

# Adaptive Dialogue Management in the KRISTINA Project for Multicultural Health Care Applications

Louisa Pragst, Stefan Ultes, Matthias Kraus, Wolfgang Minker

Ulm University

Germany

firstname.lastname@uni-ulm.de

## Abstract

The goal of the EU-funded KRISTINA project is to help migrants in European countries get information about their resident country's health care system by the means of a socially competent dialogue system. This system has to be able to handle a considerably large dialogue domain as well as hold a natural conversation whilst taking into account the cultural background as well as the current emotional state of its dialogue partner. Dialogue management, as core component responsible for the course of the conversation, therefore needs to be able to meet these challenges. Our research is focused on adaptiveness of dialogue management to the cultural background and emotional state of the user as well as the generation of appropriate emotional responses. Furthermore the benefits of the integration of a reasoner will be investigated.

## 1 Introduction

In Europe, migration is ever-present. Nevertheless it can not be expected that all migrants are instantly able to speak the language of their resident country, much less to be acquainted with the culture. Under these circumstances it can be a challenge for migrants to get medical help when needed. The underlying goal of the EU-funded KRISTINA project is to provide health-related information to migrants, e.g., information about the resident country's health care system, while eliminating language and cultural barriers.

However, cultural peculiarities may hinder the interaction: elderly migrants often are reluctant in communicating health issues in a foreign environment in a manner they are not used to. While a regular person is usually not trained to deal with

these cultural differences, the KRISTINA agent is intended to be a human-like, socially competent and cultural-aware system and a trustworthy source of the needed information.

There are many use cases for such a system: elderly migrants often are reluctant to see a doctor and suffer from social exclusion, their relatives have problems interacting with the local administration and temporal migrant care workers are confronted with isolation, a lack of professional training and communication problems with patients as well as supervision personnel.

To provide natural communication, the KRISTINA agent will be designed as a multimodal dialogue system having a dialogue manager (DM) at its core. Establishing the described kind of interaction results in the following challenges: as the system will be designed for many use cases, the domain of the dialogue is considerably large. Here, flexible structures are needed to approach this issue. Hence, we will integrate an external reasoning component into our dialogue manager. To ensure social competence, the user's cultural background as well as his emotional state will be taken into account. This can be further enhanced by generating appropriate emotional responses.

In the following section, we will give a short overview of the architecture of our proposed dialogue manager and continue to elaborate on how we intend to handle the inherent challenges.

## 2 Architecture of the dialogue manager

The general architecture of the KRISTINA dialogue manager can be seen in Figure 1. In order to render the system as a natural and socially competent dialogue partner, it takes into account cultural and emotional input in addition to the usual semantic input. Furthermore, the output will be augmented with an additional emotional response. Aside from that the dialogue manager gets additional information from a reasoning component to

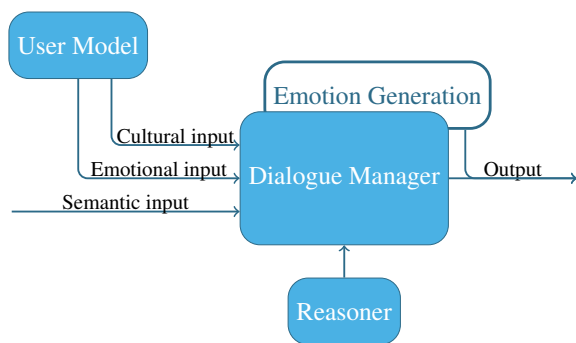


Figure 1: General architecture of our dialogue manager. In addition to semantic information it gets cultural and emotional input from the user model as well as enriched information generated by the reasoner component. The semantic output is supplemented by an appropriate emotional response.

handle the size of the dialogue domain.

The following issues have been identified as main research goals. For addressing them in our research, we will use our existing dialogue manager OwlSpeak (Ultes and Minker, 2014) and intend to explore data-driven approaches based on statistical learning methods. By that, we hope to grasp hidden aspects of human-human interaction.

### 2.1 Adaptation to cultural background and emotional state

For rendering the dialogue manager adaptive to multiple nationalities, the dialogue strategy will consider the cultural background of the user. This will provide migrants with a familiar way of communication and thus might help building trust. In addition, emotions may influence the dialogue strategy as well. By taking into account the emotions of the user (Bertrand et al., 2011) the acceptance of the system may be improved (e.g., (Jaksic et al., 2006; Partala and Surakka, 2004)).

### 2.2 Generation of appropriate emotional responses

Supplementary to the semantic representation of a system action from the dialogue manager, our research will investigate the generation of appropriate emotional responses. We expect that this will enhance the naturalness of the dialogue and thus improve user satisfaction.

### 2.3 Integration of a reasoner

For handling the huge domain, an external reasoning component will be integrated into the dialogue manager. All domain-related processing will be part of the reasoning leaving the dialogue manager itself with handling the interaction-related phe-

nomena like grounding. The reasoner will identify the information which is missing to fulfill the user request. This results in a separation of dialogue management and dialogue domain forming a plug-in architecture: the reasoning component may be easily exchanged. This arrangement will improve the modularity and robustness of the overall system. A similar architecture has been described by Nothdurft et al. (2014).

## 3 Conclusion

In this work, we present three research goals of the KRISTINA project for rendering dialogue management multicultural and emotional with the goal of improving user acceptance and naturalness of the dialogue. Taking into account the cultural background and emotional state gives the user a sense of familiarity. By generating appropriate emotional responses, the dialogue system appears to be more human-like and thus improving the user experience. Using an external reasoner improves the modularity of the overall system and gives the dialogue manager the possibility to exploit advanced reasoning techniques.

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## References

- Gregor Bertrand, Florian Nothdurft, Wolfgang Minker, Harald Traue, and Steffen Walter. 2011. Adapting dialogue to user emotion—a wizard-of-oz study for adaptation strategies. In *Proc. of IWSDS 2011*, pages 285–294. Springer.
- Nada Jaksic, Pedro Branco, Peter Stephenson, and L Miguel Encarnação. 2006. The effectiveness of social agents in reducing user frustration. In *CHI’06 extended abstracts on Human factors in computing systems*, pages 917–922. ACM.
- Florian Nothdurft, Felix Richter, and Wolfgang Minker. 2014. Probabilistic human-computer trust handling. In *Proc. of SIGDIAL 2014*, pages 51–59, Philadelphia, PA, U.S.A., June. ACL.
- Timo Partala and Veikko Surakka. 2004. The effects of affective interventions in human–computer interaction. *Interacting with computers*, 16(2):295–309.
- Stefan Ultes and Wolfgang Minker. 2014. Managing adaptive spoken dialogue for intelligent environments. *Journal of Ambient Intelligence and Smart Environments*, 6(5):523–539, August.