3 lane road
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.5.6.2 Logical Outputs

Signal Name	Description
Overlay POI Data	POI Data overlaid on video feed
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.5.6.3 Logical Parameters

Parameter Name	Description
NA	

4.5.7 Function Modeling

4.5.7.1 Use Cases

4.5.7.2 State Charts

4.5.7.3 Activity Diagrams

4.5.7.4 Sequence Diagrams

4.5.7.5 Decision Tables

4.5.8 Function Requirements

4.5.8.1 Functional Requirements

4.5.8.1.1 Normal Operation

###R_FNC_AR_00033### Overlay Point of Interest Data

The AR overlay POI function shall receive the logical input signals as shown in section 4.5.3.1. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00034### Overlay Point of Interest Data on FIR/AR Camera Feed

The AR overlay POI function overlay POI data on video feed received from AR camera or FIR camera. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00035### Overlay Point of Interest Data to HMI Display

The AR overlay POI function shall send the overlaid POI data to the HMI display. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00036### Overlay Point of Interest Data Trigger – Active Route

The AR overlay POI function shall overlay any POIs active in the navigation system while the route is active, including any POIs triggered by a voice command (e.g., Show me pharmacies" "Show me restaurants). (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00037### Overlay Point of Interest Data Trigger – Inactive Route

The AR overlay POI function shall overlay any POIs triggered by a voice command (Show me all the pharmacies around" "Show me restaurants"), for inactive route. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00038### Overlay Conditional Point of Interest Data from Personalized Preferences/Smart Selection – with Inactive route

The AR overlay POI function shall overlay the conditional POIs based on the available user personalized preferences/activities/smart selection, in the inactive route. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

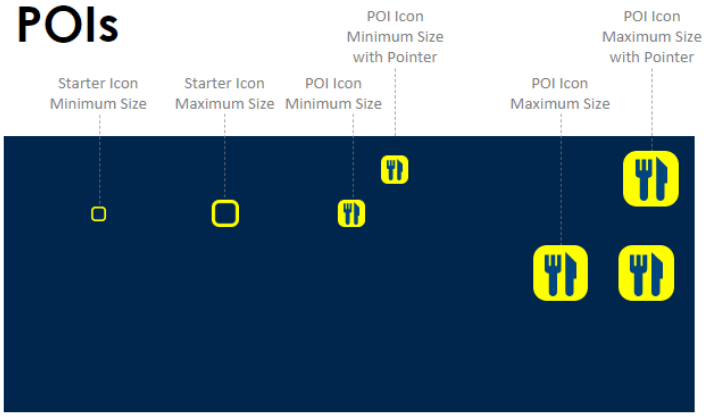
###R_FNC_AR_00039### Overlay Point of Interest Data Rendering Location

The AR overlay POI function shall display the POI location As vehicle approaches the POI, the vertical position of the POI icon translates relative to the camera FoV perspective. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00040### Display Point of Interest Data – Icon Size

The AR overlay POI function shall overlay the POI with below icon size. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).



i) The Minimum starter icon size: 4 millimeters starter square size for the HHDD
ii) Transition to POI icon when starter icon scale to 8 millimeters or greater
iii) The Minimum POI icon size is 8 millimeters
iv) The maximum POI icon size is 16 millimeters

End of Requirement

###R_FNC_AR_00041### Display Point of Interest Data – Active Routing

With navigation routing enabled, the AR overlay POI function shall treat POI like a destination location preferred POI.

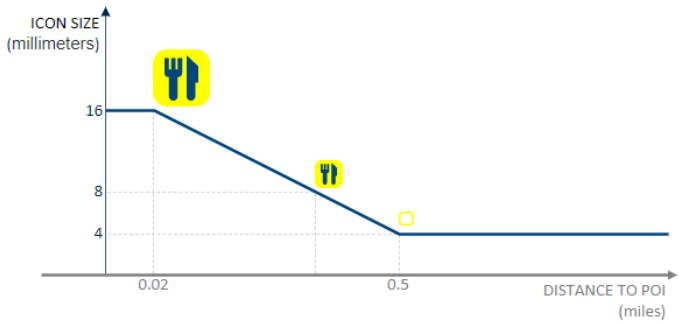
1- When POI is within FOV, then the 3D POI starts appearing as “Starter Icon” and “POI Icon” accompanied with Turn by Turn Path
2- Icon start transition from a static small square that gets bigger and gets more prominent and spatial as we approach the POI.

No AR screen trigger shall be required when a POI is outside the FoV.
(TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00042### Display Point of Interest Data – Icon Size Change vs Distance

The AR overlay POI function shall change the POI icon size, depends on the distance to the POI (as shown in Figure below). Greater than 0.5 miles away from POI, the Starter icon is 4 millimeters. The Starter icon starts scaling larger at a distance 0.5 miles away from the POI. The Starter icon transitions into the POI icon once it is scaled to 8 millimeters in size. Closer than 0.02 miles from the POI, the POI icon scaled to 16 millimeters and stops scaling up (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).



End of Requirement

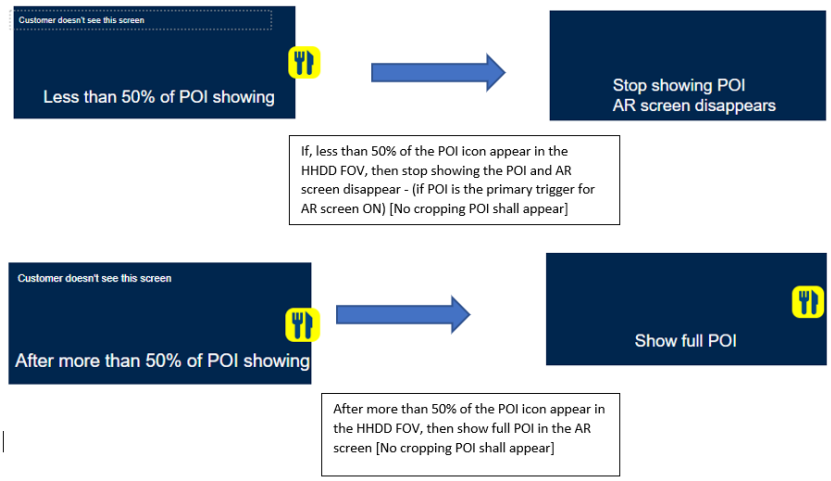
###R_FNC_AR_00043### Display Point of Interest Data – Fade In

The AR overlay POI function shall start showing POI when more than 50% of the actual POI showing at 100 ms fade-in. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00044### Display Point of Interest Data – Fade Out

The AR overlay POI function shall fade-out at 500 ms. When it's outside the FoV. No cropping of the POI is required (sticks and then fade away if less than 50% of POI showing within the location of the POI). As shown in the figure below, If, less than 50% of the POI icon appear in the HHDD FOV, then stop showing the POI and AR screen disappear – (if POI is the primary trigger for AR screen ON) [No cropping POI shall appear]. After more than 50% of the POI icon appear in the HHDD FOV, then show full POI in the AR screen [No cropping POI shall appear] (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).



End of Requirement

###R_FNC_AR_00045### Display Point of Interest Data – Color

The AR overlay POI function shall show the POI icon color as #ffff00. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

4.5.8.1.2 Error Handling

4.5.8.2 Non-Functional Requirements

4.5.8.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**

Table 16: FSRs satisfied by Logical Function

4.5.8.4 Other Requirements

4.5.8.4.1 Design Requirements

4.6 Logical Function "Overlay Destination Data"

4.6.4 Function Overview

4.6.4.1 Function Description

This function will overlay destination navigation information on the video feed from the AR camera or FIR camera.

4.6.4.2 Function Variants

Variant Name	**Variant Description**	**Variant Condition** (optional)
NA		

4.6.4.3 Input Requirements/Documents

Refer to Feature document.

Reference	**Section/Requirement**	**Description**	**Derived Requirement**

(Reference as listed in ch. "References")			(optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			

Table 17: Input Requirements/Documents

4.6.4.4 Assumptions

Refer to Feature document.

4.6.5 Function Scope

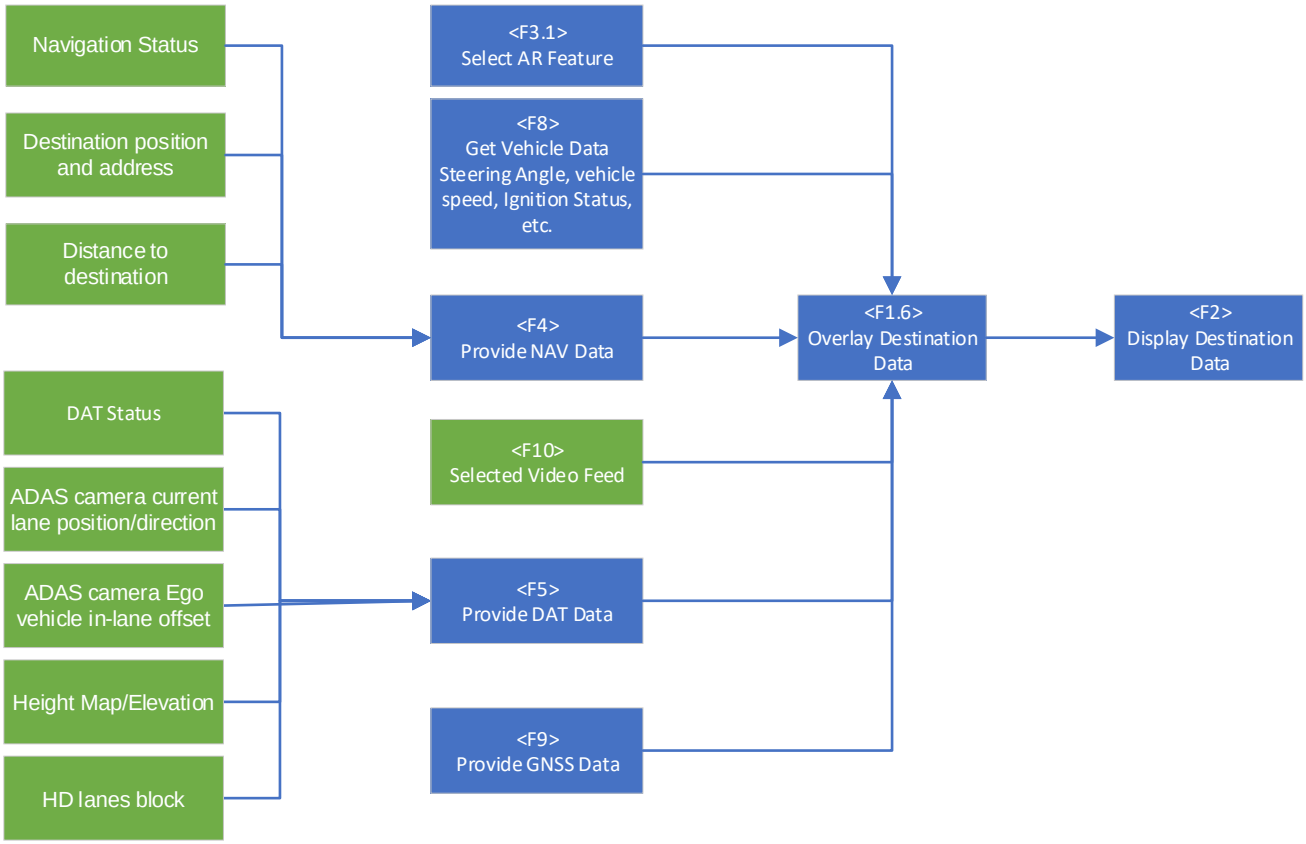


Figure 8: Context Diagram of Function Overlay Destination Data

4.6.6 Function Interfaces

4.6.6.1 Logical Inputs

The highlighted signals, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

Signal Name	Description
AR Feature Status	AR Feature Status (ON/OFF)
Navigation Status	Navigation status (ON/OFF)
Vehicle Data	Vehicle data (Steering Angle, vehicle speed, Ignition Status, etc.)
Destination position	GPS point of destination address.
Distance to destination	Value of distance to the destination.
Name of building/business	Name of building/business (i.e. mall, restaurant.)
Footprint, number of levels,	Building outline to support visualization of POIs. Footprint of building on lot and heights of building.
DAT Status	ADAS Status (ON/OFF).
ADAS camera current lane position/direction	Lane the ego vehicle is in when road has several lanes
ADAS camera Ego vehicle in-lane offset	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane
Height Map/Elevation	Vertical geometry, slope detection
HD lanes block	Change points of lanes geometry e.g. change from a 2 lane road to 3 lane road
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.6.6.2 Logical Outputs

Signal Name	Description
Overlay Destination Data	Data overlaid on video feed
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.6.6.3 Logical Parameters

Parameter Name	Description
NA	

4.6.7 Function Modeling

4.6.7.1 Use Cases

4.6.7.2 State Charts

4.6.7.3 Activity Diagrams

4.6.7.4 Sequence Diagrams

4.6.7.5 Decision Tables

4.6.8 Function Requirements

4.6.8.1 Functional Requirements

4.6.8.1.1 Normal Operation

###R_FNC_AR_00046### Overlay Destination Data

The AR overlay destination function shall receive the logical input signals as shown in section 4.6.3.1

End of Requirement

###R_FNC_AR_00047### Overlay Destination Data on FIR/AR Camera Feed

The AR overlay destination function shall overlay destination data on video feed received from AR camera or FIR camera.

