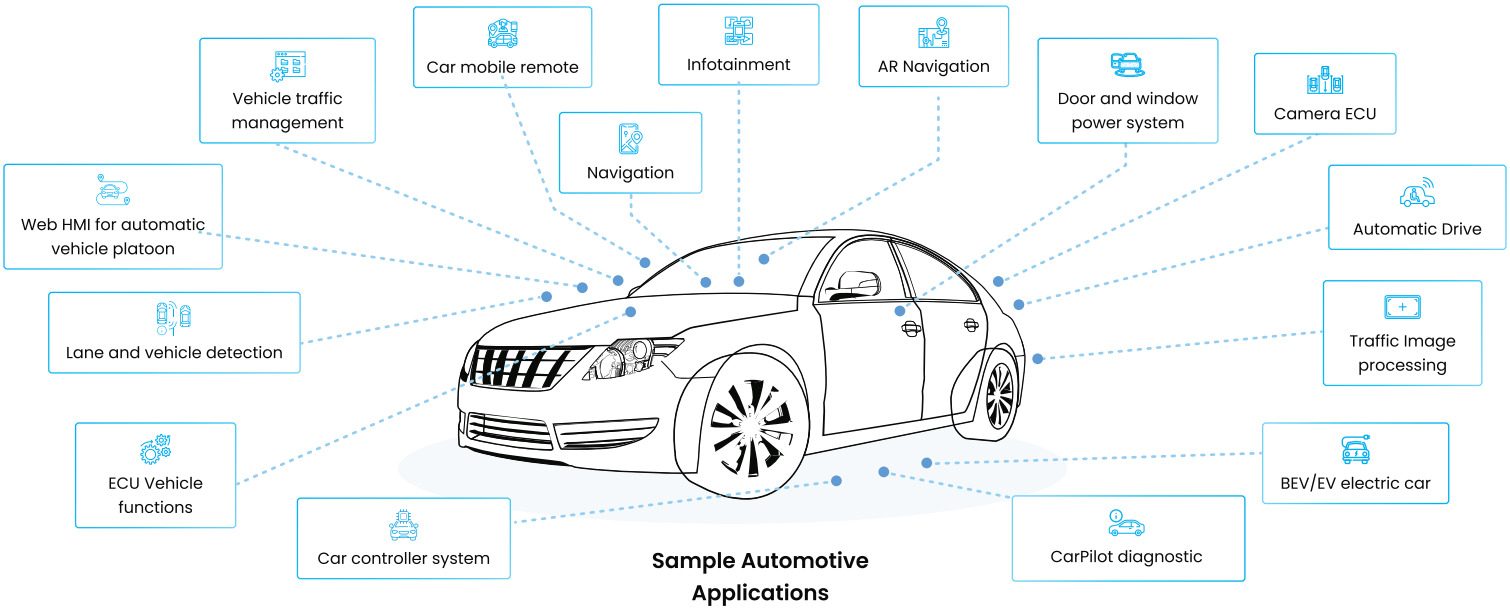
TMA solutions

TMA Automotive Software Center

TMA Automotive Software Center

300 engineers

Customers from **10** countries



Sample Automotive Applications

Why TMA

for Automotive Software Development

9 years of experience in Automotive Software Development

Experienced in Full Embedded System Development

Setup and operate dedicated offshore centers for global companies

Trusted by Top Global Tier-1 Automotive Suppliers

www.tmasolutions.com

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sales@tmasolutions.com

Automotive Software Services

PCB Design	Embedded Software Development	Model Based Development
ECU Programming	Driver Development	Middleware & Application Development
Computer Vision Mechanism	Data Science AI/ML	GPS/IMU/Sensors/ Radar/Lidar...

Automotive Software Skill Set

Model-Based Development	Data Science AI/ML	Python
Embedded Software	Image Processing	Open CV
Real-time Operating system	Mobile Apps	QT UI Design
ECU Hardware, Sensors	Cloud	C/C++

Tools

Simulink Stateflow	SCADE Suite	TPT	MXAM
LabVIEW	MATLAB	ASCET	dSPACE

Automotive Software Stack

FPGA

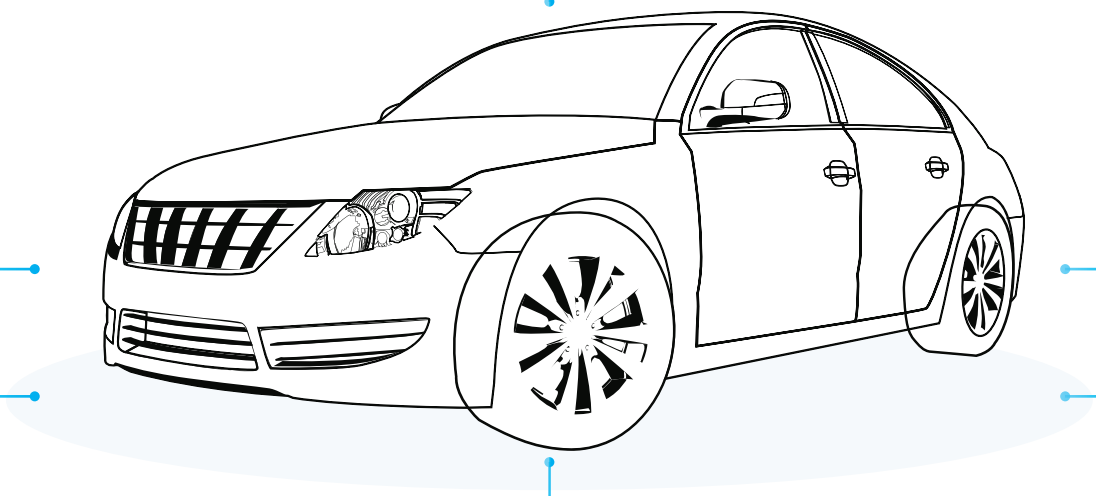
FIFO, PISO, MUX, Hash, DDR RAM Handling, VHDL & Verilog, Xilinx ISE, RTL

OS

RTOS, Linux/RTLinux Kernel, Android, ucLinux, ttylinux, Gentoo,VxWorks, QNX, INTEGRITY

Wireless

LTE, Zigbee, BLE, IR, NFC, Beacon, RFID, WIFI, 3G, MQTT, Navi/GPS



MCU / ECU

NXP, ESP, STM, ARM, TI, Qualcomm, Renessas, Sierra Wireless, x86, MIPS, PIC, AVR32

Firmware & Device Drivers

FOTA, SOTA, BSP, Keil C, IAR, Altium, Buildroot, Openembedded, OpenWRT, uBoot

Interfaces

TouchPanel, Camera, USB, CAN, ETH, LCD, HMI, CF/MMC/SD, GMLAN, SPI, UART, I2C, I2S

