

Dialogue systems

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Basic Terms

Dialogue systems

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Dialogue Flow Control

Basic Terms

Cooperative Conversation Rules

Dialogue Initiative and Feedback

Next Aspects of Dialogue Strategies

- Dialogue – communication of two or more participants (flow of utterances).
- Utterance – continuous communication from one participant to the other.
- Turn – Utterance of one participant and response of the other.
- Dialogue strategy
 - Function that assigns to subsequent utterance to the given one.
 - It utilises a knowledge of a dialogue state:
 - required and entered informations
 - dialogue participants abilities
 - ...
 - It is property of each dialogue participant.

Basic Concepts

Dialogue Communication

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Next Aspects of
Dialogue Strategies

- Evaluation function:
 - function assigning a real number to every dialogu.
 - Used notation is $E(L)$, where L is a dialogue.
- Dialogue communication – An ordered quaternion

$$M = (S_1, S_2, E_1, E_2)$$

- $S_i, i \in \{1, 2\}$ – dialogue strategy of a participant.
- $E_i, i \in \{1, 2\}$ – evaluation function of a participant.

Basic Concepts

Cooperation in a Dialogue

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Next Aspects of
Dialogue Strategies

- Dialogue communication $M = (S_1, S_2, E_1, E_2)$ is called:
 - Cooperative $\Leftrightarrow E_1 = E_2$. Both participants has the same objective and try to cooperate.
 - Non-cooperative $\Leftrightarrow E_1 \neq E_2$. The objectives of both participant differs.
 - zero sum communication $\Leftrightarrow E_1 = -E_2$. The objectives are contradictory.
- The evaluation is based on the game theory:
 - dialogue can be viewed as a game of two participants.

Cooperative Conversation Rules

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Next Aspects of
Dialogue Strategies

- A dialogue system should try to keep the dialogue to be cooperative.
- Author Herbert Paul Grice – English linguist.
- Aspect of informativeness:
 - 1 Be reasonably informative – no less no more than needed.
- Aspect of quality:
 - 1 Don't tell false informations.
 - 2 Don't tell the informations you're not able to prove by adequate evidence.
- Aspect of manner:
 - 1 Information should be direct and straightforward.
 - 2 Avoid ambiguity or obscurity.
 - 3 Strive for brevity.
 - 4 Be disciplined, keep the dialogue orderly.

Cooperative Communication Rules

cont.

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Next Aspects of
Dialogue Strategies

- Aspect of civility, empathy and ethics:
 - 1 Minimize the demands on the communication partner and maximize the benefits for him.
 - 2 Minimize the shortcomings of the communication partner and maximize his strengths.
 - 3 Maximize the partner's agreement and minimize his disagreement.
 - 4 Maximize the empathy towards your partner.
- Aspect of asymmetry:
 - 1 Inform a user of all important characteristics that deviate from the expected dialogue flow and that he should consider to ensure cooperation.
 - 2 Ensure short but still adequate informations about the system possibilities and limits.
 - 3 Give the user enough and understandable informations about the system interaction.

Cooperative Communication Rules

Human — Computer Communication

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Next Aspects of
Dialogue Strategies

- Aspect of knowledges and abilities:
 - 1 Consider the user's relevant knowledge.
 - 2 Consider the user's possible wrong analogies.
 - 3 Differentiate between novice and experienced system user.
 - 4 Consider the user's legitimate perceptions of the system's knowledge and capabilities.

- Aspect of clarification and elimination of errors:
 - 1 Initiate the meta-communication that leads either to elimination or to clarification of a communication error in the case of communication failure.
 - 2 Ensure a meta-communication explaining either non-consistent or ambiguous user input data.

