Ontology-Based Feedback System in Text

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Abstract. A major limitation of current online learning environments is the lack of timely formative feedback systems to correct students misconceptions hence facilitate learning. This paper intended to propose an ontology-based online feedback system to resolve the limitation. The domain of the ontology is light energy based on Next Generation Science Standards (NGSS). Using Jena API, the feedback system will extract students simple sentence and transform it into relationships, and then determine correctness of the sentence by adding the relationship to the existing ontology to check whether it is still consistent.

1 Introduction

Online learning environments has helped students to overcome various obstacles (e.g., time schedule) faced in imparting education to students. However, students may lose interests in online learning environments if there is no feedback when they encounter problems. Therefore, this paper tries to resolve the dilemma by developing an ontology-based online feedback system. The system will use Jena API to extract data from and write to RDF graphs. The function of the system is to give feedback to students when they have misconceptions. To realize the function, the system will go through the following three steps: extracting students simple sentence, transforming the sentence into relationship, and then add the relationship to the existing ontology to check consistency.

2 Ontology

In this work, we constructed an ontology for the domain of light energy. The construction of the ontology is constrained to explicit facts from Next Generation Science Standards (NGSS), and does not include facts from the entire domain of light energy. In Figure 1 we presents a graphical representation of a part of the light ontology. It shows that the ontology includes other forms of energy (e.g., heat energy). The reason for that is when we are searching for key word light energy in NGSS, the facts contains other forms of energy at the same time.

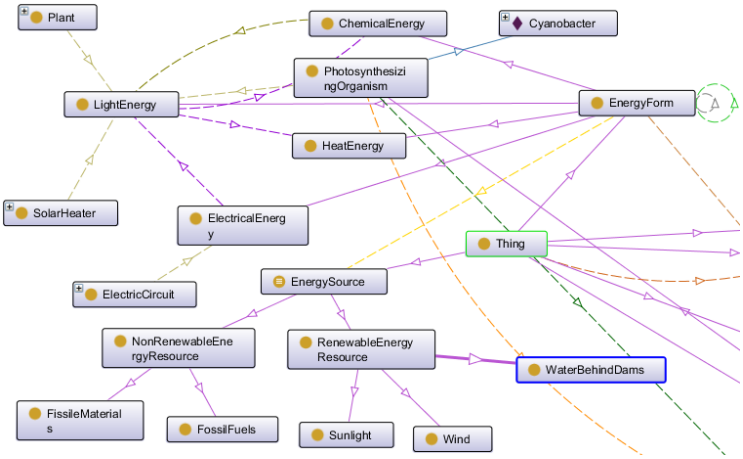

Fig. 1. Graphical representation of a section of the light ontology.

3 Approach

[2]developed an ontology-based automatic grading system to support students learning. They also stated that there are three steps for checking consistency: information extraction, transformation of extracted relationships, and determining correctness of a sentence [1]. The first step is information extraction. Information extraction is a process during which natural language texts are transformed into structured information, e.g., a knowledge base. For instance, from the sentence electrical energy can be transferred into light energy, an information extraction process will identify electrical energy and light energy as two concepts that are connected by the relationship isTransferredInto. This leads to the extraction of the relationship isTransferredInto (electrical energy, light energy). However, sentences are much more complicated than the example and a fact can be stated in different ways. We are still trying to find a way to extract information efficiently. The second step is to create a mapping system to match relationships generated from natural language texts with relationships in the ontology since words used to represent concepts and relationships might differ in the same domain [3]. One possible solution for the mapping system is to use WordNet to identify synonyms. We are still trying to figure out how to integrate WordNet to our feedback system. The third step is to determine correctness of the sentence by conducting logic reasoner. There are two situations in which a sentence is consistent with the ontology: one is that the sentence is incomplete (the sentence is consistent with the ontology, but cannot be entailed from it.) and the other is that the sentence is entailed from the ontology. Our feedback system will consider both situations to be correct and provide corresponding feedback only when the ontology is inconsistent. We will use Jena API to extract data from and write to RDF graphs to check consistency.

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