End of Requirement

###R_FNC_AR_00048### Overlay Destination Data to HMI Display

The AR overlay destination function shall send the overlaid destination data to the HMI display.

End of Requirement

###R_FNC_AR_00049### Overlay Destination Data as POI

The AR overlay destination function shall display the destination POI on any location (final and/or waypoint) inputted by the user in the NAV system and marked the entrance of the destination building.

End of Requirement

###R_FNC_AR_00050### Overlay Destination Data Highlight Destination

The AR overlay destination function shall overlay rendered augmented Destination icons/symbols on the target destination by highlighting the destination to help driver locate the specific location of the place upon reaching the target destination, driver should be able to see the destination street address with destination icon.

End of Requirement

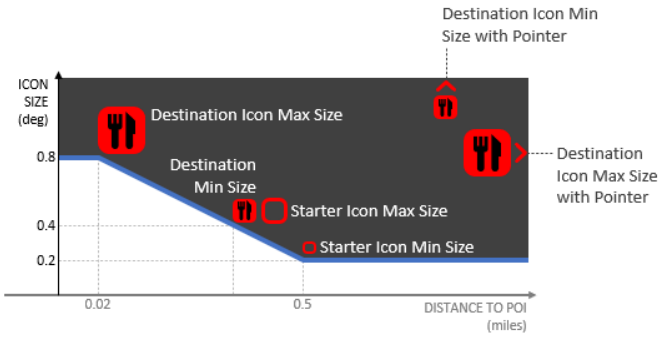
###R_FNC_AR_00051### Overlay Destination Data Show Pointed Arrow/Carpet

The AR overlay destination function shall show a pointed arrow as Lane guidance starting to merge (e.g. reduced arrow size) with the house entry or driveway as House or Destination is starting to show on the AR view.

End of Requirement

###R_FNC_AR_00052### Display Destination Data – Icon Size

The AR overlay destination function shall overlay the destination once the destination is within FoV, the 3D Destination starts appearing as “Starter Icon” and “POI Icon” accompanied with Turn by Turn Path when route is enabled). Transition from a static small red square that gets bigger and gets more prominent and spatial as we approach the destination as below.



1. The Minimum starter icon size: 4 millimeters starter square size for the HHDD
2. Transition to POI icon when starter icon scale to 8 millimeters or greater
3. The Minimum POI icon size is 8 millimeters
4. The maximum POI icon size is 16 millimeters
5. As shown in figure below, the POI icon size depends on the size. Greater than 0.5 miles away from POI, the Starter icon is 4 millimeters. The Starter icon starts scaling larger at a distance 0.5 miles away from the POI. The Starter icon transitions into the POI icon once it is scaled to 8 millimeters in size. Closer than 0.02 miles from the POI, the POI icon scaled to 16 millimeters and stops scaling up

End of Requirement

###R_FNC_AR_00053### Display Destination Data – Pointer Size

The AR overlay destination function shall show the destination (POI) icon pointer if the POI is outside the FoV with pointer size is 6 millimeters x 3.4 millimeters. The Pointer shall not scale with distance to destination/POI.

End of Requirement

###R_FNC_AR_00054### Display Destination Data – Fade In/Out

The AR overlay destination function shall show the destination icon with fade- in at 100 ms and AR view closes 4 seconds after reaching the destination.

End of Requirement

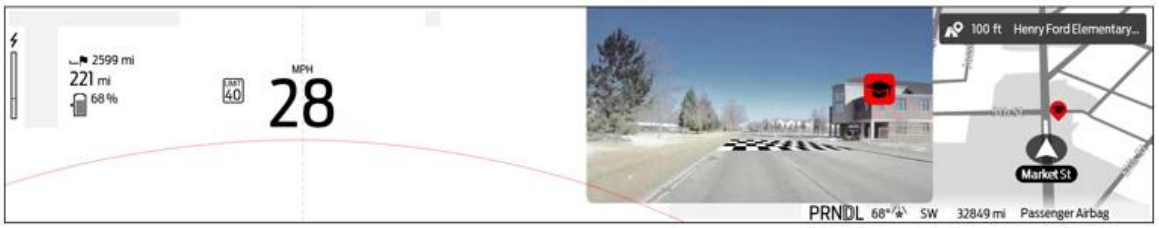
###R_FNC_AR_00055### Display Destination Data – Color

The AR overlay destination function shall show the destination icon color as red (#ff0000).

End of Requirement

###R_FNC_AR_00056### Display Destination Data – Checkered

When a destination is outside HHDD FOV, the AR overlay destination function shall trigger the AR screen and 2D map shall show the exact location of Destination – or a symbol on the checkered pattern is shown (or green square with arrow showing where the destination is geolocated). The 2D Destination name, + 2D Distance to maneuver, + 2D Next turn icon changes OR Highlight building inputted by user (final or/and waypoint). A checkered pattern (250 ms fade-in) is applied on the roadway adjacent to the destination location.



- A checkered pattern is applied on the roadway adjacent to the destination location.

Street Address (House Number) Destination

End of Requirement

4.6.8.1.2 Error Handling

4.6.8.2 Non-Functional Requirements

4.6.8.3 Functional Safety Requirements

FSR ID (from Feature Doc)	Requirement Title
…	

Table 18: FSRs satisfied by Logical Function

4.6.8.4 Other Requirements

4.6.8.4.1 Design Requirements

4.7 Logical Function “Overlay Blind Spot (BLIS) Data”

4.7.4 Function Overview

4.7.4.1 Function Description

This function will overlay blind spot (BLIS) information on the video feed from the AR camera or FIR camera.

4.7.4.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.7.4.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 19: Input Requirements/Documents

4.7.4.4 Assumptions

Refer to Feature document.

4.7.5 Function Scope

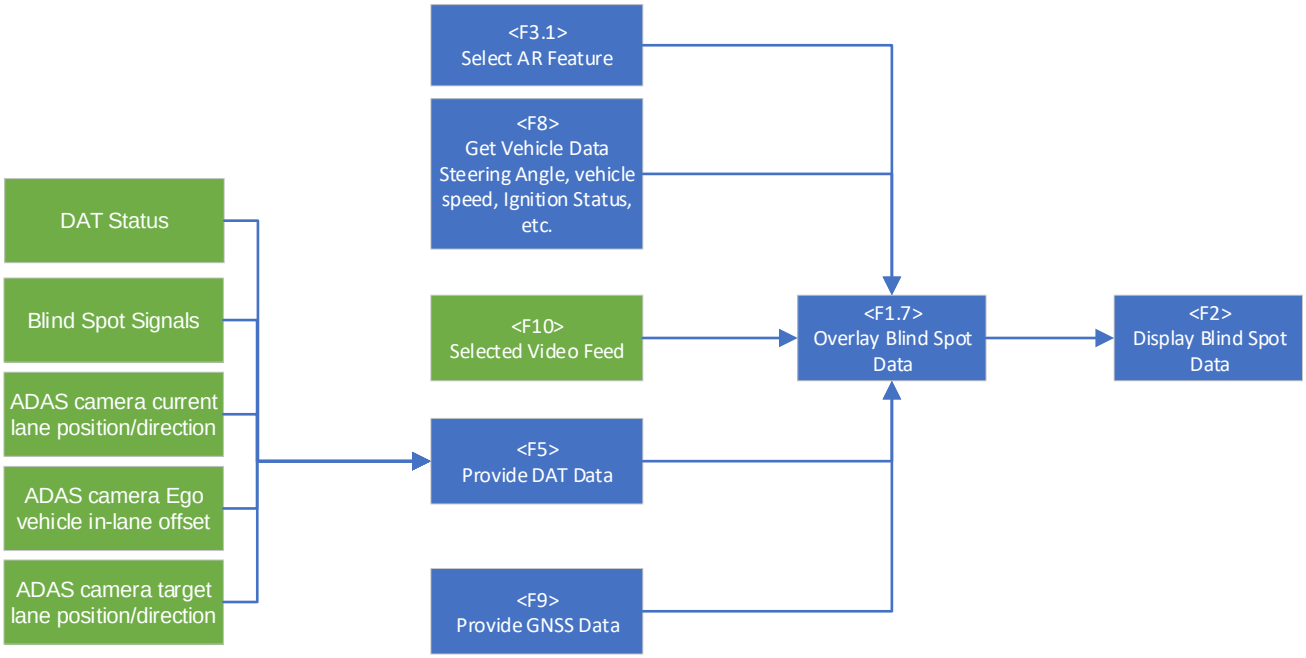


Figure 9: Context Diagram of Function Overlay BLIS Data

4.7.6 Function Interfaces

4.7.6.1 Logical Inputs

Signal Name	Description
AR Feature Status	AR Feature Status (ON/OFF)
SD map lane count info	Number of available lanes on the road the ego car is on
DAT Status	ADAS status (ON/OFF)
Vehicle Data	Vehicle data (Turn Signal Status, Steering Angle, vehicle speed, Ignition Status, etc.)
ADAS camera current lane position/direction	Lane the ego vehicle is in when road has several lanes
ADAS camera Ego vehicle in-lane offset	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane
ADAS camera target lane position/direction	Lane the car is heading to in a lane change, position of target lane, relative to vehicle frame
Blind Spot Signals	
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.7.6.2 Logical Outputs

Signal Name	Description
Overlay Blind Spot Data	Blind Spot Data overlaid on video feed
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.7.6.3 Logical Parameters

Parameter Name	Description
NA	

4.7.7 Function Modeling

4.7.7.1 Use Cases

4.7.7.1.1 Blind spot (BLIS)

4.7.7.2 State Charts

4.7.7.3 Activity Diagrams

4.7.7.4 Sequence Diagrams

4.7.7.5 Decision Tables

4.7.8 Function Requirements

4.7.8.1 Functional Requirements

4.7.8.1.1 Normal Operation

###R_FNC_AR_00057### Overlay Blind Spot Data

The AR overlay blind spot function shall receive the logical input signals as shown in section 4.7.3.1

End of Requirement

###R_FNC_AR_00058### Overlay Blind Spot Data on FIR/AR Camera Feed

The AR overlay blind spot function shall overlay blind spot data on video feed received from AR camera or FIR camera.

End of Requirement

###R_FNC_AR_00059### Overlay Blind Spot Data to HMI Display

The AR overlay blind spot function shall send the overlaid blind spot data to the HMI display.

End of Requirement

###R_FNC_AR_00060### Overlay Blind Spot Data – Trigger

The AR overlay blind spot function shall overlay rendered augmented Carpet image with BLIS symbol on top of it as warning on the left/right line of the vehicle, when the corresponding ADAS system triggers the BLIS status/alerts and in the same direction the left/right turn indicator signal has been turned ON by the driver.

End of Requirement

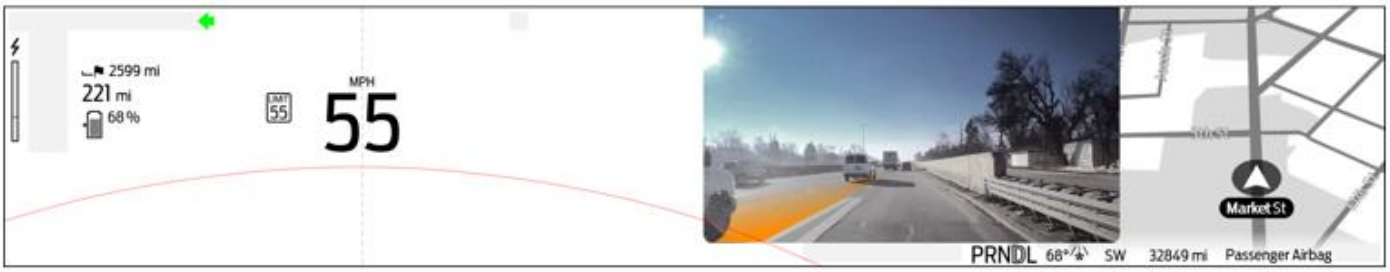
###R_FNC_AR_00061### Overlay Blind Spot Data Trigger- Exit

The AR overlay blind spot function shall stop rendering when the trigger is completed (e.g., signal indicator is deactivated, ADAS activate BLIS is cleared.