Aspects of a Cooperative Dialogue System

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Next Aspects of Dialogue Strategies

- The dialogue system should take into account the following aspects when communicating with the user:
 - aspect of informativeness
 - aspect of persuasiveness
 - aspect of manner
 - aspects of civility, empathy and ethics
 - aspect of asymmetry
 - aspect of a user knowledges and abilities
 - aspect of error clarification and elimination

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Next Aspects of Dialogue Strategies

- The dialogue next step is determined by a dialogue strategy of one of communicating participants.
 - One participant usually asks the questions and the other responds.
- We can distinguish in the case of human — computer communication:
 - user initiative dialogue
 - system initiative dialogue
 - mixed initiative dialogue
- The systems in a real life utilize:
 - mixed initiative dialogues
 - system initiative dialogues.

Dialogue Initiative

Examples

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Next Aspects of Dialogue Strategies

■ System initiative dialogue:

System: Your user name please

User: xyz

System: Say the sentence:

"My voice is my passport. Verify me!"
to verify you.

User: My voice is my passport. Verify me!

...

Dialogue Initiative

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Next Aspects of Dialogue Strategies

- **Mixed initiative dialogue:**
 - User:** I'd like to go by train from Adamov to Kerkyra today.
 - System:** Would you like to find a direct connection or a connection with transfers?
 - User:** I'd like a direct one.
 - System:** I'm sorry. There is no direct Adamov - Kerkyra connection.
 - ...

Dialogue System Feedback

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Next Aspects of
Dialogue Strategies

- The system should verify the information prior to process them:
 - speech recognition errors correction
 - user errors corrections
 - ...
- Acquired Data Verification manners:
 - Summarizing feedback – system repeats the user input and allows their correction when needed.
 - "Echo" feedback – the system repeats every input right after it has been entered and offers user to correct it.
 - Implicit feedback – the last data entered by user are part of the query on the the next data.
 - Explicit feedback – system validates the input data using the explicit queries on their values.

Dialogue System Feedback

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Next Aspects of Dialogue Strategies

■ Summarizing feedback:

User: I'd like to go by train
from Adamov to Kerkyra.

System: Searching the connection by train.
Departure Adamov,
final stop Kerkyra.

■ Echo feedback:

System: What kind of transport do
you prefer?

User: Train.

System: You want to go by train.
Where do you want to go from?

User: Adamov.

System: You want to go from Adamov.
Where do you want to go?

Uživatel: To Kerkyra.

Dialogue System Feedback

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Next Aspects of Dialogue Strategies

■ Implicit feedback:

System: Student name.

User: Jan Novák.

System: Where was Jan Novak born?

...

■ Explicit feedback:

System: Student name.

User: Jan Novák.

System: Student name is Jan Novák. Correct?

...

Correction dialogue example

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Next Aspects of Dialogue Strategies

User: My name is Jan Horák and I was born on August 8th 1988 in ABC.

System: User entered name Jan Novák, birth date August 8th 1988 and birth place ABC.

User: No. My name is Jan Horák.

System: Your name is Jan Horňák. Birth date August 8th 1988 and birth place ABC.

User: No, My name is Jan Novák.

System: Your name is Jan Novák, born on August 8th 1988 in ABC.

Other Aspects of Dialogue Strategies

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Next Aspects of Dialogue Strategies

- Possibility to interrupt system.
- Possibility to start correction and meta communication by user:
 - User: Would you be so kind and repeat the last question?
- Possibility to request a help:
 - User: Could you specify the required data?
- User knowledges and abilities detection:
 - Partially can be derived from a previous dialogue:
 - number of user errors
 - number of help requests
 - ...
 - Dialogue system initiative adoption.
- Dialogue system initiative adoption – for example user in a hurry, stressed user, ...

Next Aspects of Dialogue Strategies

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Next Aspects of Dialogue Strategies

- User emotions detection:
 - recognition based on non-verbal voice characteristics – required support in a speech recognition module
 - using another sensors – EEG, EKG, ...
- multilinguality
- multimodality
 - the dialogue is conducted by avatar (talking head) – suitable for the hearing impaired users for example
 - alternative inputs:
 - keyboard
 - face detection
 - ...
- courtesy
- prosody
- learning from mistakes.