Interaction Profiles for an Artificial Conversational Companion

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Abstract. Using Artificial Companions for tasks requiring long-term interaction like language learning or coaching can be approached by creating local computational models for particular interaction structures, and models reflecting changes in interaction over time. An Artificial Conversational Companion (ACC) that helps to practice conversation in a foreign language is expected to play the role of a language expert in conversation. We apply methods of Conversation Analysis to obtain data-driven models of interaction profiles for language experts and language novices from a corpus of instant messaging based dialogues between native speakers of German and advanced learners of German as a foreign language. We show different ways how the artificial agent can simulate "doing being expert" in conversation and promote learning.

Keywords: artificial companions, interaction profiles, foreign language practice, conversation analysis, instant messaging, German

1 Introduction

Artificial companions [18], relational agents [2] and companion technologies [17] are in focus of multidisciplinary research projects related for instance, to health, sports & fitness [16], ambient assisted living [5], coaching & stress relief [13, 20] and second language acquisition [4]. The interpretation of the term *companionship* is for each of them slightly different, but they all have in common the expectation that the Companion interacts with the user for a prolonged period of time and adapts its behaviour to user's needs.

These expectations raised a wave of discussions about what the Companions are allowed and desired to be [1, 19]. Specifically, if a Companion should help to practice conversation in a foreign language only by means of instant messaging, what exactly must the Companion be able to do? All state-of-the-art approaches are based on assumptions about how such interaction should work, see for instance [10, 14]. We use, in contrast, a data-driven modelling approach to answer this question. We analysed a corpus of instant messaging long-term

communication between German native speakers (NS) and advanced learners of German (non-native speakers, NNS) [7]. The corpus consists of 72 dialogues, approximately 4800 messages in total. The phenomena that we are interested in are rare because they are dispreferred, however, they are still important. Our data analysis approach is methodologically grounded in Conversation Analysis (CA) [11, 12] which is reasonable for models of actions based on single examples.

2 Doing Being Language Expert in Conversation

The concept of an idealised native speaker who produces error-free language is problematic because "native speaker status does not necessarily correlate with a high command of the language, [...] speakers' proficiency in their linguistic repertoires is relative, domain- and activity-dependent, and may change over time" [8, p. 25]. The complementary class of non-native speakers must be then a subordinate and less proficient, which is not supported by sociolinguistic data.

The notion of differential language expertise [11] reflects more precisely the emic perspective of CA: "language expertise, like any other social category or attribute, is not primarily subject to an outside observer's judgment" [8, p. 26]. In other words, none of the interaction participants can be seen as a language expert or a language novice until this is made observable in conversation.

Interaction profiles are concerned with *individual* shapes of each interaction participant emerging under influence of all the interaction participants and the interaction history. The concept of interaction profiles describes how the conversational activities of all participants of an interaction become systematic and stable with the focus on one participant suggesting that each participant separately has only a limited influence on her own image in each interaction [15].

Example 1 illustrates how participants (L08-learner, N04-native speaker) of a conversation make their differential language expertise relevant in conversation. The learner L08 makes her not-yet-perfect language expertise relevant in turns 120, 125, 128 and 130 in form of a repair initiation, excuse for errors and expressions of thanks for linguistic explanations. The NS positions himself as language expert in turns 121-123, 126, 129 and 131 in form of an explanation, an error correction, evaluation of language proficiency and encouragement. Turns 118-124 build a sequence of other-initiates self repair: the NS produces a trouble source in turn 118 which is marked as such by the *other* - the learner, and then the NS produces an explanation. Turns 124, 126 and 127 are part of an other-correction sequence where the learner produces an error and the NS corrects it. Turn pairs 125 & 127, 128 & 129 and 130 & 131 form meta-talk about repair and face work. All these actions are contributions to the collaborative construction of interaction profiles of N04 as a language expert and L08 as a learner.

We found mainly three classes of sub-dialogues used by chat participants to make their differential language expertise relevant and to position themselves as novices or experts in conversation:

1. Face work and evaluation: learners' excuses for mistakes and fishing for compliments, native speakers' evaluations and encouragements;

2. Meta-talk and learning together: talking about language learning, offering help in language learning tasks and online exam rehearsal;
3. Repair sequences with linguistic trouble source: explanations, corrections, word searches, vocabulary check, definition work and similar.

The number of such sub-dialogues differs for each pair of participants in the corpus. For instance, some of the NSs' corrected a lot of language errors, and some of them tried to avoid corrections (let-it-pass strategy). In addition, there are backward links between separate sub-dialogues. For instance, if a learner could not understand an abbreviation and requested an explanation, the NS explained proactively other abbreviations even if the learner did not ask.

Example 1. Constructing interaction profiles of novice and expert (simplified: turn 119 belongs to a different sub-dialogue and is omitted)

118 `N04` Ja, Kommissar Rex hab ich früher auch geschaut... Das muß 15 Jahre her sein, da kannst Du dich dran erinnern?
Yes, I watched Komissar Rex in the past, too... It must have been 15 years ago, you can still remember it?

120 `L08` her sein, da kannst Du dich dran erinnern?
verstehe nicht)
her sein, da kannst Du dich dran erinnern?
don't understand [smile]

121 `L08` her=früher
her = earler

122 `N04` etwas ist schon lange her = "etwas ist vor langer Zeit passiert"
etwas ist schon lange her = "something has happened long time ago"

123 `N04` und "dran" (umgangssprachlich) = "daran" (hochdeutsch)
and "dran" (colloquial) = "daran" (standard German)

124 `L08` aha...nun in Belarus wurde es später passiert.
aha... well in Belarus it was happened later.