Case Study

Infotainment

Scope of Work

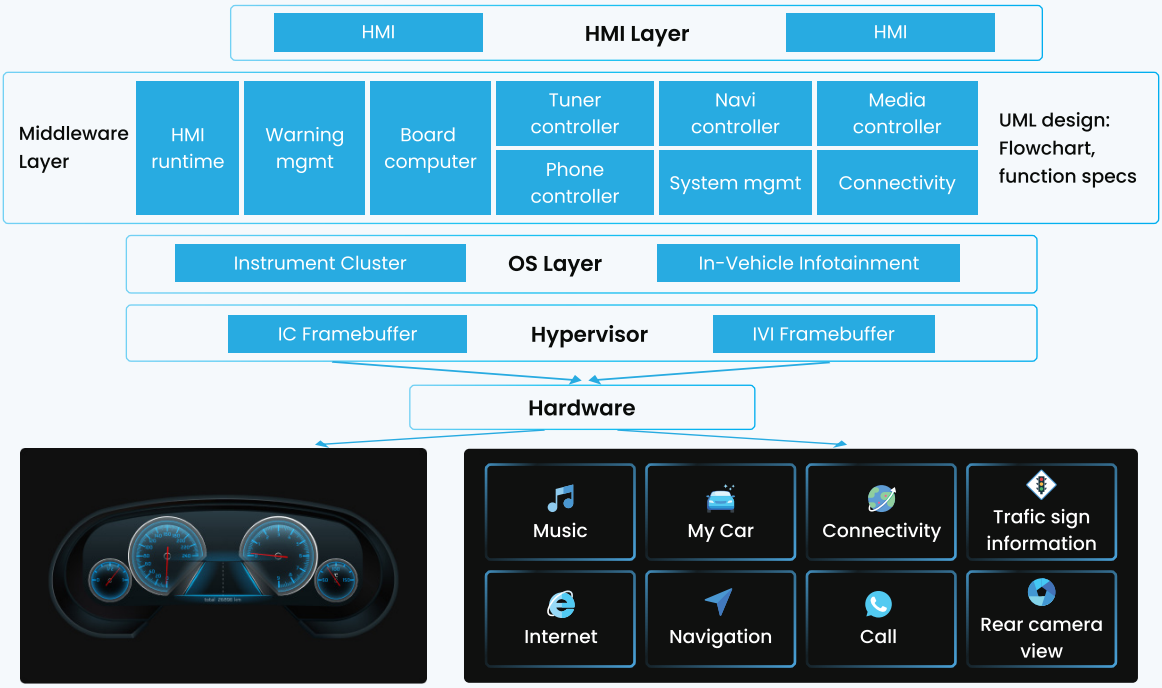
- Develop GUI and functions of infotainment system
- Develop applications for Vehicle's SYNC infotainment system
- Implement graphical user-interfaces using QML / Qt Quick
- Integrate APIs / SDKs that provide services for: media, phone, navigation, and speech-recognition

Technologies

- Tools: Qt, QML, QNX, Genevi, Yocto, Naver Map, NaviCore Map, in-house tools
- Platform: Linux, Core ARM
- Language: C++, UML
- Protocol: CAN, TCP/IP, USB, Bluetooth, Ethernet, and/or Wi-Fi

Products

- CAN parsers, navigation data calculation, HVAC API
- HMI Instrument Cluster: Speedometer, Tachometer, Fuel Level, Battery Voltage, Odometer, Tire Pressure, Key Status, Lights, Handbrake status, Engine Warning, Airbag Status, etc...
- Infotainment application:
  - Launcher, Android Auto, Media Player
  - Navigation: position calculations from GNSS, Satellites info, DGPS, WAAS, etc..
  - HVAC: air control, temperature control



Case Study

In-Vehicle System

Scope of Work

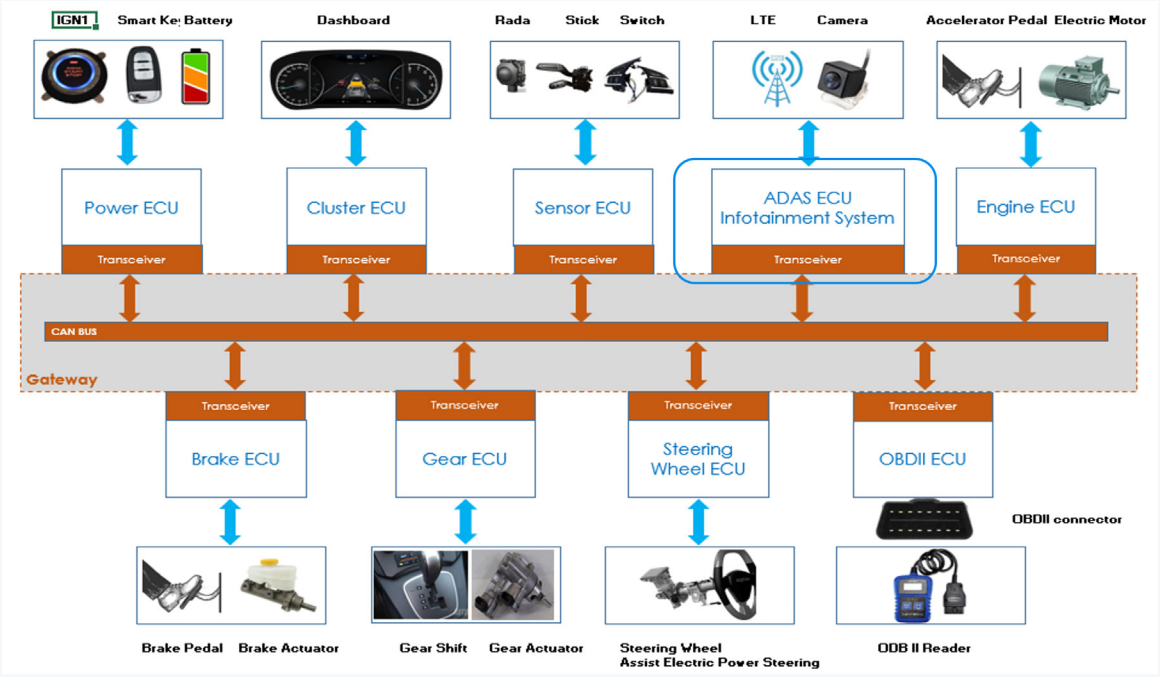
- Develop and test ECUs
- Do ECUs integration test
- Develop, test and port embedded software
- Maintain and port firmware, middleware and platform