End of Requirement

###R_FNC_AR_00062### Overlay Blind Spot Data Carpet Color

The AR overlay blind spot function shall overlay the blind spot with “Amber (color: #ff8c00)” Carpet color.



End of Requirement

4.7.8.1.2 Error Handling

4.7.8.2 Non-Functional Requirements

4.7.8.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 20: FSRs satisfied by Logical Function

4.7.8.4 Other Requirements

4.7.8.4.1 Design Requirements

4.8 Logical Function "Overlay Lane Low Visibility Data" – MVP+ variant – (ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

4.8.4 Function Overview

4.8.4.1 Function Description

The function will overlay lane information on the video feed from the AR camera or FIR camera to show the most likely path for the driver (i.e., navigation without a route set). The function shall be triggered through a readily available Vigilance control (i.e., dead man's switch) on steering wheel (and Voice Recognition Command control (e.g. "Help me see"), on HMI display when the driver activates this function due to Lane Low Visibility due to rain, fog, bad weather, mud or debris covering the actual lane markings of the road.

4.8.4.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.8.4.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 21: Input Requirements/Documents

4.8.4.4 Assumptions

Refer to Feature document.

4.8.5 Function Scope

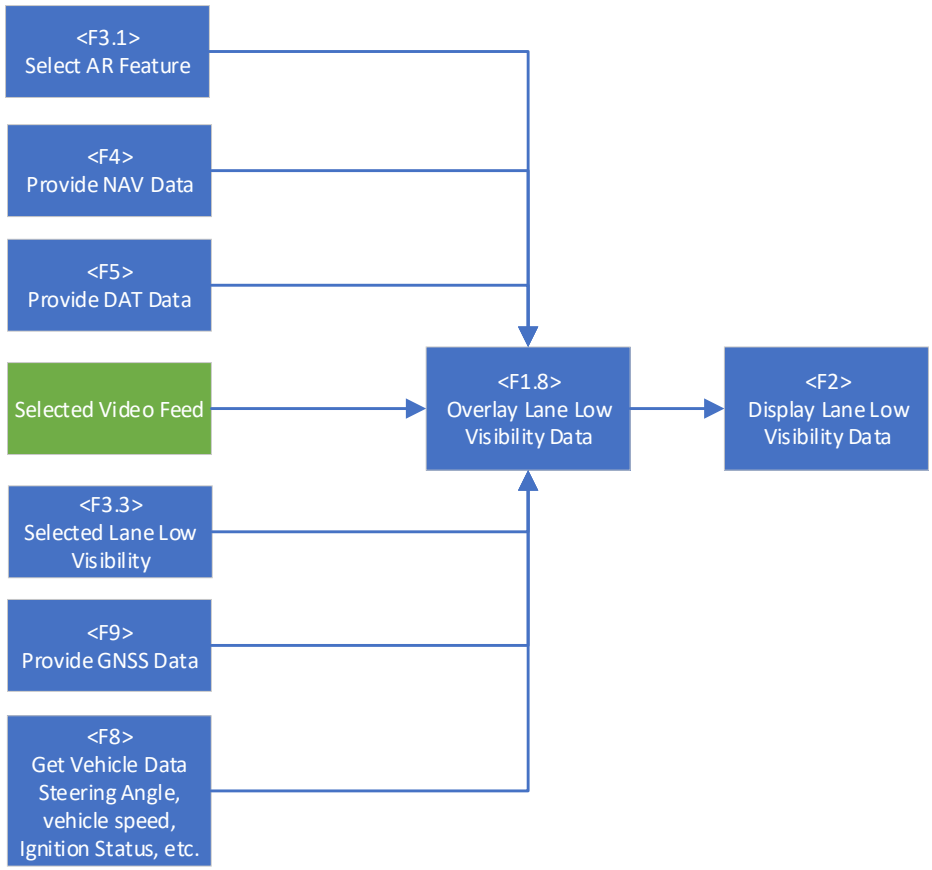


Figure 10: Context Diagram of Function Overlay Lane Low Visibility Data

4.8.6 Function Interfaces

4.8.6.1 Logical Inputs

Signal Name	Description
Vehicle Mode Status	Vehicle mode of operation
AR Feature Status	AR Feature Status (ON/OFF)
Navigation Status	Navigation status (ON/OFF)
Navigation Data	Navigation data
ADAS Status	ADAS status (ON/OFF)
Lane Low Visibility Status	Lane low visibility trigger switch
ADAS camera current lane position/direction	Lane the ego vehicle is in when road has several lanes

ADAS camera Ego vehicle in-lane offset	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane
SD map lane count info	Number of available lanes on the road the ego car is on
Lane markings type	Marking type e.g. solid, dotted, double line. Lane type e.g. bike lane, HOVs etc.
Vehicle Data	Rain Sensor Signal / other visibility triggers
GNSS Data	GNSS/GPS data from TCU.
Video Mode	Mode of operation (Enable/Disable)

4.8.6.2 Logical Outputs

Signal Name	Description
Overlay line low visibility Data	line low visibility Data overlaid “Positioning the lane based upon the road geometry” on video feed
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.8.6.3 Logical Parameters

Parameter Name	Description
NA	

4.8.7 Function Modeling

4.8.7.1 Use Cases

4.8.7.2 State Charts

4.8.7.3 Activity Diagrams

4.8.7.4 Sequence Diagrams

4.8.7.5 Decision Tables

4.8.8 Function Requirements

4.8.8.1 Functional Requirements

4.8.8.1.1 Normal Operation

###R_FNC_AR_00063### Overlay Lane Low Visibility Data

The AR overlay lane low visibility function shall receive the logical input signals as shown in section 4.8.3.1(MVP+ variant – ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

###R_FNC_AR_00064### Overlay Lane Low Visibility Data on FIR/AR Camera Feed

The AR overlay lane low visibility function shall overlay Positioning the lane based upon the road geometry data on video feed received from AR camera or FIR camera. (MVP+ variant – ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

###R_FNC_AR_00065### Overlay Lane Low Visibility Data to HMI Display

The AR overlay lane low visibility function shall send the overlaid lane low visibility data to the HMI display. (MVP+ variant – ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

###R_FNC_AR_00066### Overlay Lane Low Visibility Data Rendering

The AR overlay lane low visibility function shall overlay rendered augmented Lane Low Visibility data as a visual image path on the road within the road boundaries by showing a pointed arrow and carpet same as green NAV path; pointed arrow is always included) lay down on the road/street at the request of the driver. (MVP+ variant – ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

###R_FNC_AR_00067### Overlay Lane Low Visibility Data Trigger

The AR overlay lane low visibility function shall be triggered when the driver presses a button on the steering wheel (Vigilance control switch, i.e. dead man's switch) or through voice command. Deactivate 30 seconds after triggers no longer meet thresholds for activation or driver pushes the steering wheel control. (MVP+ variant – ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

###R_FNC_AR_00068### Overlay Lane Low Visibility Carpet

The Carpet of the AR overlay lane low visibility function shall be configurable, and the length is a function of speed, start at the bottom of the screen and extends as the speed increases. Path shall show and a "box" around lead vehicle boundaries.

1. When activated the icon changes to the deactivate icon.
2. Once the featured is turned on by driver action (i.e., SW button push or voice command) a path arrow appears to communicate the ideal driving path. The amber color (color2: #ff8c00) is a reminder to the driver to maintain a conservative speed in accordance with traffic flow during the low visibility situation.
3. Lead objects are identified with amber bracket metaphor (color2: #ff8c00) . Minimum bracket height is 0.4 deg (8 mm). Minimum bracket stroke is 0.35 mm (RQT-002003-021811 Symbol Usage & Legibility).
4. Bracket metaphor follows scaling profile of POI icon.

(MVP+ variant – ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

4.8.8.1.2 Error Handling

4.8.8.2 Non-Functional Requirements

4.8.8.3 Functional Safety Requirements

FSR ID (from Feature Doc)	Requirement Title
…	

Table 22: FSRs satisfied by Logical Function

4.8.8.4 Other Requirements

4.8.8.4.1 Design Requirements

4.9 **Logical Function "Overlay Lane Level Guidance Data" –**MVP+ variant – (ongoing discussion with CIED team if it can be moved to MVP or post <J1> ; currently not available from Google – pending discussion with alternative map supplier and getting data from ADAS

4.9.4 Function Overview

4.9.4.1 Function Description

This function will overlay rendered augmented Lane Level Guidance with a path/arrow to follow rather than abstract instructions to the driver for situational awareness of the driver to show the preferred lane (entry, exit, machine learning…), guide away from obstacle or hazards that will determine if it is clear and do the lateral motion to move into the desired lane. This function related to overlay turn by turn function.

Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.9.4.2 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			

Legal Regulations			
Industry Standards			
Other Sources			

Table 23: Input Requirements/Documents

4.9.4.3 Assumptions

Refer to Feature document.

4.9.5 Function Scope

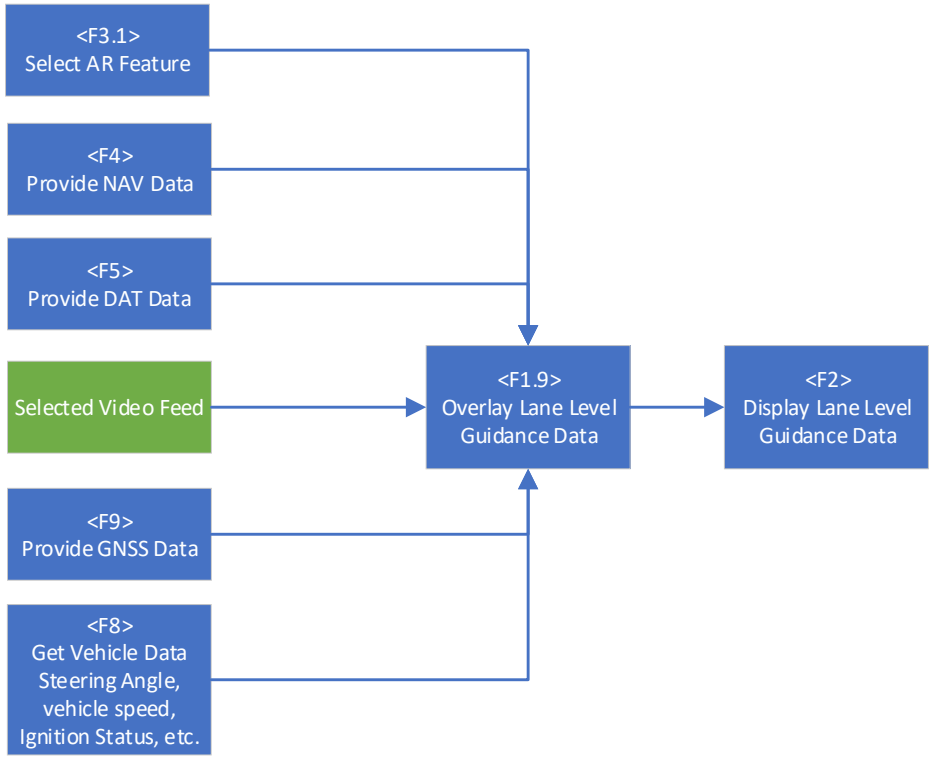


Figure 11: Context Diagram of Function Overlay Lane level Guidance Data

4.9.6 Function Interfaces

4.9.6.1 Logical Inputs

Signal Name	Description
Vehicle Mode Status	Vehicle mode of operation
AR Feature Status	AR Feature Status (ON/OFF)
Navigation Status	Navigation status (ON/OFF)
Navigation Data	Navigation data
ADAS Status	ADAS status (ON/OFF)
Vehicle Data	Vehicle data (Steering Angle, vehicle speed, Ignition Status, etc.)
ADAS camera current lane position/direction	Lane the ego vehicle is in when road has several lanes
ADAS camera Ego vehicle in-lane offset	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane
Lane markings type	Marking type e.g. solid, dotted, double line. Lane type e.g. bike lane, HOVs etc.
HD lanes block	Change points of lanes geometry e.g. change from a 2 lane road to 3 lane road
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.9.6.2 Logical Outputs

