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1 Research Interests

My main research focus is **natural language generation** (NLG) for spoken dialogue systems (SDS). I have been working with template-based and rule-based NLG systems, and I am developing a fully trainable NLG system that is based on **sequence-to-sequence learning** using recurrent neural networks. Recently, I have been focusing on making the NLG outputs **user-adaptive**. I also concern myself with NLG for languages with rich morphology (which include Czech, my native language) and **multilingual** natural language processing in general.

I am also interested in machine translation, which often uses techniques similar to NLG. Since I have a backrgound with a strong emphasis on linguistic analysis, my other research interests include dependency syntax, deep syntax (within the Prague tectogrammatics theory (Sgall et al., 1986)), and valency.

1.1 Previous Work

My most recent work is an NLG system trainable using just pairs of input meaning representations (such as dialogue acts) and the corresponding output sentences.[1] The first generator version was a two-stage setup composed of a sentence planning step based on A*-style search with a perceptron ranker and a rule-based surface realizer (Dušek and Jurčíček, 2015). The second version is based on sequence-to-sequence models and is able to operate in a two-stage setup, generating sentence plans for the surface realizer, as well as in a joint setup generating strings directly (Dušek and Jurčíček, 2016b). My recent experiments focus on entrainment, i.e., adapting the generator output to previous user utterances by reusing wording and syntax (Dušek and Jurčíček, 2016a).

My other work involves various improvements to the TectoMT transfer-based deep syntactic machine translation system, which includes a natural language generation component (Žabokrtský et al., 2008; Dušek et al., 2012; Dušek et al., 2015).

I have also worked on domain expansion, database interface, handcrafted dialogue policy, and the NLG component of the Alex SDS in the public transport information domain (Dušek et al., 2014).[2] Even though this work mostly involved software development of standard SDS components, it helped me understand the inner workings of a dialogue system.

Previously, I have developed a trainable morphology generation system based on logistic regression, word suffix features, and edit scripts that convert base word forms into correctly inflected forms (Dušek and Jurčíček, 2013).[3]

1.2 Future Plans

I am currently finishing my Ph.D. thesis, which is concerned with improvements of NLG for dialogue systems. My immediate goals therefore involve improvements to my sequence-to-sequence NLG system and experimenting with **generating Czech** sentences, where the rich morphology introduces different kinds of problems than those that need to be addressed in English.

I am also interested in a tighter integration of the individual models in the traditional dialogue systems pipeline, possibly resulting in **end-to-end** fully trainable solutions (Wen et al., 2016). Within this scenario, I would like to focus more on custom-tailoring the system responses for a particular user and situation – adapting to users' way of speaking and providing contextually accurate responses.

2 Future of Spoken Dialog Research

I think that the most important problems in SDS to be solved in the near future are the ones concerning fast deployment for multiple and/or open domains. Current large-scale virtual asistants developed by the industry, such as Siri, Cortana, or Google Now as well as new chatbot platforms such as Facebook's Viv offer a wide variety of domains but their inner workings are handcrafted in a large part, and their ability to keep track of dialogue contexts is rather limited.

A progress beyond the current systems will require improved architectures and training methods, where a turn

[1] https://github.com/UFAL-DSG/tgen

[2] https://github.com/UFAL-DSG/alex

[3] https://ufal.mff.cuni.cz/flect/

towards end-to-end training (Wen et al., 2016; Williams and Zweig, 2016) and bootstrapping with little training data are to be expected.

In addition, more expressive semantic representations of the dialogue state will be required for open domains and more flexibility. Here, I can imagine a shift towards graph-based knowledge representation and later possibly towards implicit modelling of the dialogue state, as is the case in today's experimental chatbots (Li et al., 2016).

Another future research direction in dialogue systems leads towards more adaptivity to a particular user and producing a more natural impression by eliciting richer contexts, conforming to social conventions, and adapting to the user's way of speaking.

Futher, future dialogue systems will probably support multimodal interfaces at a broader scale than today, combining touch input and visual output with the speech interface. Finally, I expect better support for multiple languages in SDS.

3 Suggestions for Discussion

My suggestions for the discussion roughly correspond to my research topics:

- NLG in dialogue systems – how to achieve fluency, naturalness, and responsiveness at the same time? How to control the output quality of statistical NLG?
- End-to-end task oriented systems and chatbots – can the latter inspire the former?
- Open-domain dialogue systems – how to make the dialogue systems scalable?
- Multimodality in dialogue systems – how to make use of multimodal interfaces while preserving a natural dialogue?

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Biographical Sketch

Ondřej Dušek is a research assistant and a 4th-year Ph.D. student of computational linguistics at the Institute of Formal and Applied linguistics, Charles University in Prague, focusing on natural language generation in spoken dialogue systems and structural machine translation. His previous studies provided him with a background both in computer science and theoretical linguistics: he obtained his master's degree in computer science in 2010 and a master's degree in German philology in 2013, both at Charles University.

His academic experience includes work on the European Union projects FAUST (2011-2013) and QTLEAP (since 2013), both on machine translation, and the VYSTADIAL project of the Czech Education Ministry focusing on spoken dialogue systems (since 2012).

His non-work interests include music, movies, a bit of sports, and spending time with friends.