Technologies

- Embedded Linux, RTOS
- C/C++, Matlab Simulink, Enterprise Architect, Ascet, SCADE
- CAN, LIN, USB, BT, ETH, SPI, UART, I2C
- SOTA, FOTA
- QT, QML, QNX, Genevi, Yocto
- NaverMap, NaviCore, HERE, TomTom, MapBoxGL, Yelp
- MCU, Sensors, Radar, Lidar, Computer Vision

Products

- Infotainment Embedded Software and HMI Applications: Cluster, Launcher, Navigation, Media Player, Camera, HVAC Controllers
- Surround View Camera
- Cluster ECU
- Power Door ECU
- LTE & Diagnostic Module



Case Study

Camera ECU

Scope of Work

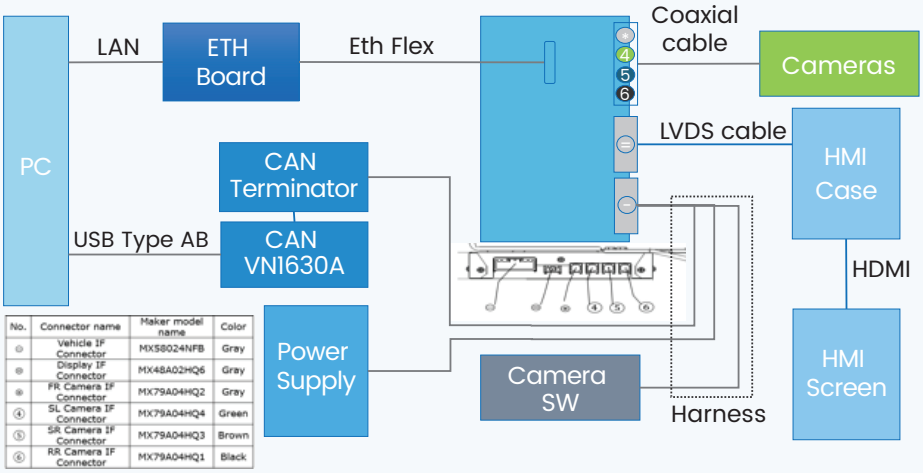
- Develop Surround View Camera ECU
- Develop Infotainment Application for the Cameras
- Do porting to multiple car models with different hardware and/or software

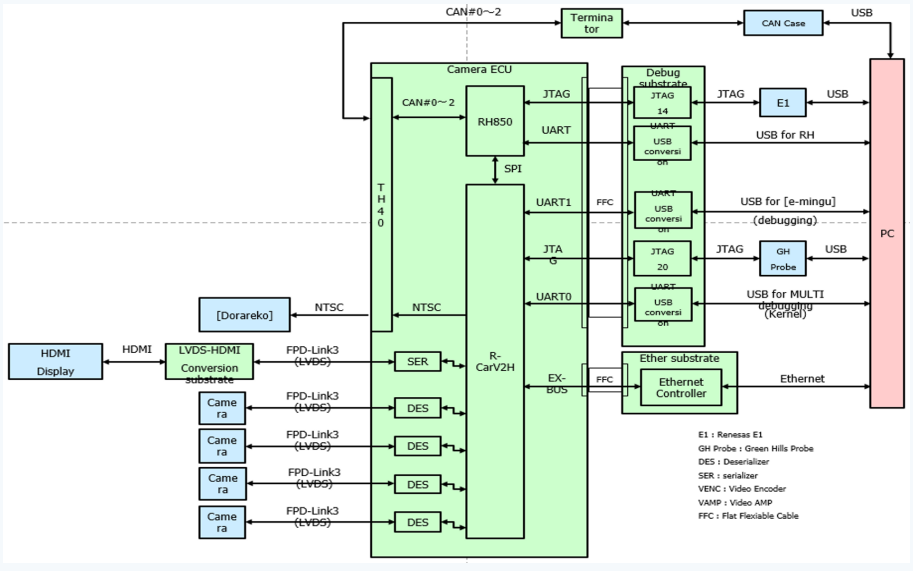
Technologies

- ulTRON and INTEGRITY Linux Kernel for RCarV2H and RH850
- C, Computer Vision
- FPD-Link3, YUV422, I2C, CAN, SOTA, FOTA

Products

- Surround and Bird Eye View
- Automatic Parking and Auto Alert
- Parking Line Recognition
- Static/Moving Object Detection
- Cross Traffic MonitorSpace Map





Case Study

ECU Vehicle Functions

Scope of Work

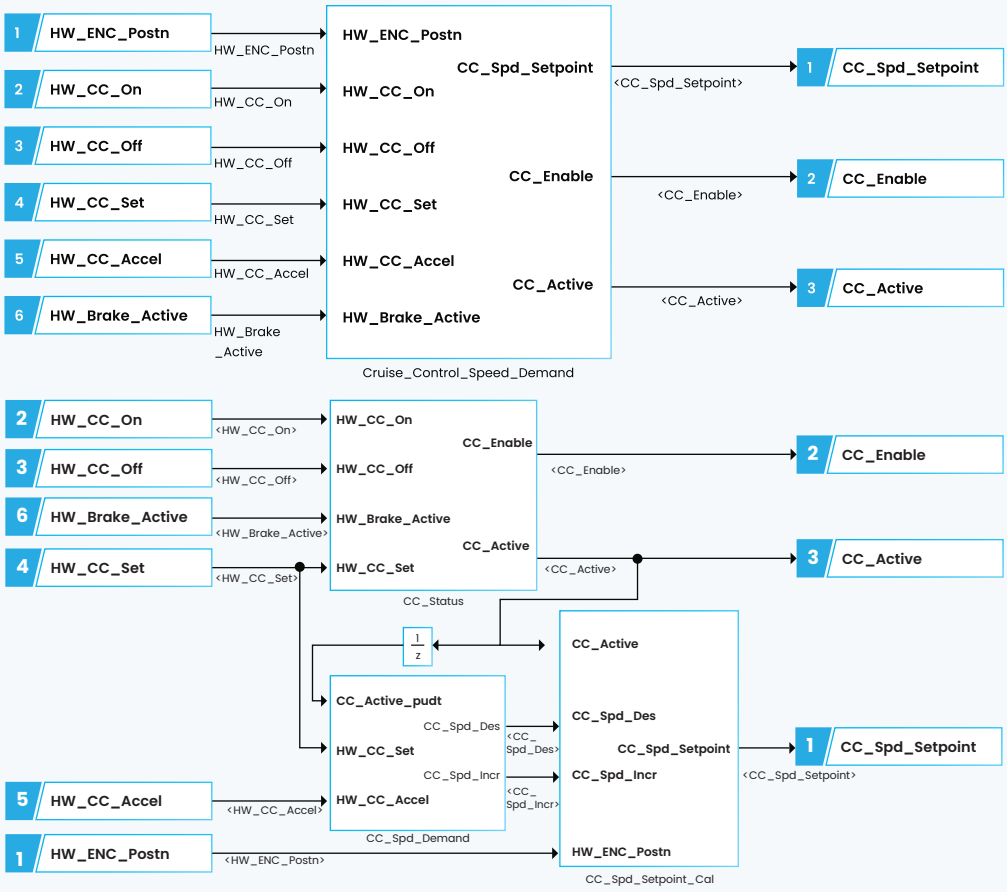
- Develop and test driver assistance functions:
  - Design and implement vehicle functions by Model Based Development method
  - Create model Library
  - Convert C code to model
  - Unit test, harness test, functional test and integration test
  - Test development and execution: Model in Loop, Software in Loop