Signal Name	Description
Overlay Lane level Guidance Data	Lane level Guidance Data overlaid on video feed.
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.9.6.3 Logical Parameters

Parameter Name	Description
NA	

4.9.7 Function Modeling

4.9.7.1 Use Cases

4.9.7.2 State Charts

4.9.7.3 Activity Diagrams

4.9.7.4 Sequence Diagrams

4.9.7.5 Decision Tables

4.9.8 Function Requirements

4.9.8.1 Functional Requirements

4.9.8.1.1 Normal Operation

###R_FNC_AR_00069### Overlay Lane level guidance Data

The AR overlay lane low visibility function shall receive the logical input signals as shown in section 4.9.3.1 (MVP+ variant - (ongoing discussion with CIED team if it can be moved to MVP or post <J1> ; currently not available from Google – pending discussion with alternative map supplier and getting data from ADAS)

End of Requirement

###R_FNC_AR_00070### Overlay Lane level guidance Data on FIR/AR Camera Feed

The AR overlay lane level guidance function shall overlay lane level guidance data on video feed received from AR camera or FIR camera. (MVP+ variant - (ongoing discussion with CIED team if it can be moved to MVP or post <J1> ; currently not available from Google – pending discussion with alternative map supplier and getting data from ADAS)

End of Requirement

###R_FNC_AR_00071### Overlay Lane level guidance Data to HMI

The AR overlay lane level guidance function shall send the overlaid lane level guidance data to the HMI. (MVP+ variant - (ongoing discussion with CIED team if it can be moved to MVP or post <J1> ; currently not available from Google – pending discussion with alternative map supplier and getting data from ADAS)

End of Requirement

###R_FNC_AR_00072### Overlay Lane level guidance Data Rendering

The AR overlay lane level guidance function shall display a path/arrow to show the preferred lane for the driver to follow. (MVP+ variant - (ongoing discussion with CIED team if it can be moved to MVP or post <J1> ; currently not available from Google – pending discussion with alternative map supplier and getting data from ADAS)

- Path arrow color (or texture) changes to amber (color[1]: #ff8c00) to communicate the need to reduce speed to comfortable complete the maneuver or check speed relative to a detected object (e.g., pedestrian).

IR View

End of Requirement

###R_FNC_AR_00073### Overlaid Lane Level Guidance Trigger point

The AR overlay lane level guidance function shall display the lane change path only when the next lane level guidance distance d_{LLG_city} is 0.25 mile for city and d_{LLG_hwy} is 1.0 mile for highway and maneuver is within FoV.
No AR screen shall be triggered if the turn by turn maneuver is not within the FoV. (MVP+ variant - (ongoing discussion with CIED team if it can be moved to MVP or post <J1> ; currently not available from Google – pending discussion with alternative map supplier and getting data from ADAS)

End of Requirement

###R_FNC_AR_00074### Overlaid Lane Level Guidance Trigger point – Configurable

The lane level guidance distance for city and highway (d_{LLG_city} and d_{LLG_hwy}) shall be configurable parameters and the value will be based on the available data from navigation. (MVP+ variant - (ongoing discussion with CIED team if it can be moved to MVP or post <J1> ; currently not available from Google – pending discussion with alternative map supplier and getting data from ADAS)

End of Requirement

###R_FNC_AR_00075### Overlaid Lane Level Guidance Data Display

The AR overlay lane level guidance function shall display the Lane Level Guidance (3D lane change path, if lane data and lane positioning available). If no lane change is required and vehicle is in the correct lane same behavior as Turn By Turn green path. 2D Street name + 2D Distance to maneuver + Next turn icon change shall be displayed. (MVP+ variant - (ongoing discussion with CIED team if it can be moved to MVP or post <J1> ; currently not available from Google – pending discussion with alternative map supplier and getting data from ADAS)

End of Requirement

4.9.8.1.2 Error Handling

4.9.8.2 Non-Functional Requirements

4.9.8.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 24: FSRs satisfied by Logical Function

4.9.8.4 Other Requirements

4.9.8.4.1 Design Requirements

4.10 Logical Function "Overlay Lane Biasing Data" – MVP+ variant - (ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

4.10.4 Function Overview

4.10.4.1 Function Description

This function will overlay rendered augmented Lane Biasing with a highlight of the object and correlate that object to the slight change in path to the right/left side of the road when the car is biasing to the right/left side of the lane because of an oncoming object on the left/right side of the vehicle.
.

Variants

Variant Name	**Variant Description**	**Variant Condition** (optional)
NA		

4.10.4.2 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	**Section/Requirement**	**Description**	**Derived Requirement** (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			

Legal Regulations			
Industry Standards			
Other Sources			

Table 25: Input Requirements/Documents

4.10.4.3 Assumptions

Refer to Feature document.

4.10.5 Function Scope

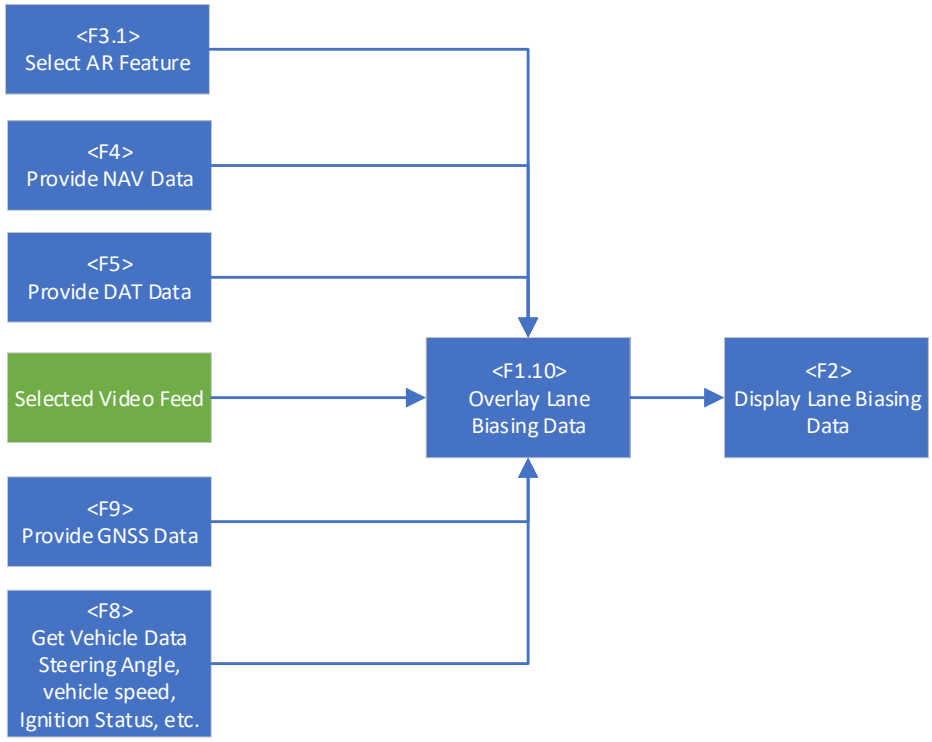


Figure 12: Context Diagram of Function Overlay Lane Biasing Data

4.10.6 Function Interfaces

4.10.6.1 Logical Inputs

Signal Name	Description
Vehicle Mode Status	Vehicle mode of operation
AR Feature Status	AR Feature Status (ON/OFF)
Navigation Status	Navigation status (ON/OFF)
ADAS Status	ADAS status (ON/OFF)
Vehicle Data	Vehicle data (Steering Angle, vehicle speed, Ignition Status, etc.)
Highway assist status	Highway Assist Status
ADAS camera current lane position/direction	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane
ADAS camera Ego vehicle in-lane offset	Number of available lanes on the road the ego car is on
SD map lane count info	Marking type e.g. solid, dotted, double line. Lane type e.g. bike lane, HOVs etc.
HD lanes block	Lane the ego vehicle is in when road has several lanes
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.10.6.2 Logical Outputs

Signal Name	Description
Overlay Lane Biasing Data	Lane Biasing Data overlaid on video feed.
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.10.6.3 Logical Parameters

Parameter Name	Description
NA	

4.10.7 Function Modeling

4.10.7.1 Use Cases

4.10.7.2 State Charts

4.10.7.3 Activity Diagrams

4.10.7.4 Sequence Diagrams

4.10.7.5 Decision Tables

4.10.8 Function Requirements

4.10.8.1 Functional Requirements

4.10.8.1.1 Normal Operation

###R_FNC_AR_00076### Overlay Lane Biasing Data

The AR overlay lane biasing function shall receive the logical input signals as shown in section 4.10.3.1 (MVP+ variant - ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

###R_FNC_AR_00077### Overlay Lane Biasing Data on FIR/AR Camera Feed

The AR overlay lane biasing function shall overlay lane biasing data on video feed received from AR camera or FIR camera. (MVP+ variant - ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

###R_FNC_AR_00078### Overlay Lane Biasing Data to HMI

The AR overlay lane biasing function shall send the overlaid lane biasing data to the HMI. (MVP+ variant - ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

###R_FNC_AR_00079### Overlay Lane Biasing Trigger Start/End

The AR overlay lane biasing function shall trigger the AR screen when ADAS lane biasing signal is active (when the car is biasing to the left or right side of the lane because of an oncoming object) and exit the AR screen when the ADAS lane biasing signal is cleared. (MVP+ variant - ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

###R_FNC_AR_00080### Overlay Lane Biasing Data Rendering

The AR overlay lane biasing function shall display the guidance metaphor as the intended path of the vehicle within the lane prior to making the maneuver. Prior to the maneuver, the potential hazard that triggered the system to perform the lane biasing is marked to communicate the driver why the vehicle is deviating from the center of the lane. The metaphor is persistent until the maneuver is complete. The visual treatment of lane biasing shall be like turn by turn specification. (MVP+ variant - ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

End of Requirement

4.10.8.1.2 Error Handling

4.10.8.2 Non-Functional Requirements

4.10.8.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 26: FSRs satisfied by Logical Function

4.10.8.4 Other Requirements

4.10.8.4.1 Design Requirements

4.11 **Logical Function "Overlay Highway Assist Data" –**Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

4.11.1 Function Overview

4.11.1.1 Function Description

This function will overlay rendered Highway Assist/Active drive assist data with a highlight representation of the path of the Blue Zones on the highway. The AR highway assist metaphor shall persistent until the Blue Zone comes to an end.

Variants

Variant Name	**Variant Description**	**Variant Condition** (optional)
NA		

4.11.1.2 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	**Section/Requirement**	**Description**	**Derived Requirement** (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			

Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 27: Input Requirements/Documents

4.11.1.3 Assumptions

Refer to Feature document.

