

# Preface

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Human-computer dialogue systems, including spoken, written, GUI-based and multimodal, have increased in number, type and complexity over the last decade. Previous work in the artificial intelligence and computational linguistics communities has focused on the building and evaluation of these systems in a variety of domains. At the same time, other forums for natural language generation research have been discussing the generation of everything from noun phrases to longer monologues.

The papers contained in the proceedings show that a large number of researchers in both industry and academia, and from around the world, have taken up the challenge to build dialogue systems with a substantial amount of computer-generated rather than pre-written dialogue.

Topics include dialogue-specific phenomena such as clarification and initiative, traditional NLG topics such as content selection and aggregation in a dialogue context, application specificity and the level of knowledge representation, multimodal issues, interfacing with speech synthesis, corpus analysis, system evaluation, authoring tools, and resource requirements for NLG projects today. Application areas covered include health care, tutoring systems, animated intelligent agents, and the generation of dialogue in narrative, multimedia, and information retrieval systems.

The goal of this symposium is to bring together people involved with these diverse types of dialogue and natural language generation systems to discuss current challenges and improve existing techniques for meeting them. We hope that ideas from each of these areas will intermingle and be adopted by researchers in the various disciplines.

For convenience, we have divided the papers into six groups, although no single classification scheme could do justice to the many dimensions of research and overlapping topics covered in these papers.

## Generation in dialogue

This group contains papers that are first and foremost about natural language generation, describing aspects of

working generation systems that have been designed for or adapted for use in dialogue systems. They discuss aspects of generation such as resources, evaluation, improving dialogue text, markup for prosody, and relationships with other modalities.

Callaway inquires about generating disfluent dialogue with the goal of allowing current generation systems to make a seamless transition to spoken language production.

Horacek notes that text generation systems are typically more powerful than the generation components of dialogue systems, and considers desirable architectural features for future generation components.

Stone describes an implemented system for generating referring expressions by example.

Chen and Tokuda have developed a tutorial dialogue system for language learning that simplifies, and thus reduces, the time-consuming task of template generation.

## Generation architectures for dialogue

A second group of papers on generation specifically focus on the architectural changes necessary to adapt working generation systems from discourse to dialogue. These papers are more “edgy” than the previous group, involving work in progress and positions to be put forward as discussion points rather than taken.

Di Eugenio, Haller and Glass describe their experience developing a natural language generation component for a tutoring system, and raise the question of the resources and time required to develop and evaluate an NLG system.

McDonald discusses the role of resource limitations in choosing a generation architecture, illustrating with his experience developing a spoken-dialogue system at MERL.

Piwek and van Deemter show how revision operators can be used to generate scripted dialogues in ways that do not apply to interaction between autonomous agents.

Theune describes the conversion of a system from monologue to dialogue generation, focusing on the influence of dialogue context on information status and its consequences.

Bratt and Dowding describe the use of parse trees to improve the prosody of a spoken dialogue agent.

## **Dialogue using generation**

In contradistinction to the first group, this section includes papers which are basically about a dialogue system but focus on the generation component.

Inui, Koiso, Nakamura and Kotani describe a fully corpus-based approach to building language-independent, topic-independent natural language dialogue systems.

Larsson discusses the generation of feedback and sequencing moves in a dialogue system, using an analysis based on feedback behaviors in human dialogue.

Lemon, Gruenstein, Gullett, Battle, Hiatt and Peters describe turn management, content selection, aggregation, and related topics in a real-time dialogue system that allows humans and complex applications to collaborate.

Liu, Du, Fang, and Wang present a semantics-based method for generating dialogue systems in Chinese.

## **Corpora**

Several authors have made creative use of novel techniques of corpus analysis in service of creating better dialogues.

Jordan examines the features used for the interpretation and generation of nominals in dialogue.

Lulis and Evens discuss the use of analogies in human tutoring dialogue.

Nickerson describes the creation and evaluation of statistical models that use domain and lexical knowledge to improve interfaces for editing knowledge bases.

Wilson describes two measures of fluency based on different statistical models and their application to the characterization of corpora.

## **Modeling**

Symposium authors used modeling techniques from several disciplines to attack a wide variety of problems.

Dowding, Aist, Hockey and Bratt describe their work using grammar-based language models for repair.

Gabsdil discusses the implementation of a new approach to generating clarification questions.

Knott and Wright describe a system that uses natural language dialogue as an approach to authoring the knowledge base from which text will be generated.

Mathews, Jackson, Graesser and Person describe a study of chains of dialogue moves in an intelligent tutoring system.

Wilcock and Jokinen argue that a model of generation

based on new information focus is best suited to dialogue generation. Their system uses a flexible, template-based, pipelined approach with an agenda.

## **Applications**

Applications discussed in this symposium cover the gamut from tutoring and health care through consumer products to defense and other government applications. Several papers with implemented applications are classified elsewhere, and most of the papers listed here could also be classified according to the major techniques used.

Green and Davis describe a proposed assistive conversational skills training system for persons caring for a person with Alzheimer's Disease.

Habel discusses the principles behind a system for incremental generation of multimodal route instructions.

Jordan, Makatchev, and Pappuswamy discuss the use of a proof-based representation and abductive reasoning to guide content selection and sequencing in a tutorial dialogue system.

Schober, Conrad, Ehlen, Lind and Coiner describe their research into survey data collection systems. To what extent are complex natural language processing techniques required to ensure user satisfaction and accurate data collection?

Traum, Fleischman and Hovy describe aspects of the generation process for virtual agents in a multi-agent multimodal system.

## **Summary**

We hope that this symposium will solidify the community of researchers working at the NLG/dialogue interface by providing a forum for the discussion of shared problems and new approaches, facilitating the definition of goals and the development of shared resources, and encouraging the formation of community. The papers come from four continents and several disciplines. We hope that you enjoy reading this technical report and learn as much from the papers as we did putting it together.