Technologies

- Tools: Ascet, Matlab-Simulink, SCADE
- Language: C

Functions

- ABS: Preventing the wheels from locking up during braking
- Cruise Control: maintain vehicle speed at a pre-selected speed
- Dynamic Radar Cruise Control: maintain a pre-set distance to a preceding vehicle
- Start-Stop system: automatically shuts down and restarts the engine



Case Study

Door and Window Power System

Scope of Work

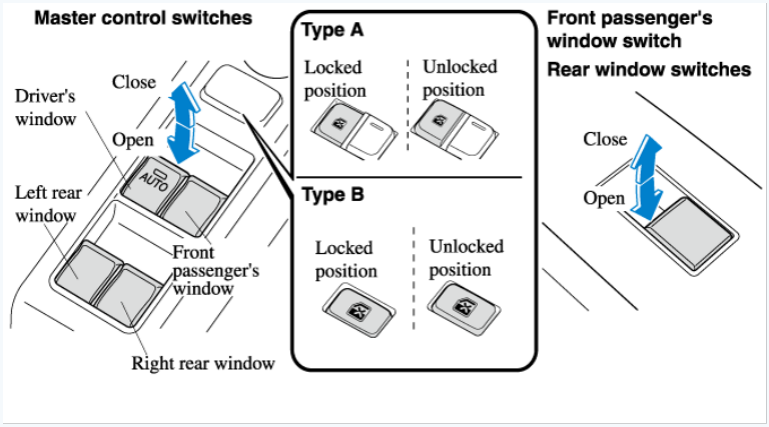
- Develop and Test models of Door and Window Power System
- Create logical structure diagram
- Create IF list (input/output of unit model)
- Create module manual (Description logics of unit model)
- Create unit model and integrated model by Simulink and Stateflow
- Develop test cases and manual testing

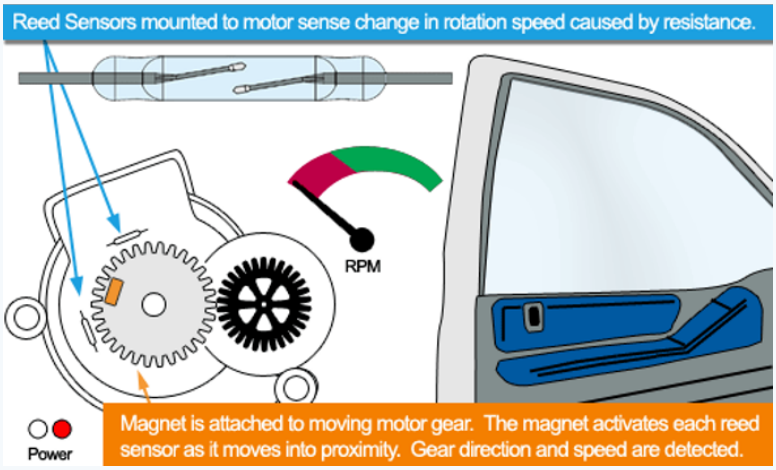
Technologies

- Matlab 2015a, Enterprise Architect 13
- Language: C++

Functions

- Self-seat automatic and manual control
- Door opening and closing interlocking control
- Control link Door Key/Wireless/Smart Door





Case Study

Car Controller System

Scope of Work

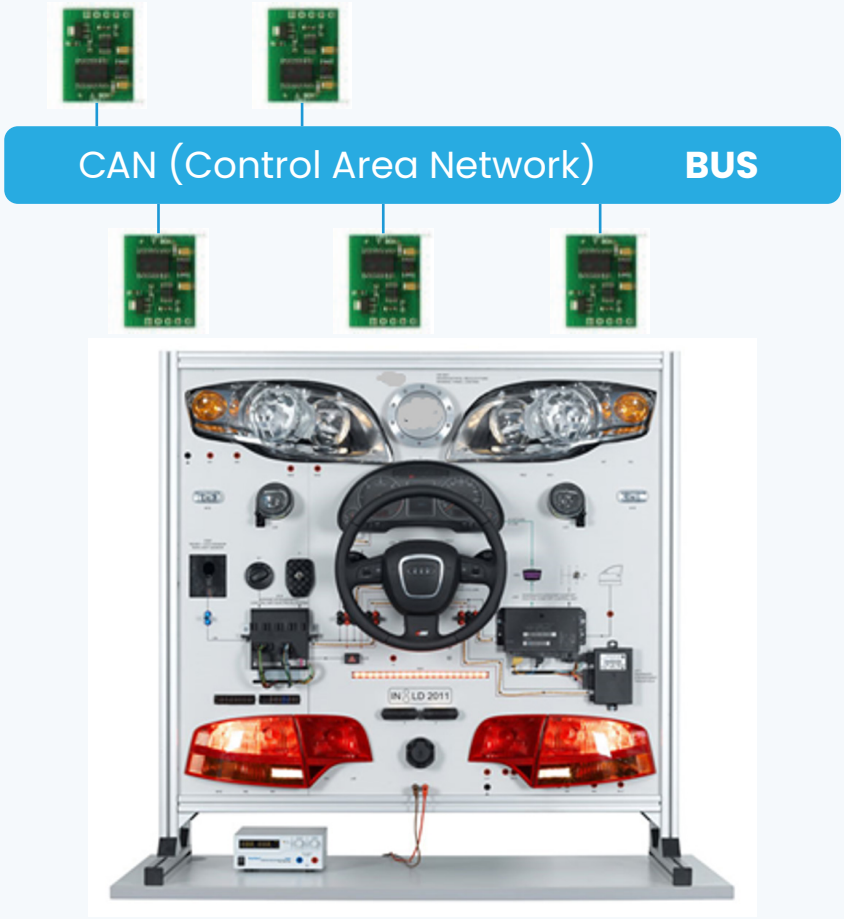
- CAN bus development
- MCU modules programing

Technologies

- Software / Embedded RTOS for ECU
  Hardware / Embedded System
- MPC56xx, S32K14x, Jetson
  Lights, Radar, Lidar, Steering, Encoders, Parsers