4.11.2 Function Scope

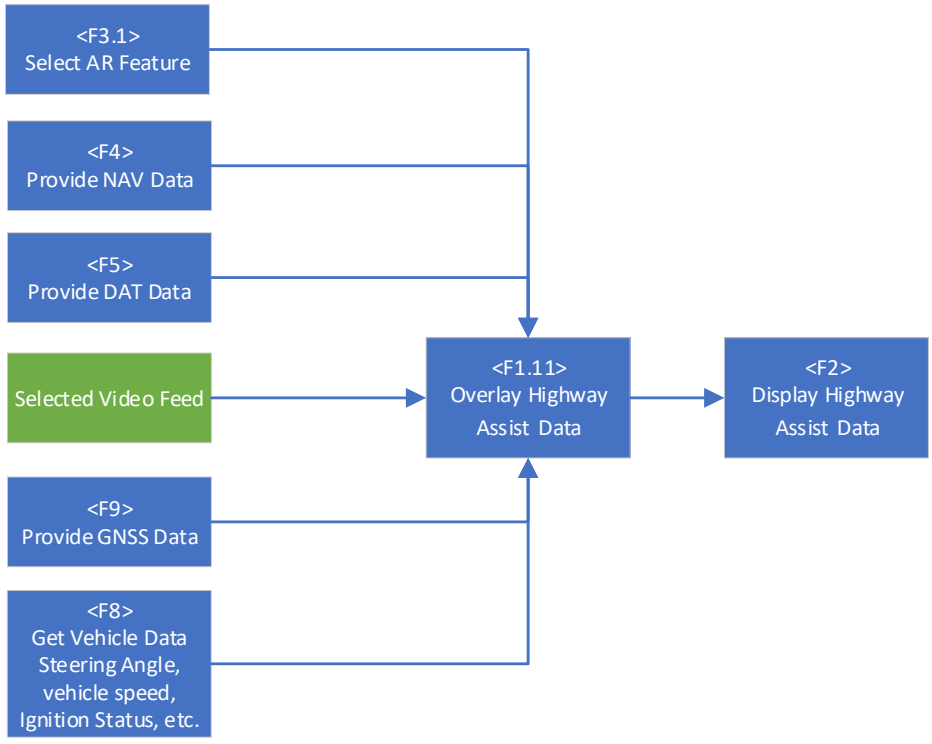


Figure 13: Context Diagram of Function Overlay Highway Assist Data

4.11.3 Function Interfaces

4.11.3.1 Logical Inputs

Signal Name	Description
Vehicle Mode Status	Vehicle mode of operation
Navigation Status	Navigation status (ON/OFF)
AR Feature Status	AR Feature Status (ON/OFF)
ADAS Status	ADAS status (ON/OFF)
Vehicle Data	Vehicle data (Steering Angle, vehicle speed, Ignition Status, etc.)
Highway assist status	Highway assist status data
ADAS camera current lane position/direction	Lane the ego vehicle is in when road has several lanes
ADAS camera Ego vehicle in-lane offset	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane
SD map lane count info	Number of available lanes on the road the ego car is on
HD lanes block	Marking type e.g. solid, dotted, double line. Lane type e.g. bike lane, HOVs etc.
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.11.3.2 Logical Outputs

Signal Name	Description
Overlay Highway Assist Data	Highway Assist Data overlaid on video feed.
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.11.3.3 Logical Parameters

Parameter Name	Description
NA	

4.11.4 Function Modeling

4.11.4.1 Use Cases

4.11.4.2 State Charts

4.11.4.3 Activity Diagrams

4.11.4.4 Sequence Diagrams

4.11.4.5 Decision Tables

4.11.5 Function Requirements

4.11.5.1 Functional Requirements

4.11.5.1.1 Normal Operation

###R_FNC_AR_00081### Overlay Highway Assist

The AR overlay Highway Assist function shall receive the logical input signals as shown in section 4.11.3.1 (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

###R_FNC_AR_00082### Overlay Highway Assist on FIR/AR Camera Feed

The AR overlay Highway Assist function shall overlay Highway Assist data on video feed received from AR camera or FIR camera. (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

###R_FNC_AR_00083### Overlay Highway Assist to HMI

The AR overlay Highway Assist function shall send the overlaid Highway Assist data to the HMI. (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

###R_FNC_AR_00084### Overlay Highway Assist Trigger

The AR overlay Highway Assist function shall trigger the AR screen when ADA (highway assist) signal is active. (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

###R_FNC_AR_00085### Overlay Highway Assist Rendering

The AR overlay Highway Assist function shall highlight/marked the path of the Blue Zones on the highway until the Blue Zone comes to an end.
When user is in ADA mode: - if NAV already ON then the green path becomes blue to represent Highway assist. If NAV is OFF, AR screen is triggered and Blue path (same behavior as Turn By Turn Nav path) appears to represent Highway Assist. 2. Blue Zones are areas specified by Ford where the user can drive autonomously. (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

###R_FNC_AR_00086### Overlay Highway Assist Path Color

The AR overlay Highway Assist function shall render the path based on:

i) When ADA mode is active and NAV is ON, then the green path becomes blue to represent Highway assist.

ii) When ADA mode is active and NAV is OFF, then AR screen is triggered and Blue path (same behavior as Turn By Turn Nav path) appears to represent Highway Assist.

iii) When ADA mode is inactive; then AR screen shall not be triggered.

Note: Blue Zones are areas specified by Ford where the user can drive autonomously. (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

4.11.5.1.2 Error Handling

4.11.5.2 Non-Functional Requirements

4.11.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 28: FSRs satisfied by Logical Function

4.11.5.4 Other Requirements

4.11.5.4.1 Design Requirements

4.12 Logical Function "Overlay Assist Lane Change Data" – Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

4.12.1 Function Overview

4.12.1.1 Function Description

This function will overlay rendered Assist Lane Change data with a highlight representation of the proposed path for a lane change to be performed by the vehicle. The AR metaphor is persistent until the Lane Change Assists comes to an end.

Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.12.1.2 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 27: Input Requirements/Documents

4.12.1.3 Assumptions

Refer to Feature document.

4.12.2 Function Scope

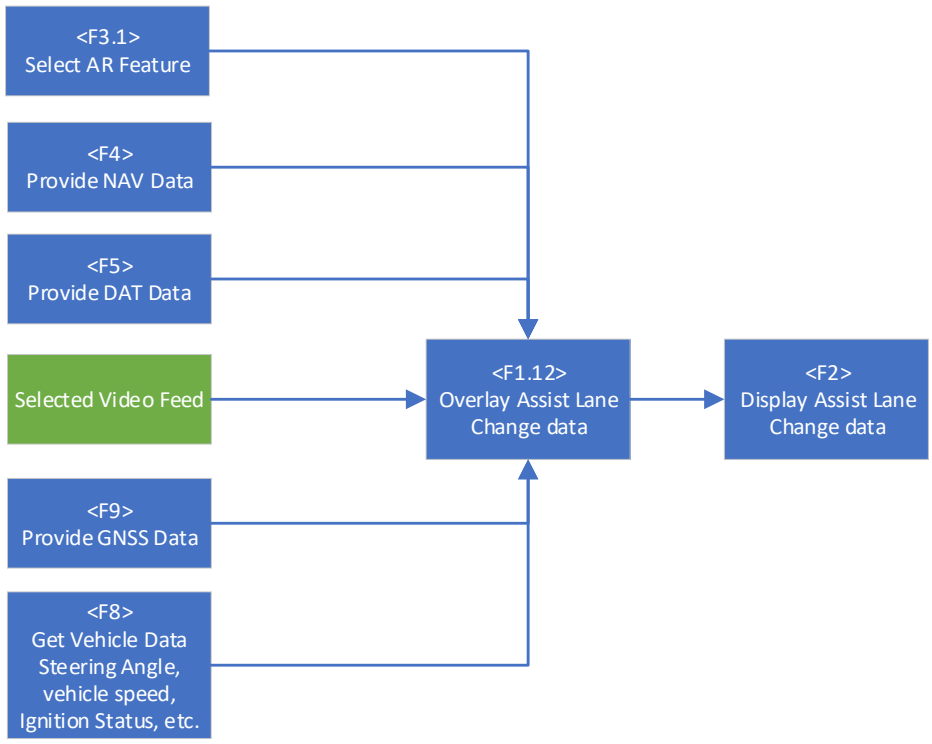


Figure 14: Context Diagram of Function Overlay Assist Lane Change data

4.12.3 Function Interfaces

4.12.3.1 Logical Inputs

Signal Name	Description
Vehicle Mode Status	Vehicle mode of operation
AR Feature Status	AR Feature Status (ON/OFF)
Navigation Status	Navigation status (ON/OFF)
ADAS Status	ADAS status (ON/OFF)
Vehicle Data	Vehicle data (Steering Angle, vehicle speed, Ignition Status, etc.)
ADAS camera current lane position/direction	Lane the ego vehicle is in when road has several lanes
ADAS camera Ego vehicle in-lane offset	Position of ego car in the actual lane its driving in, lane marking relative to ego car, to align rendering to middle of lane
ADAS camera target lane position/direction	Number of available lanes on the road the ego car is on
SD map lane count info	Marking type e.g. solid, dotted, double line. Lane type e.g. bike lane, HOVs etc.

Speed limit value	Speed limit value
Lane type and restrictions	Lane type and restrictions
Left/Right indicator signal	Left/Right indicator signal
Lane change restrictions	Lane change restrictions
GNSS Data	GNSS/GPS data from TCU.
Video Feed	Selected video feed.

4.12.3.2 Logical Outputs

Signal Name	Description
Overlay Assist Lane Change data	Assist Lane Change data overlaid on video feed.
Video Control Signal	Control signal to trigger the video feed to the HMI On and OFF

4.12.3.3 Logical Parameters

Parameter Name	Description
NA	

4.12.4 Function Modeling

4.12.4.1 Use Cases

4.12.4.2 State Charts

4.12.4.3 Activity Diagrams

4.12.4.4 Sequence Diagrams

4.12.4.5 Decision Tables

4.12.5 Function Requirements

4.12.5.1 Functional Requirements

4.12.5.1.1 Normal Operation

###R_FNC_AR_00087### Overlay Assist Lane Change Data

The AR overlay Assist Lane Change function shall receive the logical input signals as shown in section 4.12.3.1 (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

###R_FNC_AR_00088### Overlay Assist Lane Change Data on FIR/AR Camera Feed

The AR overlay Assist Lane Change function shall overlay Assist Lane Change data on video feed received from AR camera or FIR camera. (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

###R_FNC_AR_00089### Overlay Assist Lane Change Data to HMI

The AR overlay Assist Lane Change function shall send the overlaid Assist Lane Change data to the HMI. (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

###R_FNC_AR_00090### Overlay Assist Lane Change Trigger

The AR overlay Assist Lane Change function shall trigger the AR screen when the assist lane change ADAS signal is active. (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

###R_FNC_AR_00091### Overlay Assist Lane Change Data Rendering

The AR overlay Assist Lane Change function shall highlight the proposed path for a lane change to be performed by the vehicle. The AR metaphor is persistent until the Lane Change Assists comes to an end. (Far variant (ongoing discussion with CIED team if it can be moved to MVP or MVP+ or post <J1>)

End of Requirement

4.12.5.1.2 Error Handling

4.12.5.2 Non-Functional Requirements

4.12.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 28: FSRs satisfied by Logical Function

4.12.5.4 Other Requirements

4.12.5.4.1 Design Requirements

4.13 Logical Function “Perform Calibration

4.13.1 Function Overview

4.13.1.1 Function Description

This function will perform calibration process for AR/FIR cameras during EOL and service.

Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.13.1.2 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 27: Input Requirements/Documents

4.13.1.3 Assumptions

Refer to Feature document.

4.13.2 Function Scope

Figure 15: Context Diagram of Function Perform Calibration

4.13.3 Function Interfaces

4.13.3.1 Logical Inputs

Signal Name	Description
Start EOL Calibration	
Start Service Calibration	

4.13.3.2 Logical Outputs

Signal Name	Description

4.13.3.3 Logical Parameters

Parameter Name	Description
NA	

4.13.4 Function Modeling

4.13.4.1 Use Cases

4.13.4.2 State Charts

4.13.4.3 Activity Diagrams

4.13.4.4 Sequence Diagrams

4.13.4.5 Decision Tables

4.13.5 Function Requirements

4.13.5.1 Functional Requirements

4.13.5.1.1 Normal Operation

###R_FNC_AR_00092### Perform Calibration

The Perform Calibration function shall receive the logical input signals as shown in section 4.13.3.1

End of Requirement

###R_FNC_AR_00093### AR Calibration - EOL

The Perform Calibration function shall be able to select between AR/FIR camera to perform EOL calibration for each camera.

End of Requirement

###R_FNC_AR_00094### AR Calibration - Service

The Perform Calibration shall be able to perform Service Calibration for AR camera or FIR camera.

End of Requirement

4.13.5.1.2 Error Handling

4.13.5.2 Non-Functional Requirements

4.13.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 28: FSRs satisfied by Logical Function

4.13.5.4 Other Requirements

4.13.5.4.1 Design Requirements

4.14 Logical Function "Perform OTA Update"

4.14.1 Function Overview

4.14.1.1 Function Description

This function will receive and perform fast OTA updates.

Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.14.1.2 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 27: Input Requirements/Documents

4.14.1.3 Assumptions

Refer to Feature document.

4.14.2 Function Scope

Figure 16: Context Diagram of Function Perform OTA Update

4.14.3 Function Interfaces

4.14.3.1 Logical Inputs

Signal Name	Description
OTA Software Update	

4.14.3.2 Logical Outputs

Signal Name	Description

4.14.3.3 Logical Parameters

Parameter Name	Description
NA	

4.14.4 Function Modeling

4.14.4.1 Use Cases

4.14.4.2 State Charts

4.14.4.3 Activity Diagrams

4.14.4.4 Sequence Diagrams

4.14.4.5 Decision Tables

4.14.5 Function Requirements

4.14.5.1 Functional Requirements

4.14.5.1.1 Normal Operation

###R_FNC_AR_00095### Perform OTA Update

The Perform OTA Update function shall receive the logical input signals as shown in section 4.14.3.1

End of Requirement

###R_FNC_AR_00096### Fast OTA Capability

The Perform OTA Update function shall be capable to receive fast OTA (Over the Air) software updates.

