METU, Department Of Computer Engineering

Graduation Project

Proposal Form

Project Information

Title

OpenAuto: Car Monitor and Console System with Mobile Pairing

Target

Public [✓] Restricted [ ]

Proposer Information

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IP (Intellectual Property) Information

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Project Description and Background Information

Description

Most of the new cars are equipped with a large LCD screen providing media control, driving info, navigation, handsfree etc. Recent high-end versions have also mobile pairing feature, so that they can serve as an easy to control console for mobile device.

In this project an embedded system with an LCD touchscreen will be developed. System will have the following features:

- Accessing and monitoring information like fuel, speed, heat, etc. through CAN bus.
- Playing music and video over car audio system (SD card, USB stick)

- Having some method for easy interaction like steering wheel switches, voice control etc.
- Pairing with one (optionally more) mobile phone over Wifi direct and/or Bluetooth
- Calling and accepting phone calls as a handsfree device
- Showing notifications of a paired mobile device.
- Showing SMS and mails of the paired mobile device.
- Mirroring screen of the mobile device for some applications like mobile navigation system.
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Similar Products/Projects

Most of the automobile vendors already providing such devices with their high-end models. Some invested iPhone pairing as in Apples CarPlay while others have Android pairing with Android Auto. Also connection protocol is mostly cable based.

The vehicle part of the existing hardware is vendor specific and closed. This project aims to have an open source alternative.

Justification of the proposal

The vehicle part of the existing hardware is vendor specific and closed. Most vendors provide it only with their new and expensive cars with high price. This project aims to have an open source inexpensive alternative. Also this project provides both trip computer and multimedia features at the same time.

Contributions, Innovation and Originality Aspects of the Project

Project involves aspects from various areas of computer science/engineering:

- Embedded systems.
- Interfacing with hardware (CAN bus, camera, media lines, control switches)
- Operating systems.
- Networking (Wifi direct, Bluetooth)
- Human computer Interaction

The idea is only recently implemented in commercial domain. Most of the cars in use do not have such a device while they have CAN bus and media playing capabilities. A good implementation can go commercial as well.

Technical Aspects of the Project

Requirements are:

- Accessing and monitoring information like fuel, speed, heat, etc. through CAN bus.

- Connection to car media system and playing music and video.
- Connection to external switches through GPIO (or wireless keyboard) for steering wheel interaction.
- Implementation/design of one or more Wifi direct profiles for pairing. Also for handsfree, bluetooth audio device profile.
- A mobile application and device part application to:
  - share notifications.
  - SMS and mail access
  - Mirroring screen of the mobile device (i.e. mobile navigation system)

Targeted Output, Targeted User/Domain Profile

Any tech-savy car owner is a target user.

Project Development Environment

Project involves:

- CAN (Car Area Network) to communicate other parts of the car, mostly sensors. CAN bus communication hardware can be bought on Internet, not too expensive.
- A touchscreen with a small computer (Raspberry Pi) is required.
- Mostly C programming language, mobile application API's like android SDK

External Support

Cooperation with a car electronics technician is recommended

References

http://www.android.com/auto/
http://www.apple.com/ios/carplay/
https://en.wikipedia.org/wiki/CAN_bus