Functions

- Brake and Accelerator Pedal
- Steering and Gear
- Lights
- ADAS: auto braking, collision warning
- Telematics: Develop web and mobile app to send/receive signals from automotive system via embedded wireless node (wifi,4G/5G)



Case Study

CarPilot Diagnostic

Scope of Work

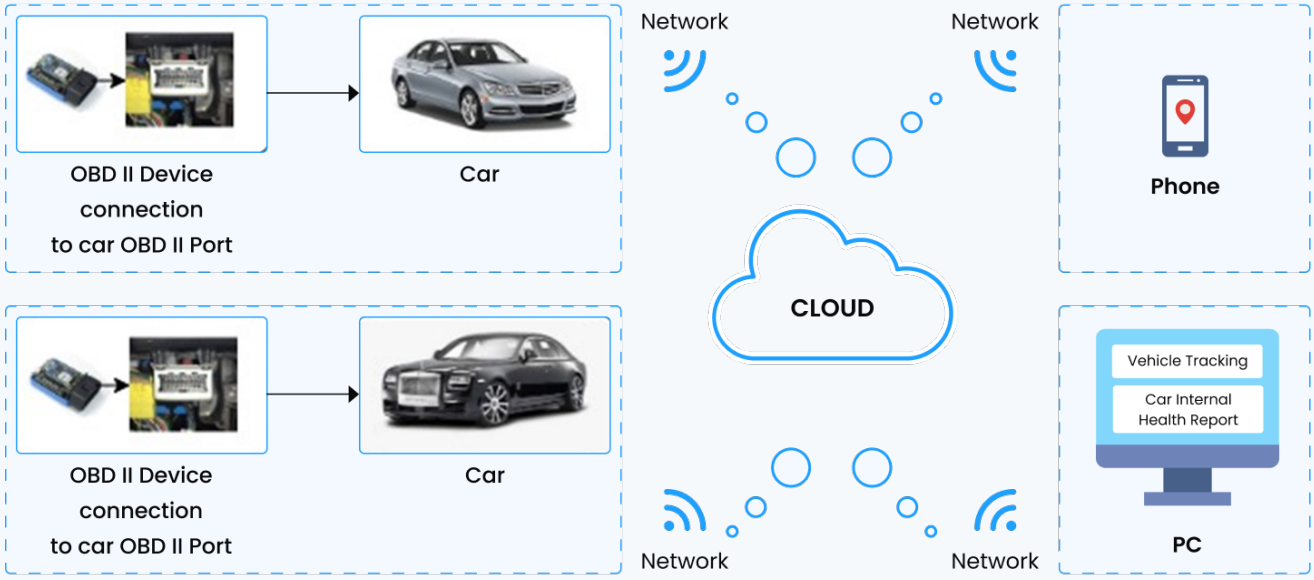
- Full product development including firmware, software, web and application
- Design whole system (hardware, software, frontend, backend, database, integration services)
- Develop firmware, software, backend and frontend
- Web application functional test

Technologies

- Tools: Eclipse, VS Code, Gcc for arm, KiCad, ESP8266 NONOS SDK, AWS
- Database: PostgreSQL, OpenDBC file Encodes
- Language: Java, ReactJS, Cordova, MapBoxGL, JS/HTML/CSS, C
- Hardware: STM32F413, ELM327, ESP8266
- Basic protocol: CAN, LIN, GMLAN, SPI, Websocket

Functions

- Mini device receives data from OBD-II port and communicate to server online, supports for 3x CAN, 2x LIN, 1xGMLAN
- Display vehicle status and diagnostic on website
- Send notification automatically to car owner when there is any error
- Location Identification



Case Study

Lane and Vehicle Detection

Scope of Work

- Develop AI Camera Image Processing
- Develop ADAS functions using camera
- Test AV navigation system

Technologies

- Software / Embedded RTOS for ECU
  - C/C++, Python, OpenCV
  - QT for Infotainment Display
- Hardware / Embedded System
  - CSI Camera
  - Drone

Functions

- ADAS Intelligent Parking Assistance
- ADAS Traffic Light Alert
- ADAS Lane Change Assist
- ADAS Sign Panel Detection
- ADAS Static/Moving Objective Detection

Case Study

Navigation (1/2)

Scope of Work

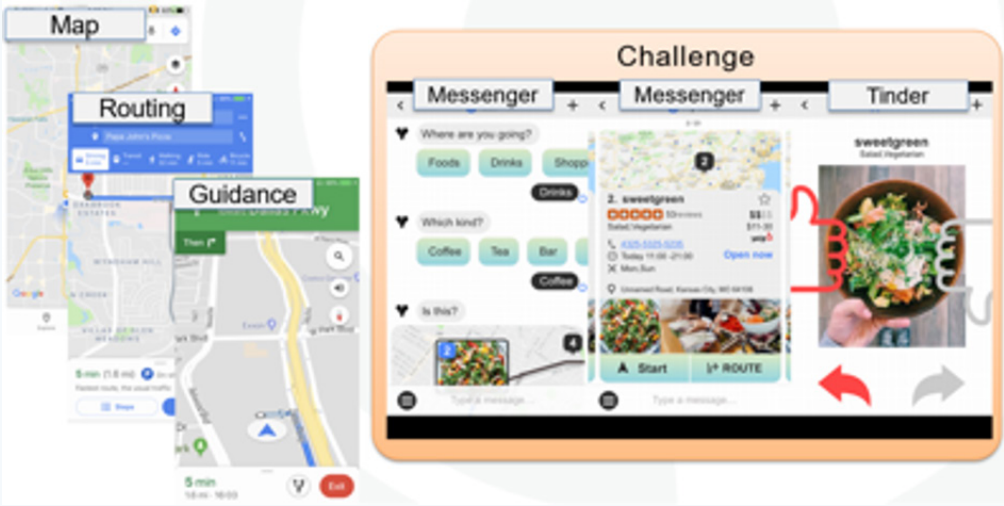
- Develop navigation system with messenger style
- Integrate with content providers (Yelp, Google…) to search POI (Place of Interest)

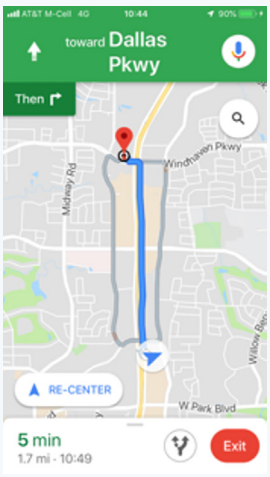
Technologies

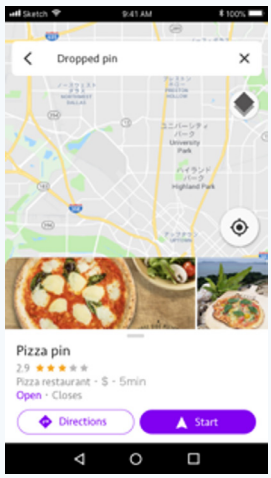
- Frontend: ReactJS , Cordova, Google Map, Mapbox, Android OS 7.0+
- Database: PostgreSQL 9.6
- Third-parties: Facebook SDK, Yelp API

