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Discourse Structure of Medical Dialogue

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Abstract

We studied recorded conversations between nurses and patients for patterns in structure of the dialogue and level of interaction. We also analyzed if the medical dialogue can fit a stack model for segment transitions. Our results show that human conversation is highly interactive. Most topics involve 13 dialogue turns. Both patients and nurses were responsible for initiating topics. Majority of clauses were acknowledgements and confirmations, and 71% of the time there were only 10 or fewer words in each dialogue turn. The stack model was usually sufficient to model topics within segments and only had a 6.0% error rate.

I. Introduction

Human-to-human dialogue has been modeled in various ways in order to understand the rich structure of human communication and enhance the design of spoken language systems.[1] The need for conversational spoken language systems is particularly urgent in the medical domain. Patients typically call their caregivers and expect immediate response. Medical dialogues have not been studied as extensively as those in other domains. In this study, we analyzed more than 2 hours of recorded conversations between home hemodialysis patients and nurses from the Lynchburg Nephrology Home Hemodialysis program in Lynchburg, VA, the largest such program in the United States.[2] Using the transcribed conversation, our goals are: (1) to segment the data into discourse segments, dialogue turns, communicative acts and dialogue clauses, as described by Flammia;[3] (2) to analyze the data for patterns in the structure of the dialogue; and (3) to see if the medical dialogue can fit a stack model for segment transitions .

II. Methodology

Recorded conversations between nurses and patients that were recorded from July to September of 2002 were analyzed. Each call was segmented into discourse segments, dialogue turns and clauses, and communicative acts. A discourse segment refers to a series of dialogue turns that address a common goal. A dialogue turn refers to what a single speaker would say without interruption. It is made up of communicative acts, which are units of dialogue clauses with a single task (e.g. to request, to respond, to explain). Finally, the smallest unit is called a dialogue clause, made up of full sentences or elliptical phrases, which are phrases with meaning within the context where it is used. The number of dialogue turns per discourse segment and per call, and the number of dialogue clauses per dialogue turn were recorded. The structure of the dialogue was also examined for the level of interaction. Finally, we analyzed whether the dialogue can fit the stack model for segment transitions described by Flammia.[3]

III. Results and Discussion

We transcribed 120 minutes and 1,019 lines (8,422 words) of questions and answers. There were 25 calls for an average of 4.8 minutes per call. A total of 44 topics were discussed. The shortest call had 9 dialogue turns while the longest call had 87 turns. On average, there were 34 turns in each call. There were about 2 segments in a single call and 13 turns per segment. Each segment, however, has approximately 2.4 subsegments. When the segments were classified according to these general headings, the number of turns per segments was shown to be less for calls that have to do with scheduling and more for segments that had to do with personal topics. The dialogue is highly interactive as defined by five measures: (1) the number of dialogue turns required to complete a topic, (2) the level of mixed initiative (Patients initiated 61% of the segments while nurses accounted for the rest.), (3) the number of confirmations and acknowledgements, (4) the size of each dialogue turn, and (5) the number and type of turns required to report a piece of information.[3] Lastly, we analyzed the data based on the stack model for segment transitions.[3] In a simpler information-seeking domain, the stack model was sufficient in representing phone conversations with only a 10% error rate. In this study, the stack model only had a 6.0% error rate and was sufficient to model topics within segments most of the time. In fact, the depth of the stack (where a stack having no subsegment has a depth of one) was only one most of the time. In summary, an interactive dialogue closely mimics how humans behave. Modeling a dialogue should be done such that the interaction appears as natural as possible.[4] While it is still unclear how these insights into human-to-human conversations can impact spoken conversational systems, this study begins to help us understand the complexity of the task at hand and gives us insights into the nature of dialogue.

IV. References

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