

Natural Language and Voice Control in Automotive Systems

VOICE CONTROL IS HIGH ON THE WISH LIST for many drivers, faced with a plethora of controls, displays and dials. Today, a wide range of companies within the automotive industry are investigating, developing and selling technology for voice control. The vision is to improve safety and comfort by letting the driver use the hands and eyes undisturbed for guiding the vehicle in traffic, and use the voice to control the ever-increasing set of equipment in the car.

However, the full impact of voice-controlled automotive equipment has yet to be seen, partially due to the lack of natural language understanding in mobile systems. Furthermore, there are many practical issues that must be overcome to enable the user to talk naturally to the things around her.

Voxi's Intelligent Speech Interfaces™ (ISI™) platform addresses these problems in a unique way. ISI™ is a general-purpose platform and is useful in many environments, ranging from automotive systems and mobile systems in general to telephony services and consumer electronics.

This paper discusses some key issues, and shows how they are addressed with the ISI™ platform.

Natural User-controlled Dialogs

The ISI™ platform from Voxi focuses on the unique features of speech: its conciseness and

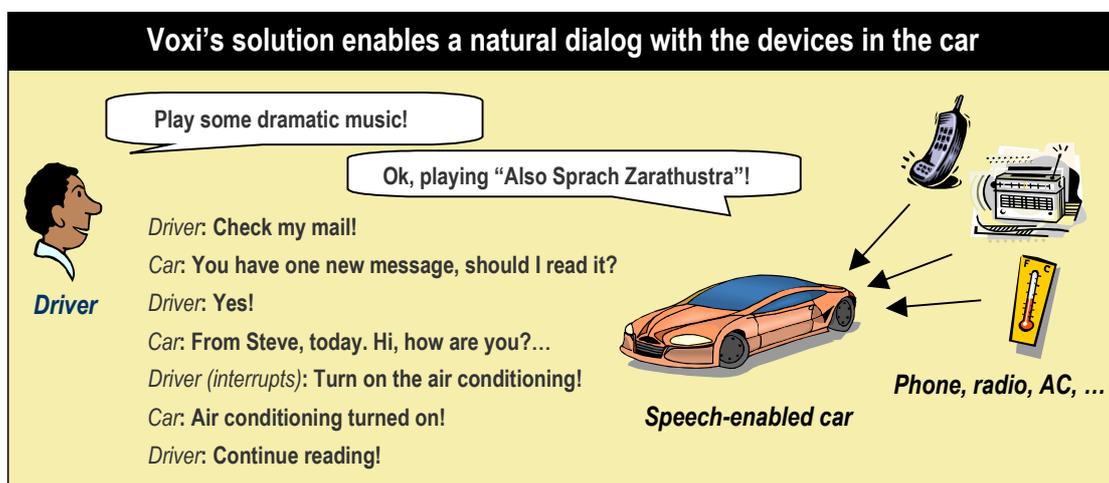
the ability to exactly express the speaker's intentions. Instead of constraining the user to limited dialog flows or menu like interaction, the user has the full initiative and can always give new natural language commands.

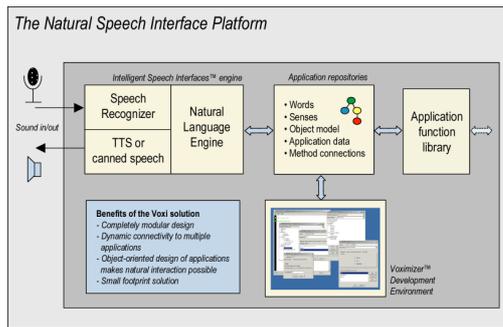
This type of interaction is well suited for a car driver, since the main attention can be given the guiding of the vehicle. With Voxi's natural language understanding, the interaction flow can freely jump between different commands and applications. The driver does not have to pay attention to following a certain dialog flow.

Adaptation to Different Languages

The automotive market is international with a high demand on localization. Thus, it is important to provide a way of adapting an existing application to a new language, without having to make a complete redesign.

To achieve this, the ISI™ platform makes a clean separation between language-dependent information (vocabulary and grammar), and language-independent information (application model and the related concepts). An application can quickly be adapted to a new language by just changing the vocabulary and grammar modules. The application logics and interaction design can be reused with no or little modification.





Platform overview

Control of Multiple Applications

The separation of the application model from the vocabulary also makes it easy to provide a unified interface to several applications. This makes it possible to dynamically collect the voice interaction for many different sub-systems in one central unit, and thus enables transparent voice control of the different systems found in a car.

User-independence

Voxi's speech recognizer requires no user adaptation or specific training of the type often found in high-end dictation systems or low-end voice markup methods. It can instantly be used by the end customer without any tedious configuration or recognizer training.

Flexible Integration in Embedded Systems

The ISI™ platform can be configured to have a small footprint, by tuning several factors. Among the more important factors are the sizes of the vocabulary and grammar, and how complex the application interaction should be.

Furthermore, the software is designed to be easy to port between different architectures. If needed, it can be custom-compiled for specific embedded CPU:s, and thus integrated into existing hardware platforms.

Rapid Development using Voximizer™

Using Voximizer™, the ISI development tool, applications can be developed using a quick development and test cycle. The vocabulary and function bindings of an application can be changed runtime and thus immediately tested.

Connections to Other Technologies

The ISI™ platform has two major modules, the speech recognizer and the natural language engine. It is possible to use a speech recognizer from another provider in combination with Voxi's natural language engine. The system can even further be customized with special solutions for speech synthesis, speech recognition, etc.

This makes it possible to adapt the solution to varying demands that may arise, such as speaker identification, noisy environments, and integration with the surrounding systems in the car.

Summary

The Intelligent Speech Interfaces™ platform from Voxi has several important features making it suitable for automotive use:

It promotes a user-controlled interaction using natural language, and it provides a unified linguistic interface to multiple applications.

Applications are easy to develop and to move between different languages, using the Voximizer™ development environment.

It can easily be adapted and integrated with different embedded CPU solutions, and is designed for limited memory and CPU usage. 

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