Functions

- Social login
- Chat with bot for POI and nearby
- Search with quick and slow mode
- Suggest search keywords
- Navigation AV







Case Study

Navigation (2/2)

Scope of Work

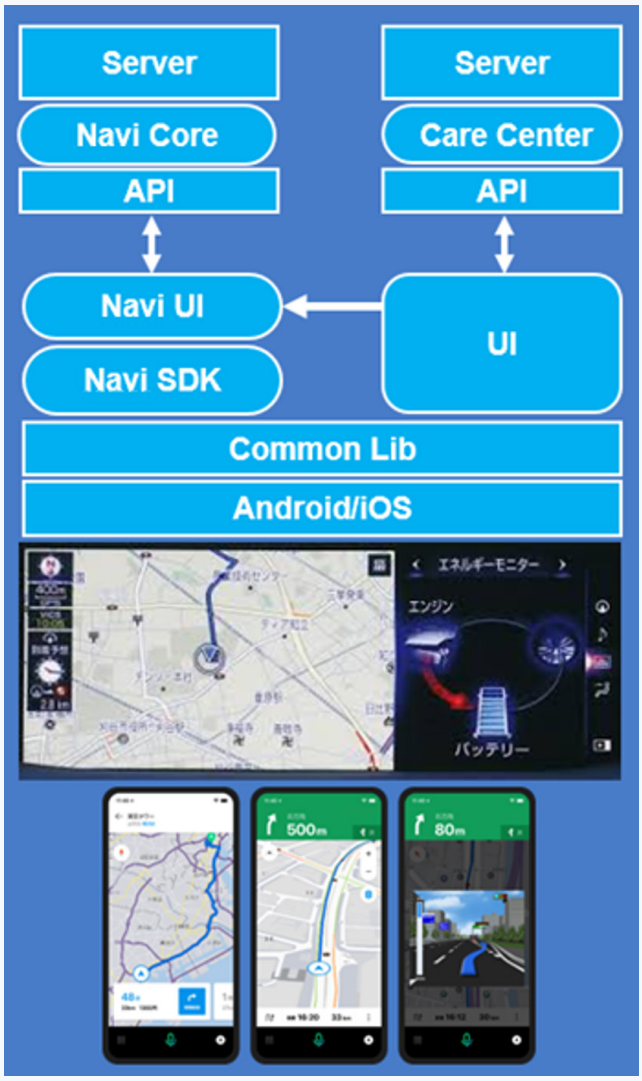
- Develop HMI and screen flow
- Develop applications for navigation
- Develop localizations of language and functions

Technologies

- Java Android, Swift, OOAD, XML, HMI
- TomTom, HERE, AWS

Functions

- Locations and Routes
- Traffic information
- Notification of ETA Home and find nearby
- Locate other parking
- Trip Rally, Racing, Planner and Share
- Walking Navi
- Find customer privilege nearby



Case Study

Web HMI for Automatic Vehicle Platoon

Scope of Work

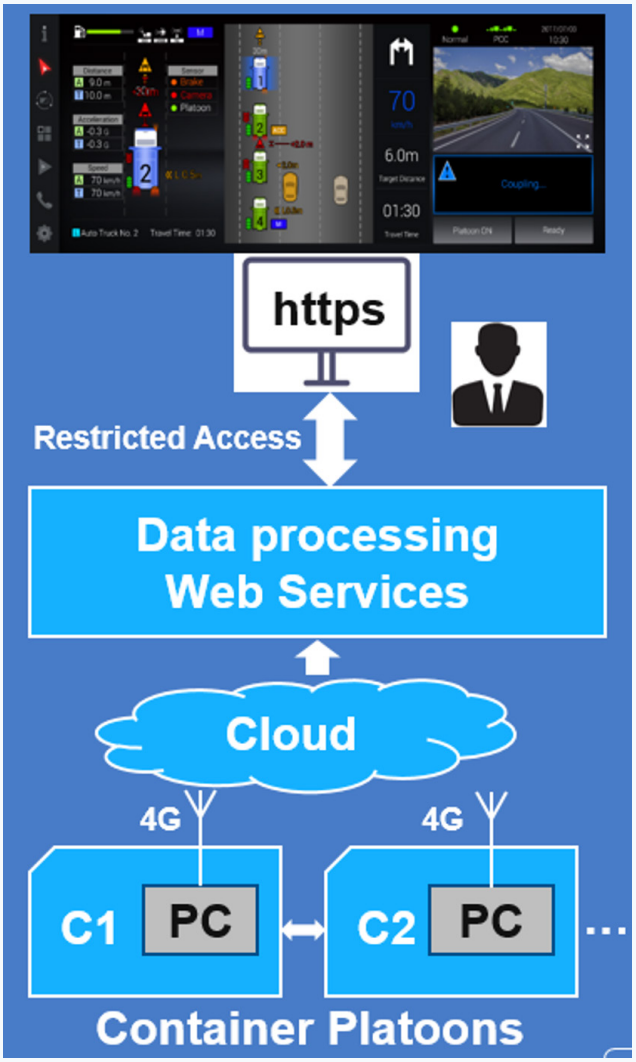
- Full system development and test:
  - In-vehicle data functions and data communication
  - On-cloud server data processing and web application

Technologies

- Tools: OpenStreetMap, Eclipse
- Platform: CenOS, AWS
- Language: Java, NodeJS, Angular, HTML5/CSS

Functions

- In-vehicle system: CAN parser, UDP message parser, data processing, data transmission mechanism
- On-cloud server: data processing, access management, login management, time stamps/log, data store/log, UI design, semi-stream camera images, web application
  - Monitor vehicle platoon position, mode
  - Monitor vehicle speed, fuel, automatic travel's time
  - Distance calculation between vehicle
  - Status of connections, sensors, automatic steering control
  - Vehicle/platoon view/switch



Case Study

Web HMI for Automatic Vehicle Platoon

Scope of Work

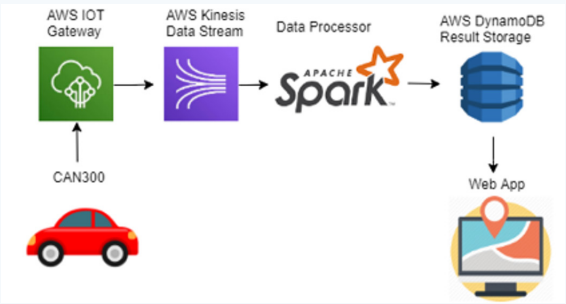
- Develop Data Collectors, Big Data Processing Pipeline
- Develop Big Data Services for traffic monitoring and management
- Develop FullStack web application to monitor traffic: jam, single spot information

