

Analysis and Modeling of Concern Alignment in Consensus-Building

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1 Introduction

Dialogue provides a central mechanism with which to negotiate a consensus among ourselves in daily interactions. Consensus can be conceived as a formation of shared commitment on certain choice of future joint actions by a group of people. These actions are often mutually conditional on each other for their successes, and hence, consensus-building has invariably involve some form of management of affective trust relationships between conversational participants. ‘Concern Alignment in Conversations’ project aims to elucidate this interplay between rational agreement seeking and affective trust management through conversations, based on empirical analyses of real life conversation data and computational modeling of the conversational processes.

2 Concern alignment

Our starting hypothesis is that consensus decision-making processes can conceptually be divided into two parts, concern alignment and joint plan construction, as shown in Figure 1 (Katagiri et al., 2011; Katagiri et al., 2012). When a group of people are in a situation to find a joint course of actions among themselves on certain objectives (*issues*), they start by expressing what they deem rel-

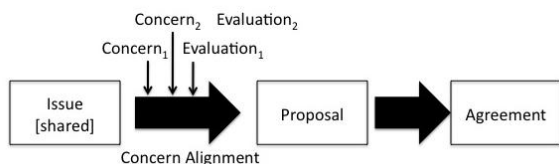


Figure 1: A schematic diagram of the concern alignment process in consensus-building.

evant on the properties and criteria on the actions to be settled on (*concerns*). When they find that sufficient level of alignment of their concerns is attained, they then proceed to propose and negotiate on concrete choice of actions (*proposals*) to form a joint action plan. When we decide to go for lunch together, we exchange what each deem relevant in selecting a restaurant, e.g., price, location, cuisine etc., before actually naming individual restaurants. In real life dialogues, these two processes can often be interleaved, people go back and forth between concerns and proposals, and a proposal jointly accepted can produce another set of concerns in implementing it at a finer level of details. Based on this conceptual framework, we have been empirically investigating conversational processes of concern alignment in medical consultation dialogues and exploring to establish a computational model of consensus-building through concern alignment.

3 Corpus-based analysis

Data: We have collected medical counseling dialogues for obese patients. Patients diagnosed as having a metabolic syndrome see expert nurses to get advises on their daily life management. The nurse and the patient discuss and seek a consensus on the methods to improve patient’s daily life habits to improve their health. The nurses try to establish affective trust relationships with their patients to keep their patients to stick to their advice after the sessions. We have collected a total of 9 sessions, about 5 hours of dialogues on video. All the sessions were transcribed.

A-B: C-introduce:(stop smoking)	⇒	C-eval/negative:(no intention)
A-B: C-introduce:(reduce smoking)	⇒	C-eval/negative:(already tried)
A-B: C-introduce:(use non-smoking pipe)	⇒	C-eval/negative:(tongue tingling)
B-A: C-introduce:(cost money)	⇒	C-eval/positive:(acknowledge)
B-A: C-introduce:(choose tobacco rather than eating)	⇒	C-eval/negative:(not good)
B-A: C-introduce:(consider when short on money)	⇒	C-eval/positive:(good)
B-A: C-introduce:(withdrawal syndrome)	⇒	C-eval/positive:(acknowledge)
B-A: C-introduce:(smoker communication)	⇒	C-eval/positive:(acknowledge)
↓		
A-B: P-introduce:(consider stop smoking when prices go up)		
B-A: P-accept: (stop smoking when prices go up)		

Figure 2: An example of sequential organization of concern/proposal exchanges in consensus-building dialogue.

Descriptive framework and analysis: Based on the concern alignment ideas, we devised a classificatory scheme for dialogue acts performed by conversational participants in terms of their contribution to concern alignment and joint action plan construction (Katagiri et al., 2013). Figure 2 shows an annotation example of a part of a counseling dialogue session. The analysis captures the process of concern alignment in which the nurse *A* and the patient *B* exchange a series of concerns, all related to the patient’s smoking behavior, and then focus and settle on a conditional plan for *B* to stop smoking, based on their responses to raised concerns,

4 Agent modeling for concern alignment

In order to capture and describe the conversational processes of concern alignment in computational terms, we have started to explore agent action selection models using game theoretical ideas.

Incomplete information: A framework for incomplete information games, such as Bayesian games (Harsanyi, 1967), should be employed to capture the process of concern alignment, as agents engaging in negotiation for consensus start with only partial information on their interlocutors’ goals and preferences, which is then gradually accumulated through the conversational interactions. Agent types and beliefs about these types include agent utility structures.

Communication game: Instead of treating a conversational exchange as a multi-step extensive-form game, we find it suitable to conceive of a consensus-building session as a communication game (Myerson, 1991), which consists of

two phases: communication and action selection. These two phases correspond to concern exchange and proposal exchange steps shown in Figure 1. Based on the information obtained in the communication phase, agents select their actions that maximize the expected utility outcomes.

Concern alignment as update: The process of concern alignment constitutes the presentation and uptake of information on participant utility structures as agent types. Exploration of model behaviors have been underway using schematic interaction settings.

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