End of Requirement

4.14.5.1.2 Error Handling

4.14.5.2 Non-Functional Requirements

4.14.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 28: FSRs satisfied by Logical Function

4.14.5.4 Other Requirements

4.14.5.4.1 Design Requirements

4.15 Logical Function “Display Augmented Reality”

4.15.1 Function Overview

4.15.1.1 Function Description

The function will display augmented reality overlay data to the screen HHDD.

4.15.1.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.15.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 30: Input Requirements/Documents

4.15.1.4 Assumptions

Refer to Feature document.

4.15.2 Function Scope

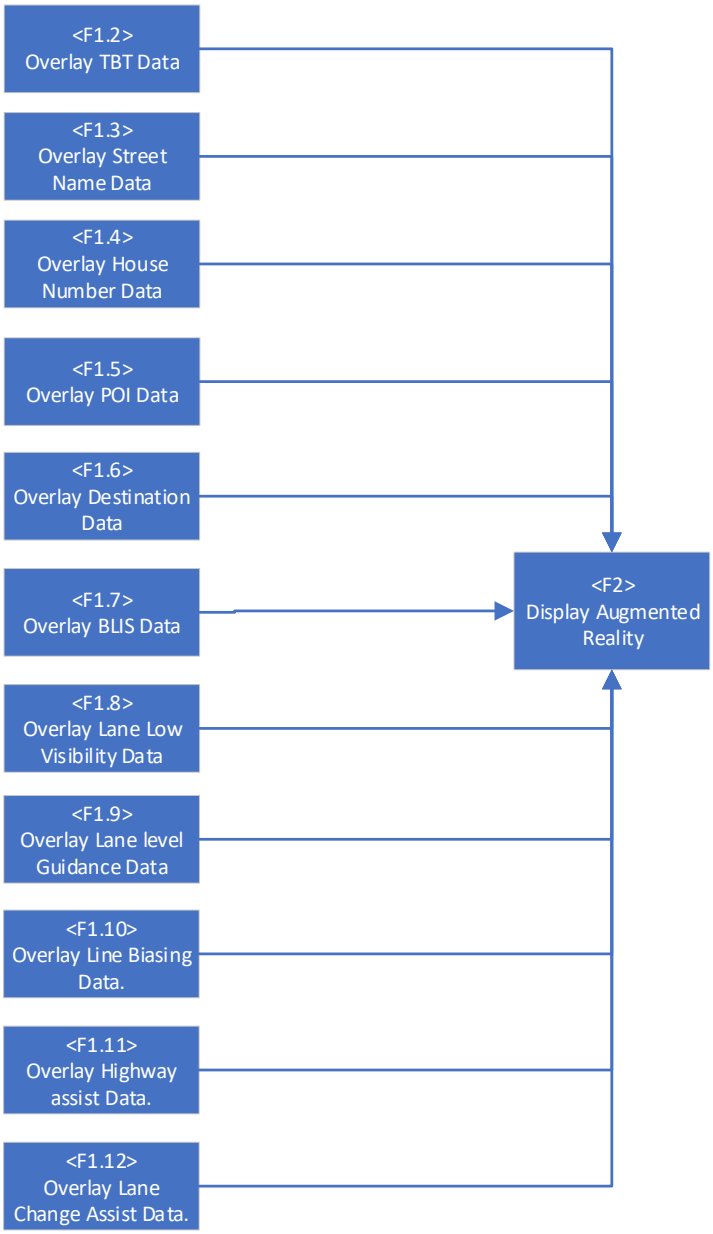


Figure 16: Context Diagram of Function Display Augmented Reality Data

4.15.3 Function Interfaces

4.15.3.1 Logical Inputs

Signal Name	Description
Overlay TBT data	TBT Data overlaid on video feed.
Overlay Street Name	Street Name Data overlaid on video feed.
Overlay House Number	House Number Data overlaid on video feed.

Overlay POI	POI Data overlaid on video feed.
Overlay Destination	Destination Data overlaid on video feed.
Overlay BLIS	BLIS Data overlaid on video feed.
Overlay Lane Low Visibility	Lane Low Visibility Data overlaid on video feed.
Overlay Lane level Guidance Data	Lane level Guidance Data overlaid on video feed.
Overlay Line Biasing Data	Line Biasing Data overlaid on video feed.
Overlay Highway Assist Data.	Highway Assist Data overlaid on video feed.
Overlay Lane Change Assist Data	Lane Change Assist Data overlaid on video feed

4.15.3.2 Logical Outputs

Signal Name	Description
Display AR	Display (TBT, Street Name, House Number, POI, Destination, BLIS, Lane Low Visibility, Lane Level Guidance, Line Biasing, Highway Assist, Lane Change Assist) data.

4.15.3.3 Logical Parameters

Parameter Name	Description
NA	

4.15.4 Function Modeling

4.15.4.1 Use Cases

4.15.4.2 State Charts

4.15.4.3 Activity Diagrams

4.15.4.4 Sequence Diagrams

4.15.4.5 Decision Tables

4.15.5 Function Requirements

4.15.5.1 Functional Requirements

4.15.5.1.1 Normal Operation

###R_FNC_AR_00097### Display Augmented Reality

The AR display function shall receive the logical input signals as shown in section 4.15.3.1

End of Requirement

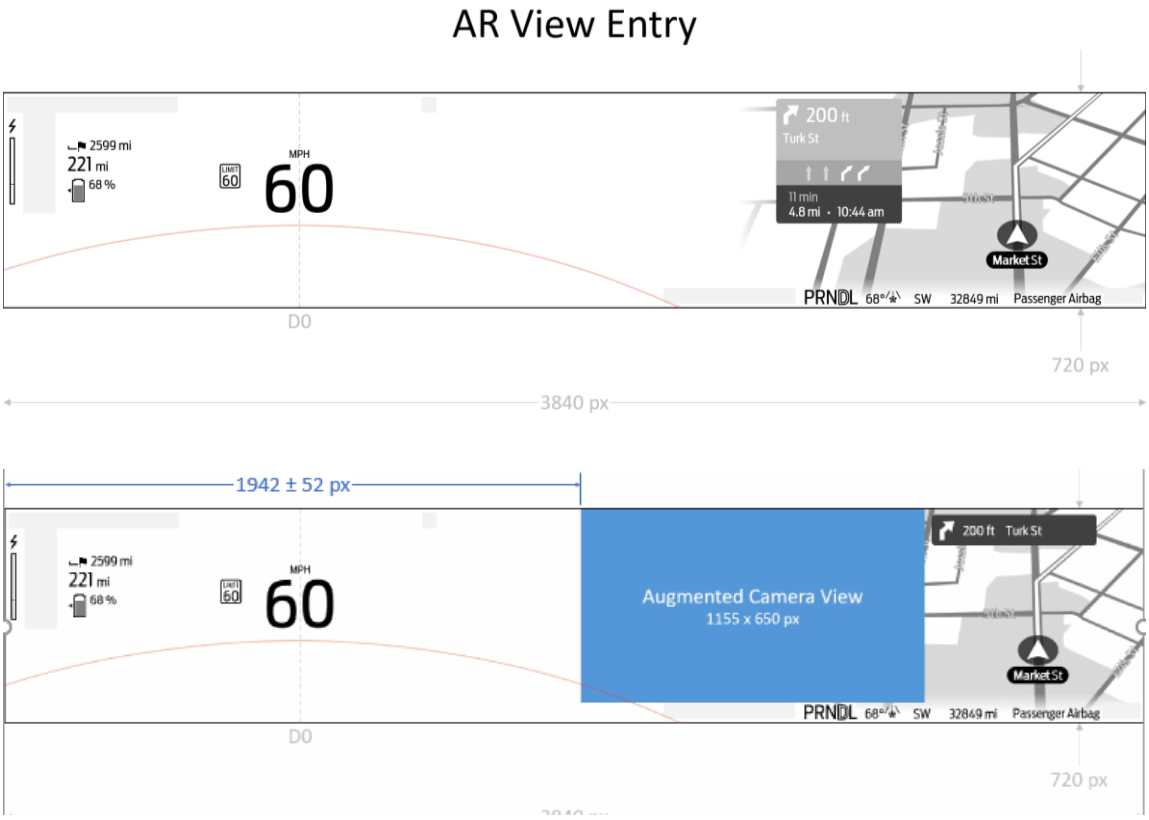
###R_FNC_AR_00098### Display Augmented Reality to HMI

The AR display function shall display the output in section 5.1.3.2 to the HMI based on rendering priority in feature document – Req #00092.

End of Requirement

###R_FNC_AR_00099### Display Augmented Reality Time Period

The AR display function shall stop AR event display once the AR event ends.
Example, of the turn by turn as below



End of Requirement

4.15.5.1.2 Error Handling

4.15.5.2 Non-Functional Requirements

4.15.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	Requirement Title

…	

Table 31: FSRs satisfied by Logical Function

4.15.5.4 Other Requirements

4.15.5.4.1 Design Requirements

4.16 Logical Function “Select AR Feature”

4.16.1 Function Overview

4.16.1.1 Function Description

The function will provide the user the option to enable/disable the augmented reality feature from HMI interphase.

4.16.1.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.16.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 32: Input Requirements/Documents

4.16.1.4 Assumptions

Refer to Feature document.

4.16.2 Function Scope

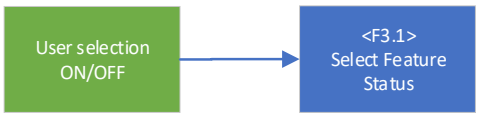


Figure 17: Context Diagram of Function Select AR Feature Status

4.16.3 Function Interfaces

4.16.3.1 Logical Inputs

Signal Name	Description
User Select Feature Status	User select feature status from HMI (ON/OFF)

4.16.3.2 Logical Outputs

Signal Name	Description
AR Feature Status	AR Feature Status (ON/OFF)

4.16.3.3 Logical Parameters

Parameter Name	Description
NA	

4.16.4 Function Modeling

4.16.4.1 Use Cases

4.16.4.2 State Charts

4.16.4.3 Activity Diagrams

4.16.4.4 Sequence Diagrams

4.16.4.5 Decision Tables

4.16.5 Function Requirements

4.16.5.1 Functional Requirements

4.16.5.1.1 Normal Operation

###R_FNC_AR_00100### Select AR Feature Status

The select AR feature status function shall receive the logical input signals as shown in section 4.16.3.1

End of Requirement

###R_FNC_AR_00101### Select AR Feature Status on HMI

The select AR feature status function shall provide an HMI option to turn AR feature ON or OFF.

End of Requirement

###R_FNC_AR_00102### Select AR Feature Status Trigger

The select AR feature status function shall be available both physically (soft button) and through spoken Voice Recognition (VR Command). A visual feedback to the driver selection shall be displayed

End of Requirement

###R_FNC_AR_00103### Select AR Feature Status Default State

The AR feature status function shall have the default ON state.

End of Requirement

4.16.5.1.2 Error Handling

4.16.5.2 Non-Functional Requirements

4.16.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 33: FSRs satisfied by Logical Function

4.16.5.4 Other Requirements

4.16.5.4.1 Design Requirements

4.17 Logical Function “Select Video Background”

4.17.1 Function Overview

4.17.1.1 Function Description

The function will provide the user the option to select between the AR camera or the FIR camera to be used as an input to the overlay functions if vehicle equipped with FIR camera.

4.17.1.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.17.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 34: Input Requirements/Documents

4.17.1.4 Assumptions

Refer to Feature document.

4.17.2 Function Scope

Figure 18: Context Diagram of Function Select Video Background

4.17.3 Function Interfaces

4.17.3.1 Logical Inputs

Signal Name	Description
User Select Video Background	User select video background from HMI (Enable/Disable)

4.17.3.2 Logical Outputs

Signal Name	Description
Video Background	Video background selected from HMI (Enable/Disable)

4.17.3.3 Logical Parameters

Parameter Name	Description
NA	

4.17.4 Function Modeling

4.17.4.1 Use Cases

4.17.4.2 State Charts

4.17.4.3 Activity Diagrams

4.17.4.4 Sequence Diagrams

4.17.4.5 Decision Tables

4.17.5 Function Requirements

4.17.5.1 Functional Requirements

4.17.5.1.1 Normal Operation

###R_FNC_AR_00104### Select Video Background

The select video background function shall receive the logical input signals as shown in section 4.17.3.1

End of Requirement

###R_FNC_AR_00105### Select Video Background Trigger

The AR select video background function shall provide the driver an HMI control, both physical and spoken Voice Recognition Commands to Select AR Video mode.