Technologies

- Apache Spark, Apache Hadoop, AWS Services
- Mapbox, HTML, SpringBoot, ReactJS, Azure Services

Functions

- Processing pipeline receives data from vehicles or mobile applications
- Data classifier provides meaningful traffic information to various services
- Big data warehousing, collector and analyzer get info from millions vehicles to provide estimated travel time for users
- Web App requests data from Information Provider and collectors then show on a map



Case Study

Car Mobile Remote

Scope of Work

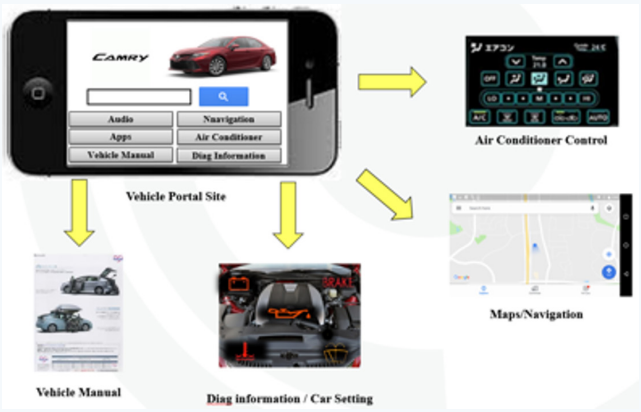
- Develop in-car portal as server for driver client to control
- Develop application functions: search, POIs, chat in group

Technologies

- Java, Java Script, Mapbox, HTML, Azure Services, AWS Services

Functions

- Easy connect by shaking phone
- Connect via wifi or Bluetooth
- Search POI and search nearby
- Share searching POIs and music
- Chat in group



Case Study

Automatic Drive

Functions

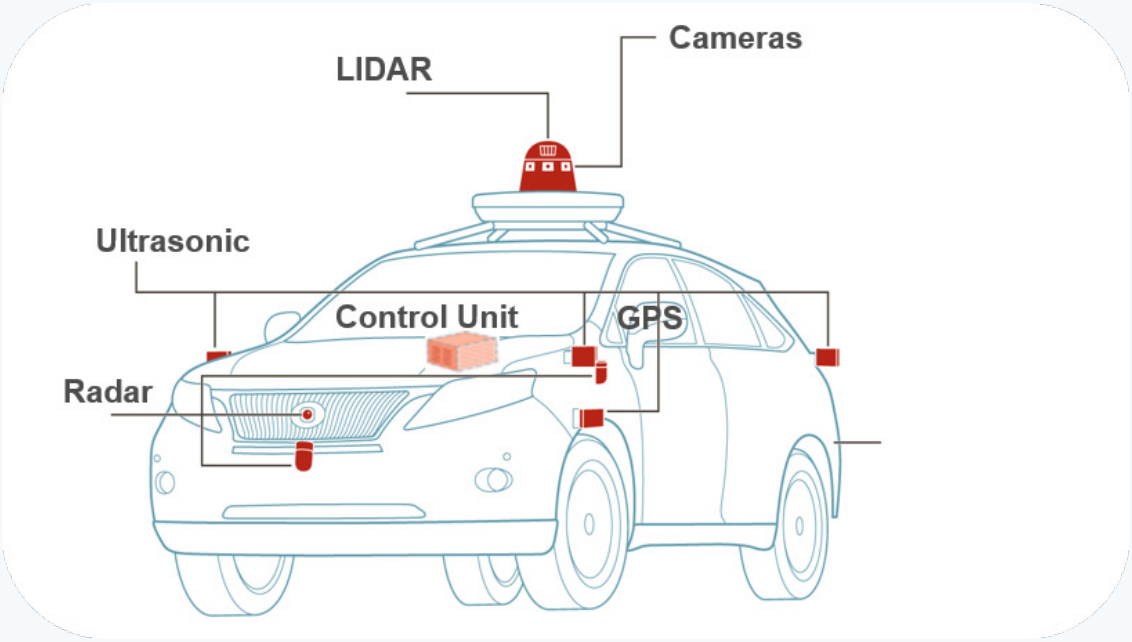
- Automatic Drive (level 3)
- Automatic Parking and Surround View
- ADAS: auto-speed, auto-brake, etc...
- Image Diagnosis
- Static/Moving Object Detection
- Cross Traffic Monitor
- Traffic Sign/Light Detection
- Lane Detection

Hardware Development

- Module programming: ECUs, camera, sensor, LIDAR,...
- Driver: LTE, BT
- Middleware: CAN, LIN, MOST, ETH/GETH, BT, USB, LTE, FOTA
- C/C++, Matlab Simulink, SCADE Suite

Software Development

- Embedded: Cluster, Infotainment launcher, HVAC, map, media player, SOTA
- Application: parsers, media stream pipe, mobile, web (traffic analysis and monitor)
- ECU camera: computer vision, analytics math algorithm, AI image recognition
- C/C++, Python, OpenCV, Java, ReactJS, Cordova, MapBoxGL, JS/HTML/CSS, Websocket, Nginx, SQL, Tomcat, OSRM



