Question Classification Schemes

Art Graesser  
Department of Psychology  
The University of Memphis  
Memphis, TN 38152, USA  
a-graesser@memphis.edu

Vasile Rus  
Department of Computer Science  
The University of Memphis  
Memphis, TN 38152, USA  
vrus@memphis.edu

Zhiqiang Cai  
Institute for Intelligent Systems  
The University of Memphis  
Memphis, TN 38152, USA  
zcai@memphis.edu

Abstract

One important first step in the Question Generation campaign is to identify question taxonomies and analytical schemes that are grounded in theory and empirical research. We present some of the proposed schemes in artificial intelligence, computational linguistics, discourse processes, education, and cognitive science.

1 Introduction

Researchers in several fields have proposed schemes for classifying questions. An important first step in a Question Generation (QG) campaign is to take stock of the landscape of question categories so that researchers can specify what types of questions they have in mind, as well as the educational context (Rus, Cai, & Graesser, 2007).

Question taxonomies have been proposed by researchers who have developed models of question asking and answering in the fields of artificial intelligence (Lehnert, 1978; Schank, 1986), computational linguistics (Harabagiu, Maiorano, & Pasca, 2002; Voorhees, 2001), discourse processing (Graesser & Person, 1994; Graesser, Person, & Huber, 1992), education (Beck, McKeown, Hamilton, & Kucan, 1997; Mosenthal, 1996) and a number of other fields in the cognitive sciences (for a reviews, see Graesser, Ozuru, and Sullins, in press).

This paper identifies some QG mechanisms, assumptions, categories, and dimensions that should help launch discussions about the landscape of questions to consider in the QG campaign.

2 Question Generation Mechanisms

Graesser et al. (1992) identified four classes of psychological mechanisms that drive the generation of questions. These are listed below.

Correction of knowledge deficits. This occurs when there is an obstacle to a goal, a contradiction, an anomalous event, a glitch in an explanation, an obvious gap in knowledge, or a decision required between equally attractive alternatives. The person experiences cognitive disequilibrium so a question is asked to obtain information to restore equilibrium. Most sincere information seeking questions are in this category (van der Meij, 1987).

Monitoring common ground. Questions are asked to gauge, assess, confirm, or ratify what each other knows about a topic.

Social coordination of action. These include indirect requests, indirect advice, requests for permission, and moves in bargaining.

Control of conversation and attention. These include greetings, directives to change the speaker, rhetorical questions, gripes, and directives to focus on an agent’s actions.

3 Assumptions behind Questions

Van der Meij (1987) identified 11 assumptions that all need to be true in order for a question to qualify as a sincere information seeking question.

1. The questioner does not know the information asked for with the question.
2. The question specifies the information sought.
3. The questioner believes that the presuppositions of the question are true.
4. The questioner believes that an answer exists.
5. The questioner wants to know the answer.
6. The questioner can assess whether a reply constitutes an answer.
7. The questioner poses the question only if the benefits exceed the costs.
8. The questioner believes that the respondent knows the answer.
9. The questioner believes that the respondent will not give the answer in absence of a question.
10. The questioner believes that the respondent will supply the answer.
11. A question solicits a reply.

4 Question Categories

The following 16 question categories were either proposed by Lehert (1978) or by Graesser and Person (1994) in their analysis of tutoring. Categories 1-4 were classified as simple/shallow, 5-8 as intermediate, and 9-16 as complex/deep questions in Graesser and Person’s empirical analyses of questions in educational settings.

1. Verification: invites a yes or no answer.
2. Disjunctive: Is X, Y, or Z the case?
4. Example: What is an example of X?
5. Feature specification: What are the properties of X?
6. Quantification: How much? How many?
7. Definition: What does X mean?
8. Comparison: How is X similar to Y?
9. Interpretation: What does X mean?
10. Causal antecedent: Why/how did X occur?
12. Goal orientation: Why did an agent do X?
13. Instrumental/procedural: How did an agent do X?
14: Enablement: What enabled X to occur?
15: Expectation: Why didn’t X occur?
16: Judgmental: What do you think of X?

It should be noted that sometimes a question can be a hybrid between two categories.

5 Other Dimensions of Questions

Some other dimensions of questions are frequently addressed in classification schemes, as discussed by Graesser et al. (in press).

1. Information sources. Does the answer come from a text, world knowledge, both, elsewhere?
2. Length of answer: Is the answer a single word, a phrase, a sentence, or a paragraph?
3. Type of knowledge: Is the knowledge organized as a semantic network, plan, causal structure, spatial layout, rule set, list of facts, etc.?
4. Cognitive process: Recognition, recall, comprehension, inference, application, synthesis, comparison, evaluation, etc.

References