1. Enable (default) – The AR feature shall switch automatically between the AR vs FIR camera based on the level of lights.
2. Disable – the AR feature shall use AR visible camera only

A visual feedback to the driver selection shall be displayed

End of Requirement

###R_FNC_AR_00106### Select Video Background Change Setting

The customer selection shall stay as driver preference for the coming ignition cycles unless the driver overwrite it in HMI setting.

End of Requirement

4.17.5.1.2 Error Handling

4.17.5.2 Non-Functional Requirements

4.17.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 35: FSRs satisfied by Logical Function

4.17.5.4 Other Requirements

4.17.5.4.1 Design Requirements

4.18 Logical Function "Select Lane Low Visibility"

MVP+ variant - (ongoing discussion with CIED team if it can be moved to MVP or post <J1>)

4.18.1 Function Overview

4.18.1.1 Function Description

The function will provide the user the option to turn ON/OFF the lane low visibility overlay function.

4.18.1.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.18.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 36: Input Requirements/Documents

4.18.1.4 Assumptions

Refer to Feature document.

4.18.2 Function Scope

Figure 19: Context Diagram of Function Select Lane Low Visibility

4.18.3 Function Interfaces

4.18.3.1 Logical Inputs

Signal Name	Description
User Select Lane Low Visibility	User select lane low visibility from HMI (ON/OFF)

4.18.3.2 Logical Outputs

Signal Name	Description
Lane Low Visibility Trigger	Lane low visibility ON/OFF

4.18.3.3 Logical Parameters

Parameter Name	Description
NA	

4.18.4 Function Modeling

4.18.4.1 Use Cases

4.18.4.2 State Charts

4.18.4.3 Activity Diagrams

4.18.4.4 Sequence Diagrams

4.18.4.5 Decision Tables

4.18.5 Function Requirements

4.18.5.1 Functional Requirements

4.18.5.1.1 Normal Operation

###R_FNC_AR_00107### Select- Lane Low Visibility

The select lane low visibility function shall receive the logical input signals as shown in section 4.18.3.1

End of Requirement

###R_FNC_AR_00108### Select- Lane Low Visibility Trigger

AR Lane Low Visibility Trigger shall provide an HMI option to trigger lane low visibility both through:

1. Vigilance control (i.e., dead man's switch) on steering wheel. The visual feedback of driver selection shall be different.
2. Driver voice command.

A visual feedback to the driver selection shall be displayed

End of Requirement

4.18.5.1.2 Error Handling

4.18.5.2 Non-Functional Requirements

4.18.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 37: FSRs satisfied by Logical Function

4.18.5.4 Other Requirements

4.18.5.4.1 Design Requirements

4.19 **Logical Function "Provide Navigation Data"-** TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier

4.19.1 Function Overview

4.19.1.1 Function Description

This function provides navigation data needed for augmented reality overlay function with and without active route.

4.19.1.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.19.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 38: Input Requirements/Documents

4.19.1.4 Assumptions

Refer to Feature document.

4.19.2 Function Scope

Figure 20: Context Diagram of Function Provide Navigation Data

4.19.3 Function Interfaces

4.19.3.1 Logical Inputs

Highlighted signals currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier

Signal Name	Description
lane count info	Number of lanes available on the road.
Speed limit value	Value of speed limit on current part of road.
Route geometry	Shape of the route, polynomial description of the road in front, e.g. to determine what part is in sight to align street signs to turn to the road orientation. Also, to visualize road restrictions to prevent turns.
Elevation data / 3D Road Geometry	A set of point along the route with height data (road or route profile). It is needed to adjust AR object created in the distance to upcoming slopes/hills.
Distance to next maneuver	Distance value to the next turn in the routing. Only w/ routing active.
Maneuver intersection geo location	lat/lon- GPS points. Size of the crossroad. Type of Cross road (T/X shaped).
Maneuver street name	Name of the next street to turn on in the active route. Can also be general direction e.g. off a highway towards a city. Only w/ routing active, not required for "free driving".
Maneuver phases from navigation system	Map Tile - graph of road links around Ego vehicle Roundabout radius/Geometry Detailed information about Round about exits.
Road network geometry and topology (roundabout geometry)	Physical layout of the road and roads connected. Dimensions and positions of the roads e.g. connected to a roundabout.
Following maneuver info	Maneuvers followed in close distance, used only in situation like "turn left, then right and right again". Only w/ routing active, not required for "free driving".
Road links street names	Street names passing along the route but not to turn. Just for info, not turn advise of active route.
Buildings position and address	GPS point of house/ building address.
House number via navigation predicted route for Inactive route	House number via navigation predicted route if route not active

House number via voice command for Inactive route	Provide house number via voice command if route not active
House number via voice command for active route	Provide house number via voice command if route active
Name of building/business	Name of building/business (i.e. mall, restaurant.)
Define common houses	Logic to define common houses instead of numbers (e.g., friend house), so we show name of the house instead of house number?
Destination position and address	GPS point of destination address.
Distance to destination	Value of distance to the destination.
Road restrictions (e.g. school, no entry, etc.)	Road segment restrictions to avoid action of driver.
Points of interest info: location, type, description	GPS location of location. Additional info required depending on UX requirement and availability on the map.
Conditional signals (for conditional POIs)	POI info categories that are required for the "smart selection" or personalization of POIs. Depends on what filters are required for the conditional POIs. No active routing required.
Footprint, number of levels, for façade highlighting	Building outline to support visualization of POIs. Footprint of building on lot and heights of building. No active routing required, bt can be used for destination too.
POI_ Voice Command (Active Route)	voice command (e.g., show me gas station; show me Italian restaurant, etc.)
POI_ Voice Command (Inactive Route)	voice command (e.g., show me gas station; show me Italian restaurant, etc.)

4.19.3.2 Logical Outputs

Signal Name	Description
Navigation Data	Provide the required data from NAV with and without active route to support the overlay functions.

4.19.3.3 Logical Parameters

Parameter Name	Description
NA	

4.19.4 Function Modeling

4.19.4.1 Use Cases

4.19.4.2 State Charts

4.19.4.3 Activity Diagrams

4.19.4.4 Sequence Diagrams

4.19.4.5 Decision Tables

4.19.5 Function Requirements

4.19.5.1 Functional Requirements

4.19.5.1.1 Normal Operation

###R_FNC_AR_00109### Provide Turn by turn (TBT) Navigation Data / Active Route

Provide Navigation Data function shall provide the signals related to turn by turn with active route

End of Requirement

###R_FNC_AR_00110### Provide Street Name Navigation Data

Provide Navigation Data function shall provide the signals related to street name and its position to 1 meter accuracy for all the streets on the ways to the destined path (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00111### Provide House Number Navigation Data

Provide Navigation Data function shall provide the house numbers information with GPS coordinates to 1 meter accuracy both in an active route and non-active navigation route. (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00112### Provide POI Navigation Data with and without active Route

Provide Navigation Data function shall provide the POI location signals in terms of Lat/Long/Alt in order to position the POI within (TBD) accuracy to the position of the POI main entrance with and without active route (TBD for MVP variant, currently not available due to Google signal availability, pending ongoing discussions for alternative map supplier).

End of Requirement

###R_FNC_AR_00113### Provide Destination Navigation Data

Provide Navigation Data function shall provide the destination data which includes GPS coordinates (Lat/Long/Alt) in order the position the destination beacon 1 meter accurate

End of Requirement

4.19.5.1.2 Error Handling

4.19.5.2 Non-Functional Requirements

4.19.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 39: FSRs satisfied by Logical Function

4.19.5.4 Other Requirements

4.19.5.4.1 Design Requirements

4.20 Logical Function "Provide DAT Data"

4.20.1 Function Overview

4.20.1.1 Function Description

This function provides ADAS related data needed (shown in section 4.20.3.1) for augmented reality overlay functions.

4.20.1.2 Function Variants

Variant Name	**Variant Description**	**Variant Condition** (optional)
NA		

4.20.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	**Section/Requirement**	**Description**	**Derived Requirement** (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			

Other Sources			

Table 40: Input Requirements/Documents

4.20.1.4 Assumptions

Refer to Feature document.

4.20.2 Function Scope

Figure 21: Context Diagram of Function Provide DAT Data

4.20.3 Function Interfaces

4.20.3.1 Logical Inputs

Signal Name	Description
ADAS Status	ADAS status (ON/OFF)
Current lane position/direction	Current lane position/direction from ADAS
Ego vehicle in-lane offset	Ego vehicle in-lane offset from ADAS
HD lanes block	HD lanes block from ADAS
Lane markings type	Lane markings type from ADAS
Height Map/Elevation	Height Map/Elevation from ADAS
Target lane position/direction	Target lane position/direction from ADAS
Object collision warning signal	Object collision warning signal from ADAS
Distance to object	Distance to object from ADAS
Object position	Object position from ADAS
Object size	Change points of lanes geometry e.g. change from a 2-lane road to 3 lane road

4.20.3.2 Logical Outputs

Signal Name	Description
DAT Data	Provide the required data from DAT to support the overlay functions.

4.20.3.3 Logical Parameters

Parameter Name	Description
NA	

4.20.4 Function Modeling

4.20.4.1 Use Cases

4.20.4.2 State Charts

4.20.4.3 Activity Diagrams

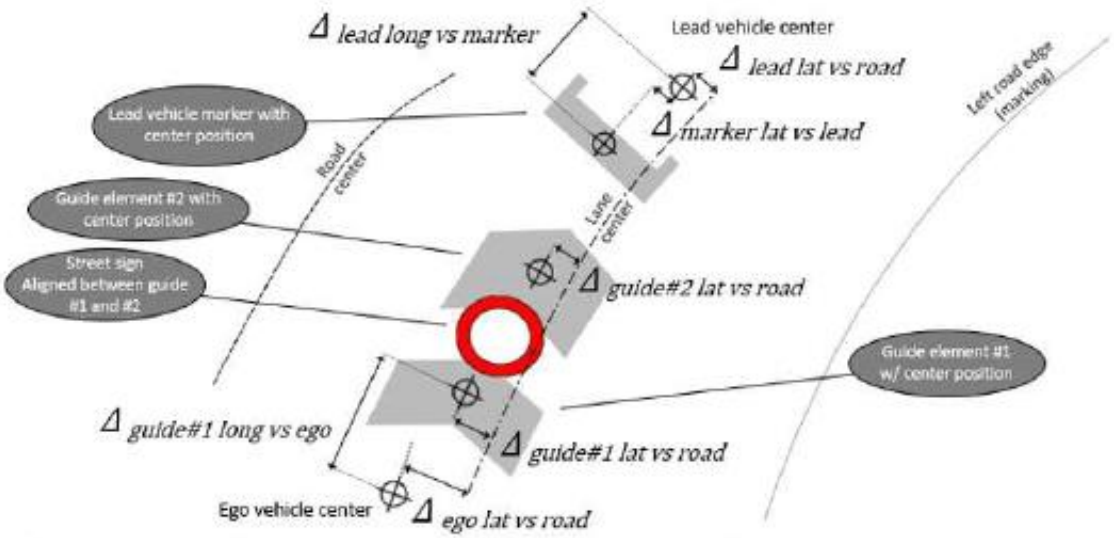
4.20.4.4 Sequence Diagrams

4.20.4.5 Decision Tables

4.20.5 Function Requirements

4.20.5.1 Functional Requirements

4.20.5.1.1 Normal Operation



Δ lead lat vs road = lateral deviation of lead vehicle to center of lane (input)
Δ ego lat vs road= lateral deviation of ego vehicle to center of lane (input)
Δ guide#1 lat vs road= lateral deviation of guide#1 to center of lane (output)
Δ guide#1 long vs ego= longitudinal deviation of guide#1 to ego vehicle (output)
Δ guide#2 lat vs road= lateral deviation of guide #2 to center of lane (output)
Δ lead long vs marker= longitudinal deviation of marker to lead vehicle (output)
Δ marker lat vs lead = lateral deviation of marker to lead vehicle (output)

###R_FNC_AR_00114### Required DAT Signals

Provide DAT Data function shall provide the signals listed in (section 4.20.3.1) to support process and perform augmented reality functions.