Case Study

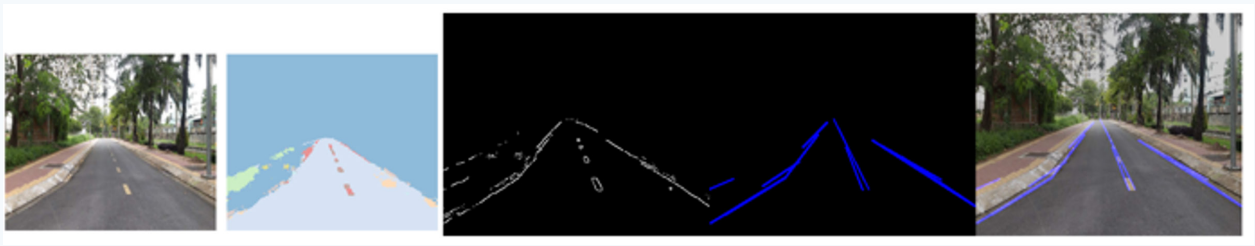
Traffic Image Processing

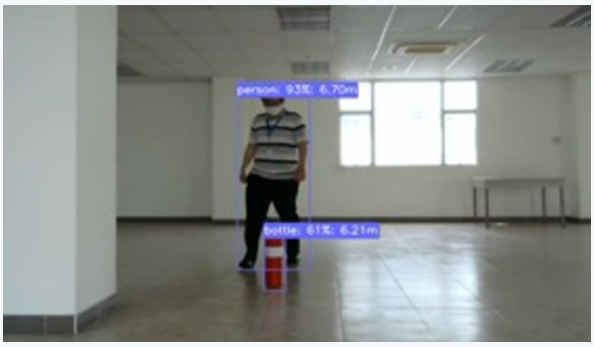
Functions

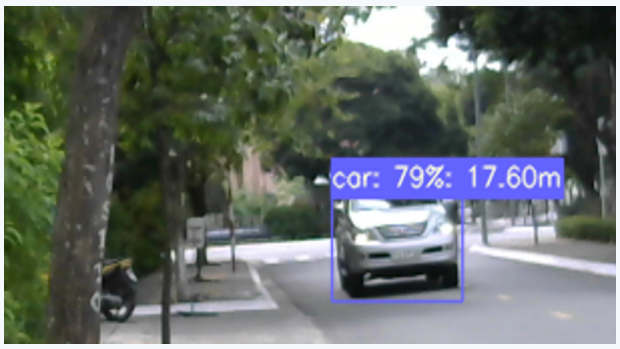
- Lane Detection
- Object Detection & Distance Measurement
- Traffic Sign Recognition
- Moving Object Detection

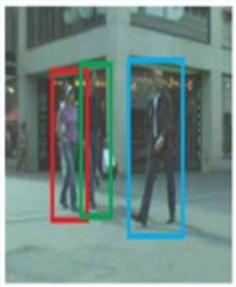
Technologies

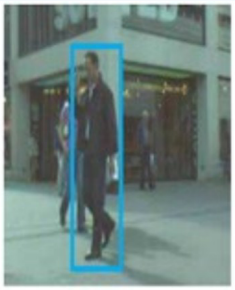
- Computer vision
- AI image recognition
- Deep Learning
- Analytics math algorithm
- C/C++, Python, OpenCV











Case Study

CarPilot Diagnostic

Scope of Work

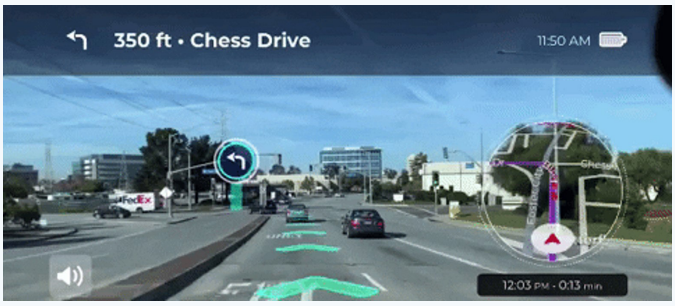
- Develop Surround View Camera ECU
- Develop Infotainment Application for the Cameras
- Do porting to multiple car models with different hardware and/or software

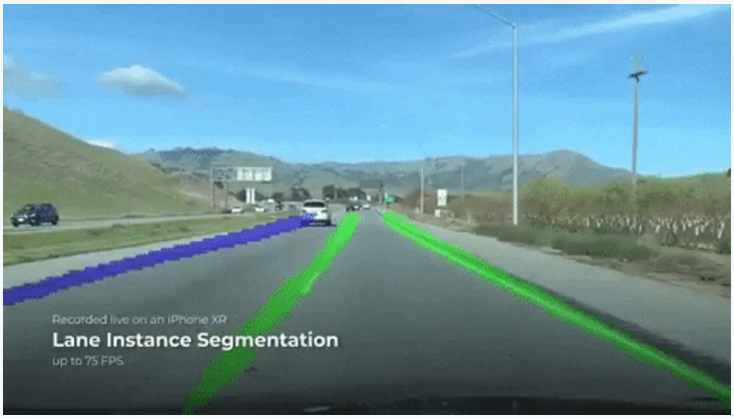
Technologies

- Front-End: Flutter, ReactJS, NodeJS, TypeScript
- Cloud Services: AWS EC2, Lambda
- Back-End: C/C++, Python, NodeJS, PostgreSQL

Functions

- Simulate driving route (Fishbone, Chevron,...) on moving.
- Drawing lane connections
- Drawing POI such as Restaurant, Convenience Store, Facilities,...
- Lane, road edge, object detection.
- Image analysis and reflect to AR platform.





Case Study

Road Damages Detection

Scope of Work

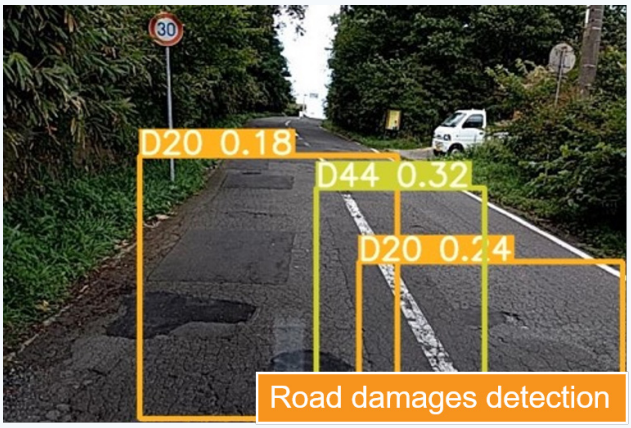
- Investigate 3rd lib that using for road damages detection (Yolov5, Hybrid Net...)
- Develop Infotainment Application for the Cameras
- Develop Mock Page for displaying detected points.

Technologies

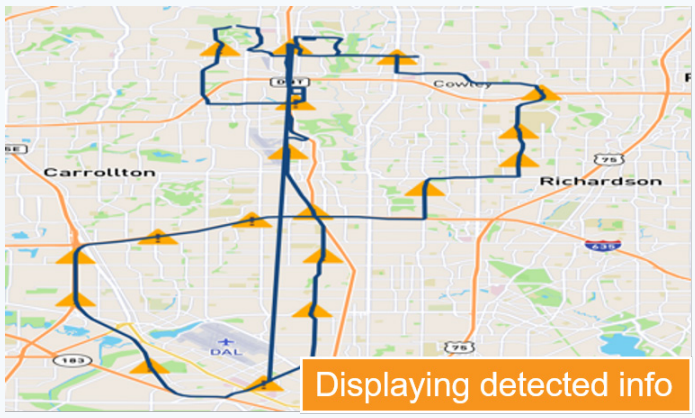
- Front-End: ReactJS, NodeJS, TypeScript
- Cloud Services: AWS EC2, Lambda
- Back-End: Python, Spring Boot, NodeJS, MySQL

Functions

- Realtime road damages capturing/detection and upload result to Cloud DB (AWS EC2).
- Using OSRM to correct geocoordinates and upload into Cloud DB (based on driving direction).
- Display all information of road damages detection into webpage.
- Drawing trajectory line based on detected coordinates.



Road damages detection



Displaying detected info

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