The Question Model inside ArikIturri

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Abstract

With the aim of facilitating the automatic acquisition of some didactic resources, i.e. exercises for Computer Assisted Assessment Applications, we have implemented ArikIturri. Using corpora as source data, the system is able to automatically generate questions about domain contents. We use Natural Language Processing (NLP) techniques to facilitate this generation. In this article we describe the generic question model underlying ArikIturri. The model is independent from the language of the source corpora.

1. Introduction

Natural Language Processing (NLP) techniques facilitate the automatic acquisition of some didactic resources, i.e. exercises, for Computer Assisted Assessment Applications [2], [5].

ArikIturri [1] is a system developed for automatic generation of didactic resources. The output of the system consists of language questions represented by the XML mark-up language. By means of the model different types of questions can be represented. Despite we have used it with the Basque language, it is independent from the language of the source corpora.

Some models have been already developed concerning mathematical-oriented questions [4] or other types explained in SIETTE [3]. Our aim is to create a model where the techniques used to generate questions are collected.

2. Question Model

When we developed ArikIturri, we took into account different types of questions for designing the question model: Fill-in-the-Blank, error correction, multiple-choice and word formation question types. Recently, we have experimented with short answer question types.

2.1. Structure of the Model

An exercise is a set of questions. The question is composed of the topic, the answer focus and the context. We define the answer focuses as the chunks of the sentence where the topic appears. The rest of the chunks are collected into the context. Different questions to treat different topics can be part of the same exercise, that is why we assign the topic attribute to the question. The answer focus consists of a head and a notHead. We make this distinction because only the head contains the necessary information of the chunk to treat the topic. The representation also allows to change the order of the chunks of the sentence. Moreover, the change attribute delimits which chunks can change the order when setting the final question in the assessment application.

The head is divided into the answer, a list of distractors and a list of headComponents. The answer is the only obligatory attribute, while the rest takes part depending on the question type. The answer is the minimum list of words where the topic to treat appears, the topic info and the analysis related to it.

As regard distractors, we define a distractor as a list of words which are incorrect in that context. That is why they are always linked to an answer focus. We also offer their corresponding linguistic analysis and the heuristics used for creating each distractor.

Finally, the headComponent collects the specific information related to the question type. We have also defined a rule attribute in order to explain how each headComponent is created.

In example 1 we present a short answer question to show the different components of the model.

Example 1. Short answer question

"NOREKIN izan nituen lehenengo harremanak Lehen Mailako irakaskuntzan? (Argentinar)"

("WHO I was in touch in Primary school with? (Argentinian)"

ArikIturri has created a short answer question to treat the sociative declension case from the source
sentence “Argentinarrekin / lehenengo harremanak / Lehen Mailako Iarakaskuntzan / izan nituen”.

The question is composed of an answer focus and the context. The answer focus is the chunk where the declension case appears (Argentinar-, lemma (-ekin, suffix) and it is represented into the model as the answer of the head. The answer of the head consists of the word “Argentinarrekin”, its corresponding analysis and the information related to the topic.

Moreover, the head has two components. On the one hand, it has a wh-word (Norekin/with who) which is used to ask about the correct answer into the WHO question. On the other hand, it has a lemma (Argentinar/Argentinian) which offers the user the necessary information to answer the question properly.

As the short answer question type does not offer any distractor, the list of distractors is empty. The notHead element is also empty since in short answers we consider the correct answer is the entire chunk. The rest of the chunks are the context of the question.

However, there is a difference between the source sentence and the generated question in terms of chunk order: what originally was 0 – 1 – 2 – 3, has been transformed into 0 – 3 – 1 – 2 chunk order. The “true” value of change attribute gives to the assessment application the opportunity of correcting different answers of the learners where some chunks of the response can be in different order.

2.2. General and Flexible

Two main characteristics of our question model are generality and flexibility. It is a general model because of its independence from the language of the questions as well as from the NLP tools used for their generation. Indeed, our model allows different types of questions to be represented and, in addition, different types of questions can be specified into the same exercise. Finally, because the model has been developed using XML, the importation and exportation processes are easy tasks.

Our model is also flexible due to different reasons. First of all, we foresee that new types, such as word order and transformation, could be also represented by this model. Besides, it also offers the possibility of changing the order of the chunks in a sentence. This is an advantage for free word order languages such as Basque. Furthermore, the fact that the model permits to have more than one answer focus into the same question has two advantages: one is the option of having different answer focuses which are related to each other; the other one is the possibility of varying the complexity of the questions. In addition, the fact that the distractors of a head can be created with different heuristics is a favourable option in terms of quality.

One way of proving the generality and flexibility of the system is to test it into different applications. We implemented a web-based post-editing environment to evaluate, manually, the generated questions. Post-editors have different options with each question: to accept it on its own, to discard it if it is not an appropriate question or to modify it. In addition, different components can be modified: the source sentence and the distractors (update or add new ones). Finally, the environment offers the option to add comments related to the reasons for not accepting the item, the explanations for modifying the item and the distractors and their opinion about new heuristics.

3. Conclusions and Future Work

We have defined and implemented a generic question model whose aim is to be as much flexible and general as possible to represent different types of questions. This model also includes some information used in the generation process which is offered to the post-editors by means of a post-editing environment.

4. References


