•APTIV•

THESIS WORK
Streaming of Cloud Infotainment System to In-Car Thin Clients

Start: Spring 2020

Extent: 2 persons, M.Sc.

Competencies: Android/Qt, Java/Kotlin/C++, Distributed System, UI, Systems Engineering

Aptiv Supervisor: Patrik Andersson

Address: Aptiv, Mölndalsvägen 36-38, Göteborg

Description

The gaming industry is rolling out new gaming so-
lutions where games are hosted and rendered in
the cloud and streamed to thin clients in 60 fps with
4K resolution. This technology enables new possi-
bilities in extending the lifetime of existing hard-
ware, simplifying deployment of software to multi-
ple clients, and enabling data analytics.

These are topics which is also of great interest to
the automotive industry, where vehicles are typi-
cally in use for 10 years or more. During the entire
lifetime of the vehicle, the car manufacturers would like to offer a high-end user experience that never
stops evolving and manage the infotainment system software in a resource and cost-effective way.
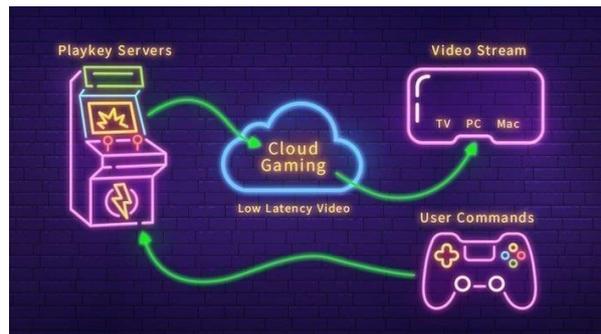
By providing solutions similar to the gaming industry, the automotive industry could address these is-
sues. But there is some major difference between the gaming industry and automotive. Cars are moving
larger distances and connection could be lost for extended periods of time, and a very large number of
sensors, connected devices and vehicle signals impact what needs to be displayed to the driver.

Purpose

The purpose of the thesis is to develop a simple Proof of Concept of an infotainment system hosted in
the cloud and streamed to multiple in-car thin clients. Ideas and concepts can and will grow over time
and spin-off new research projects in the area, but the thesis shall cover at least one of the topics below:

- Architectural challenges
- How to integrate Connected Devices (Bluetooth, Wi-Fi), vehicle signals, and radio tuners em-
  bedded in the vehicle (e.g. FM, DAB)
- 5G integration, connection drops, and poor connection quality
- Response-time optimization – how to make a fluent user experience and maintain framerate

Business Value

- Minimize hardware cost as the need for computation power moves to the cloud, and extended
  end of life for existing hardware
- Push minor and major software changes to entire fleet of vehicles much easier, with instant
  rollback if needed
- Enabling usage data mining and integration of an endless amount of big data more easily

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THESIS WORK
Car 2.0 - A Voice Controlled UI

Start:	Spring 2020
Extent:	2 persons, M.Sc.
Competencies:	Android, Java, Interaction Design, UI
Aptiv Supervisor:	William Leeson
Address:	Aptiv, Mölndalsvägen 36-38, Göteborg

Description

Voice control promises a better and safer user experience for the car as you are no longer required to locate, reach out and touch something. Instead you just need to express your wish to the car and it will perform the operation. Even better, passengers in the back can also change something such as the music without having to reach into the front.

Much as the Amazon Echo and Google Home devices bring a hands free experience to the home, something similar is needed for the car. We needs to create an effortless voice control experience tailored to the car, but there are some challenges:

- How do you give appropriate feedback without screens and distracting the driver?
- How can you manage several passengers wishes through one interface?
- How can you distinguish the various people in the car from the passengers to the driver?
- How to you make the system nonintrusive and not too talkative

Business Value

- By figuring out how to create a good voice interface we can fit the interfaces to suit our customers, thereby creating more desirability
- A voice interface offers less distraction than a graphical UI and is therefore safer

Purpose

Using Aptiv's existing Android platform, a Proof of Concept Voice UI needs to be created which can handle possible actions of the infotainment device and help give the driver more control, and cater to the environment in the car. The following research topics must be covered:
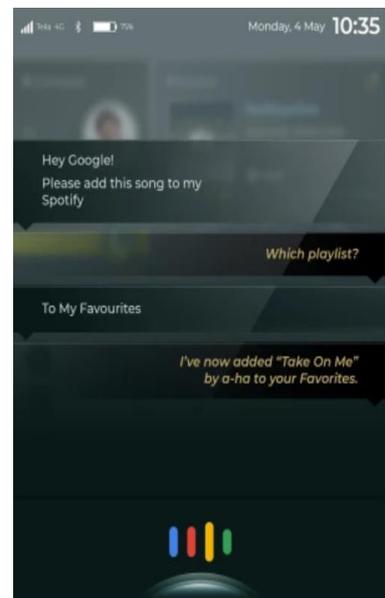
- What is a good voice interface for the car?
- What is the best voice based AI to use?
- What tools can be used to create voice dialogs?
- How can you create a voice interface?
- What could an Aptiv voice experience sound like? ("Aptiv, I want to…")

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THESIS WORK
Machine Learning of Pie Menus with Multiple User Input Sources

Start:	Spring 2020
Extent:	2 persons, M.Sc.
Competencies:	Android, Java/Kotlin, UI, Machine Learning
Aptiv Supervisor:	Patrik Andersson
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Description

Pie menus is proven to be faster and more reliable to select from than classical linear menus, because selection depends on direction instead of distance. Studies have shown that these results applies to finger and drag menu systems as well.

Pie menus can be concatenated into sequences; after a selecting an item in the first pie menu, a new pie menu appears. The user may then continue selecting a new item, and so on. This will end up in a gesture like motion which could be learned by an ML algorithm so that the user may do a gesture rapidly on the screen instead and end up with the correct action.

Concept Idea: Radial Menu UI

Since gestures can be hard to do on the display in the vehicle and requires reaching out, there is an interest to fuse the algorithm with input from a 3D motion sensor as well. By letting the algorithm handle both touch and 3D motion sensing input one may be able to create a consistent and seamless integration between different input methods used in the vehicle.

Purpose

The purpose of the thesis is to develop an ML algorithm based on pie menus that recognizes user gestures on both the display and in space so the input gestures are consistent in the vehicle.

Business Value

- Exploring new user interaction methods in infotainment system can lead to safer operations
- Applying machine learning to learn user behavior can lead to a superior user experience
- Understanding how ML can be used in in-vehicle infotainment can lead to new use cases

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