End of Requirement

~~###R_FNC_AR_00115### Required DAT Signals Availability~~

~~The signals shall be available on the bus when the ignition status is Run.~~

End of Requirement

4.20.5.1.2 Error Handling

4.20.5.2 Non-Functional Requirements

4.20.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 41: FSRs satisfied by Logical Function

4.20.5.4 Other Requirements

4.20.5.4.1 Design Requirements

4.21 Logical Function “Provide AR camera Data”

4.21.1 Function Overview

4.21.1.1 Function Description

This function is related to AR camera data video input need for augmented reality overlay function.

4.21.1.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.21.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 42: Input Requirements/Documents

4.21.1.4 Assumptions

Refer to Feature document.

4.21.2 Function Scope

Figure 22: Context Diagram of Function Provide AR Camera Data

4.21.3 Function Interfaces

4.21.3.1 Logical Inputs

Signal Name	Description
AR Camera Stream	The raw video received captured by AR camera sensor

4.21.3.2 Logical Outputs

Signal Name	Description
AR Video Feed	AR camera video feed to AR feature

4.21.3.3 Logical Parameters

Parameter Name	Description
RGB video	AR camera sensor type
Gain	AR camera gain
Integration Time	AR camera integration time

4.21.4 Function Modeling

4.21.4.1 Use Cases

4.21.4.2 State Charts

4.21.4.3 Activity Diagrams

4.21.4.4 Sequence Diagrams

4.21.4.5 Decision Tables

4.21.5 Function Requirements

4.21.5.1 Functional Requirements

4.21.5.1.1 Normal Operation

###R_FNC_AR_00116### AR Camera Packaging

The AR Camera shall be packaged as below:

a) Within a 6-inch distance to the DAT (FWC) camera
b) Within a 5% FOV to the DAT (FWC) camera.
c) AR camera misalignment in the vehicle do to mechanical tolerances shall be:
   Roll < ± 2.0 degrees
   Pitch < ± 1.0 degrees
   Yaw < ± 2.0 degrees

End of Requirement

4.21.5.1.2 Error Handling

4.21.5.2 Non-Functional Requirements

4.21.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 43: FSRs satisfied by Logical Function

4.21.5.4 Other Requirements

4.21.5.4.1 Design Requirements

4.22 Logical Function “Provide FIR Camera”

4.22.1 Function Overview

4.22.1.1 Function Description

This function is related to FIR camera data video input need for augmented reality overlay function.

4.22.1.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.22.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 44: Input Requirements/Documents

4.22.1.4 Assumptions

Refer to Feature document.

4.22.2 Function Scope

Figure 23: Context Diagram of Function Provide FIR Camera Data

4.22.3 Function Interfaces

4.22.3.1 Logical Inputs

Signal Name	Description
FIR Camera Stream	The raw video received captured by FIR camera sensor

4.22.3.2 Logical Outputs

Signal Name	Description
FIR Video Feed	FIR camera feed to AR feature

4.22.3.3 Logical Parameters

Parameter Name	Description
NA	

4.22.4 Function Modeling

4.22.4.1 Use Cases

4.22.4.2 State Charts

4.22.4.3 Activity Diagrams

4.22.4.4 Sequence Diagrams

4.22.4.5 Decision Tables

4.22.5 Function Requirements

4.22.5.1 Functional Requirements

4.22.5.1.1 Normal Operation

###R_FNC_AR_00117### FIR Camera Packaging (if vehicle is equipped)

The FIR Camera shall be packaged as below:

a) Within 6" in X and Y, and 2" in depth maximum separation to the AR camera for full blending AR vs FIR images, if the packaging of FIR allows that (Note- this is Not the current case for FIR camera in CDX747)
b) If AR and FIR Camera packaging not within full blending, the FIR camera shall be packaged TBD distance to allow for partial/selective blending.
c) FIR camera misalignment in the vehicle due to mechanical tolerances shall be:
   Roll < ± 2.0 degrees
   Pitch < ± 1.0 degrees
   Yaw < ± 2.0 degrees

End of Requirement

4.22.5.1.2 Error Handling

4.22.5.2 Non-Functional Requirements

4.22.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 45: FSRs satisfied by Logical Function

4.22.5.4 Other Requirements

4.22.5.4.1 Design Requirements

4.23 Logical Function “Provide Vehicle Data”

4.23.1 Function Overview

4.23.1.1 Function Description

This function is related to vehicle data (Ignition status, vehicle speed, steering angle, and turn signal status) values need for augmented reality overlay function.

4.23.1.2 Function Variants

Variant Name	Variant Description	Variant Condition (optional)
NA		

4.23.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "**Error! Reference source not found.**")
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			
Other Sources			

Table 46: Input Requirements/Documents

4.23.1.4 Assumptions

Refer to Feature document.

4.23.2 Function Scope

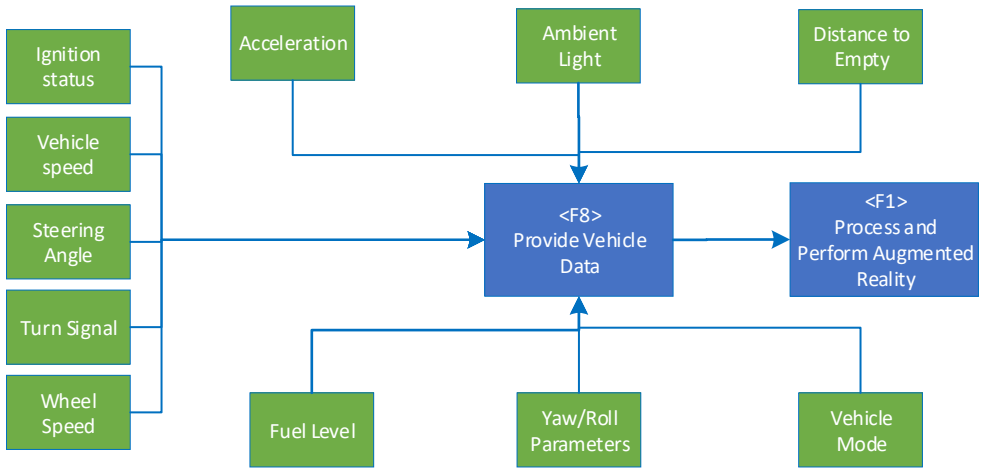


Figure 24: Context Diagram of Function Provide Vehicle Data

4.23.3 Function Interfaces

4.23.3.1 Logical Inputs

Signal Name	Description
Ignition Status	Get Ignition Status
Vehicle Speed	Get Vehicle Speed
Steering Angle	Get Steering Angle
Turn Signal Status	Get Turn Signal Status
Wheel Speed	Get Wheel Speed
Acceleration	Get Acceleration data
Ambient Light	Get Ambient Light status
Distance to Empty	Get Distance to Empty status
Fuel Level	Get Fuel level status
Yaw/Roll Parameters	Get Yaw/Roll Parameters –
Vehicle Mode	Get Vehicle Mode status

4.23.3.2 Logical Outputs

Signal Name	Description
Vehicle Data	Ignition Status, Vehicle Speed, Steering Angle, Turn Signal Status, Wheel Speed, Acceleration, Ambient Light, Distance to Empty, Tire Pressure Monitor, Yaw/Roll Parameters, and Vehicle Mode values needed for augmented reality overlay functions.

4.23.3.3 Logical Parameters

Parameter Name	Description
NA	

4.23.4 Function Modeling

4.23.4.1 Use Cases

4.23.4.2 State Charts

4.23.4.3 Activity Diagrams

4.23.4.4 Sequence Diagrams

4.23.4.5 Decision Tables

4.23.5 Function Requirements

4.23.5.1 Functional Requirements

4.23.5.1.1 Normal Operation

###R_FNC_AR_00118### Provide Vehicle Data

The Get Vehicle Data function shall receive the logical input signals as shown in section 4.23.3.1from the specified ECU's

End of Requirement

4.23.5.1.2 Error Handling

4.23.5.2 Non-Functional Requirements

4.23.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	**Requirement Title**
…	

Table 47: FSRs satisfied by Logical Function

4.23.5.4 Other Requirements

4.23.5.4.1 Design Requirements

4.24 Logical Function “ Provide GNSS Data”

4.24.1 Function Overview

4.24.1.1 Function Description

This function is related to GNSS data need for augmented reality overlay function.

4.24.1.2 Function Variants

Variant Name	**Variant Description**	**Variant Condition** (optional)
NA		

4.24.1.3 Input Requirements/Documents

Refer to Feature document.

Reference (Reference as listed in ch. ”References”)	**Section/Requirement**	**Description**	**Derived Requirement** (optional – reference to requirement in ch. “**Error! Reference source not found.**”)
Feature Requirements			
Ford Engineering Standards			
Legal Regulations			
Industry Standards			

Other Sources			

Table 48: Input Requirements/Documents

4.24.1.4 Assumptions

Refer to Feature document.

4.24.2 Function Scope

Figure 25: Context Diagram of Function Provide GNSS Data

4.24.3 Function Interfaces

4.24.3.1 Logical Inputs

Signal Name	Description
Latitude	Latitude data.
Longitude	Longitude data.
Height	Height data.
Moving direction	Moving direction data.
Calculated speed	Calculated speed data.
VDOP	Vertical dilution of precision data.
HDOP	Horizontal Dilution of Precision data.
PDO	Position dilution of precision data.

4.24.3.2 Logical Outputs

Signal Name	Description
GNSS Data	

4.24.3.3 Logical Parameters

Parameter Name	Description
NA	

4.24.4 Function Modeling

4.24.4.1 Use Cases

4.24.4.2 State Charts

4.24.4.3 Activity Diagrams

4.24.4.4 Sequence Diagrams

4.24.4.5 Decision Tables

4.24.5 Function Requirements

4.24.5.1 Functional Requirements

4.24.5.1.1 Normal Operation

###R_FNC_AR_00119### Provide GNSS Data

The Provide GNSS Data feature shall receive the logical input signals as shown in section 4.24.3.1

End of Requirement

4.24.5.1.2 Error Handling

4.24.5.2 Non-Functional Requirements

4.24.5.3 Functional Safety Requirements

FSR ID (from Feature Doc)	Requirement Title
…	

Table 49: FSRs satisfied by Logical Function

4.24.5.4 Other Requirements

4.24.5.4.1 Design Requirements

5 OPEN CONCERNS

ID	Concern Description	e-Tracker / Reference	Responsible	Status	Solution
1	FIR Camera Packaging			Open	
2	Overlay Street Name Data			Open	
3	Overlay House Number Data.			Open	
4	Overlay Point of Interest Data.			Open	
5	Overlay Lane Low Visibility Data.			Open	
6	Overlay Lane level Guidance Data.			Open	
7	Overlay Line Biasing Data.			Open	
8	Overlay Highway assist Data.			Open	
9	Overlay Assisted Lane Change.			Open	
10	Select Lane Low Visibility			Open	
11	Voice Commands, still depends on Google confirmation			Open	
12	NAV Signals refresh rate			Open	
				Open	

Table 50: Open Concerns

6 REVISION HISTORY

Revision	Date	Description	Approved by	Responsible
1.0	10-7-20	Initial Release / <PSC>		Mahmoud Abdelhamid
2.0	04-21-21	• Add new functions. - Overlay Lane Low Visibility Data. - Overlay Lane level Guidance Data - Overlay Line Biasing Data. - Overlay Highway assist Data - Get Vehicle Data. - Provide GNSS Data. • Add new requirements and revise the old ones. • Update the logical signal tables.		Mahmoud Abdelhamid
2.1	07-09-2021	The following section were updated on the document: • 2 Function Group Description. • 3 Functional Decomposition and Architecture. • 4 Function Specification. • 5 Open Concerns • 6 Revision History • Functional Requirements: o Deleted/replaced requirement- #3, #13, #53 o Modified requirement: #1, #14, #15, #16, #17, #18, #51, #52, #54, #55, #56, #62, #67, #68, #72, #116, #117		aalsamar

7 APPENDIX

7.2 Data Dictionary

7.2.4 Logical Signals

*#**Macro**: Add Ins -> Add Requirement macro (select “Logical Signal” as type)*

7.2.5 Logical Parameters

*#**Macro**: Add Ins -> Add Requirement macro (select “Logical Parameter” as type)*

7.2.6 Encoding Types

*#**Macro**: Add Ins -> Add Requirement macro (select “Encoding Type” as type)*

Document ends here.