125 `L08` oh danke für solche Erklärungen))
oh, thanks for such explanations

126 `N04` äh nein :-) "es wurde später im Fernsehen gezeigt" oder sowas in der Art.
er no [smile] "it was shown later on the TV" or something like that.

127 `N04` Gerne, wenn ich Dich damit nicht nerve, hab ich noch eine: "passieren" gibt es nicht in der Form "etwas wurde passiert", sondern es heißt z.B. "etwas ist passiert"
You are welcome, if I don't annoy you with it, then I have one more: "to happen" does not exist in the form "something was happened", but it is called for example "something has happened"

128 `L08` klar))ich kann mir vorstellen, wie lustig und unklar meine Sätze sind))
clear [smile] I can imagine how funny and unclear my sentences are [smile]

129 `N04` ist nicht so schlimm, wie Du vielleicht gerade glaubst, keine Angst!
it is not so bad as you might be thinking, don't panic!

130 `L08` danke für Besonderheitn der Sprache=)für mich ist es sehr gut , dass du meine Fehler korrigierst)
thank you for the particularities of the language [smile] for me it is very good that you correct my errors [smile]

131 `N04` wenn es nicht nervt, gerne :-)
if it is not annoying, you are welcome [smile]

3 Modelling Interaction Profiles for a Language Expert

Assumed, that only the sub-dialogues found in the corpus are available for the future ACC, many different interaction profiles for a language expert can emerge in interaction, even given a limited number of possible characteristic actions. We approach the challenge of modelling interaction profiles for language expert - language novice chat interaction by splitting the tasks in local and long-term models. Local models deal with short sub-dialogues and address separate instances of repair, face work etc. Long-term models deal with issues as decisions if a correction is appropriate and which form should it take, or if an explanation of a particular potentially problematic expression is required. The following local models should help an ACC in "doing being language expert":

1. Other-initiated self-repair when the ACC is the trouble-speaker (OISR).
   a) Recognition of repair initiations. Everything can become a trouble source in conversation therefore, a repair initiation can be placed everywhere.
   b) Extraction of the trouble source. Every repair initiation is designed to contain all the information about the nature of the trouble.
   c) Repair carry-out. Synonyms, paraphrases and templates for various turn formats are required.
2. Error correction:
   a) Language error detection.
   b) Generation of a proper correction. Corrections may be *exposed* (explicit, the correction becomes the interactional business) like in Example 1 or *embedded* (implicit, without focusing on in in the talk) [9].
3. Face work: specific adjacency pairs, compare to turns 128-129 in Example 1.
4. Meta-talk about language learning and task-based learning sub-dialogues.

The long-term models manage the activation of the local models over time and include (but are not limited to) the following decisions:

1. Is a correction appropriate at a particular point in a conversation?
2. Is a proactive explanation based on interaction history appropriate/required?
3. Which conventions must be taken into account, for instance for corrections?

There is a difference between "being a language expert" and "doing being language expert". Equipped with the patterns obtained form empirical data, the Companion software can *position* itself as a language expert (e.g. react appropriately to repair initiations and do face work in form of assessments).

4 Preliminary Results and Evaluation Design

While still more efforts need to be made in formalising long-term models, we created formal models for repair with linguistic trouble source which were implemented in a prototype using chatbot technology as a baseline [3]. Natural Language Understanding & Generation is covered by the Artificial Intelligence Markup Language (AIML) [6] and is provided by pattern-template pairs as shown below. If the chatbot finds an input that matches to WIE GEHTS, the utterance stored in the template tag will be delivered to the user as a response.

```
<category>
   <pattern>WIE GEHTS</pattern>
    <template>Gut, und selbst? Alles paletti?</template>
</category>
```

Sub-dialogues related to novice-expert face work and meta-talk about language learning were integrated into the AIML files in form of new pattern-template pairs. A repair manager is responsible for the sub-dialogues related to the repair with linguistic trouble source and includes, for instance, open rules for the recognition of the repair initiations. We use an extract of the German Wiktionary for meta-linguistic information and repair generation. The required output is generated online from synonyms, notes on pragmatics and examples and is not restricted to the output variants foreseen by the template tag.

Example 2 explains how a chatbot can benefit from patterns extracted from the corpus to come closer to the behaviour of a language expert. The bot uses a colloquial expression in turn 2 which is not clear for the user. The user initiates the repair in turn 3 using a specific repair initiation format: repetition of the trouble source combined with a question mark. The bot recognises turn 3 as a repair initiation and extracts the trouble source (the repeated word). Bot's response in turn 4 is a repair carry-out generated from the linguistic database.

Example 2. A sub-dialogue with the chatbot: other-initiated self-repair where the chatbot is the trouble-speaker.

1 `User` wie gehts?
how are you?
2 `Bot` Gut, und selbst? Alles paletti?
I'm fine, and you? Everything okay?
3 `User` paletti?
4 `Bot` umgangssprachlich alles gut, alles in Ordnung, alles okay.
colloquial everything good, everything fine, everything okay.

The local models of OISR and corrections can be evaluated by standard quantitative methods using precision/recall metrics with the accuracy of the repair initiation recognition and trouble source extraction as evaluation criteria. However, a non-present repair or correction does not mean that it is missing. There is no guarantee that the user will make errors that can be corrected. The user may also choose to look up the dictionary instead of a repair initiation. Therefore, the most reasonable way to evaluate the long-term models is qualitative analysis of chat protocols combined with other methods of qualitative social research, like interviews and questionnaires.

5 Conclusions

CA turned out to be a powerful tool for data-driven modelling of rare phenomena in conversation. In this work we reported how we use CA-methods to identify and simulate instances of "doing being expert" in a free chat between a language learner and a Companion. The new models allow the Companion to position itself as a language expert and contribute to Companion's interaction profile.

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