

Dialogue Systems

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What is a Dialogue System?

- Dialogue system – an information system communicating using natural language
 - frequently common IS with a dialogue interface
- Offers communication using spoken language.
- Alternative:
 - DTMF communication
 - textual natural language communication
 - multimodal communication:
 - speech and picture (human face simulation, sign language subtitles, etc.),
 - speech and text
 - ...

Dialogue Systems advantages and disadvantages

- Advantages:
 - + More natural way of communication.
 - + Accessibility:
 - visually and motorically impaired users
 - another users with difficulty to communicate with computer a standard way
 - possibility to navigate user through the process of entering data step-by-step
 - a next step to better accessibility – multimodal interface.
 - ...

Dialogue Systems Advantages and Disadvantages

- Advantages:
 - + Larger amount of potential users:
 - number of computer users vs. number of phone users.
 - + ...
- Disadvantages:
 - communication speed
 - sequential sound perception vs. parallel image perception
 - can be partially eliminated using proper dialogue strategy

- Labs:
 - LSD – doc. Kopeček
 - focuses on:
 - dialogue systems and sound processing
 - social informatics
 - assistive technologies
 - ...
 - NLP – doc. Pala
 - focuses on:
 - corpora
 - vocabularies
 - morphology
 - syntactic analysis
 - semantics
 - ...

Dialogue systems – State-of-the-art

Research in Czech Republic

Dialogue
Systems

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Dialogue
System
Introduction

State-of-the-art
DS Structure

- FIT VUT Brno
 - signal processing
 - speech recognition
 - automatic conference processing system
 - ...
- ZČU Plzeň
 - speech recognition
 - dialogue systems
 - ...
- ČVUT – speech synthesis

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Enterprise - Czech republic

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- FROG Systems s.r.o. – CS-voice 97
- OptimSys s.r.o – VoiceXML platform OptimTalk, dialogue systems
- ...

Dialogue Systems – State-of-the-art

Research Worldwide

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- W3C Voice Browser Working Group
 - IBM
 - Nuance Communication
 - Lucent Technologies
 - Motorola
 - ScanSoft
 - Tellme Networks
 - Vocalocity
 - ...
- W3C Multimodal Interaction Working Group
 - MIT
 - OGI
 - EPF Lausanne
 - ...

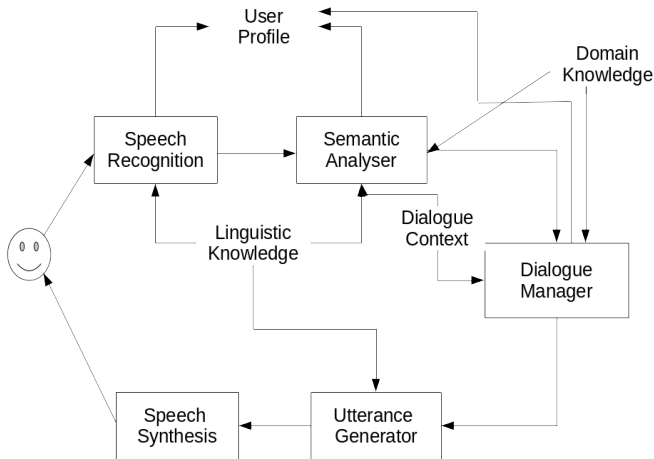
Dialogue System Structure

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Components of the Dialogue System

- User – terminal device, mediating the user to DS communication:
 - phone – communication using the PSTN connected to IS using VoIP gateway – VoIP gateway performs voice to data conversion and vice versa
 - VoIP client– direct user to DS communication using VoIP protocols(SIP, H.323, Skype, ...)
 - text client – DTMF + VoIP, telnet, ssh, XMPP,... textual communication
- Speech Recognition:
 - transforms speech to its textual representation
 - may use:
 - continues speech recognition
 - command recognition
 - it uses language models, like grammars etc., to improve the success rate.

Dialogue System Components

- Semantic analyser
 - extracts relevant data from recognized speech
 - utilises attribute grammars for example
- Dialogue manager
 - finite state automaton
 - the dialogue next step is determined by the its state and the user input.
- Utterance generator – generates utterances using data from the dialogue manager. The generated utterance is processed by text-to-speech synthesis then.
- Speech synthesis – generates speech for the user using the utterances from the utterance generator.

Information utilized by the Dialogue System

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- Linguistic knowledge – language information utilized by other components of DS to improve user inputs understanding as well as the speech synthesis quality (n-grams probabilities, speech recognition grammars, etc.)
- User profile – user information (voice characteristics, used utterances and phrases, ...).
- Domain knowledge – information about the dialogue system area (required data, ...)
- Dialogue context – information about the dialogue current state (current step of the dialogue, user input, user error rate, ...).