Automated Adaptive Mobile Learning System using the Semantic WEB

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Abstract

A directed graph represents an accurate picture of course descriptions for online courses through the computer-based implementation of various educational systems. The Learning Path Graph (LPG) represents and describes the structure of domain knowledge, including the learning goals, and all other available learning paths. Here, we propose an adaptive m-learning *system architecture* and a *conceptual framework* that uses the Semantic Web to obtain the students' data from other educational institutions. This process will enable the educational institutions to communicate and exchange students' data, and then use this information to adjust the students' profiles and modify their learning paths. The Semantic Web will create a more personalized dynamic course for individual students according to their ability, educational level, and experience.

Introduction

Throughout the most recent decades, various research has examined the possibilities of changing the educational instruction model from the customary one-size-fits-all instructing model to a more adaptive and customized learning instruction model. Most of the techniques calculate the optimal learning path depending on the characteristics in the student's profile to make the course more personalized. However, we have not seen any technique updating the profiles dynamically using the Semantic Web to exchange the information between educational institutions. One of the most challenging tasks for Adaptive Mobile Learning is to create an Adaptive Course.

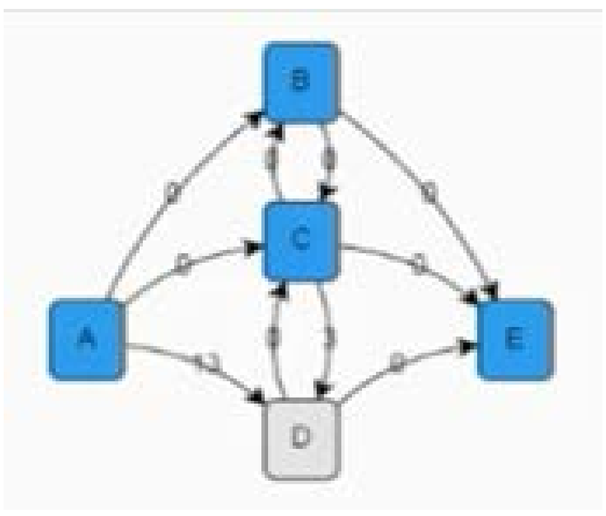

Figure 1. Learning Path Graph

Here, we intend to show how to optimize an Adaptive Mobile Learning System by using the Learning Path Graph (LPG) as shown in Figure 1 [1]. Furthermore, we intend to demonstrate how to customize the students' profiles by using the Semantic Web in order to provide credit to students for the course units completed in other accredited educational institutions.

Adaptive m-learning System Architecture

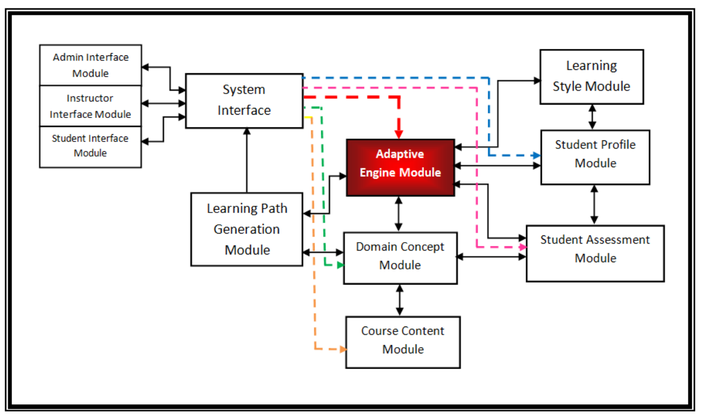

Figure 2. Adaptive m-learning system Architecture

Typically, any System Interface contains an Admin Interface Module (AIM), an Instructor Interface Module (IIM) and Student Interface Module (SIM). This interface allows administrators, instructors and students to access our AML system.

1. System Interface.
   - Admin Interface Module (AIM)
   - Instructor Interface Module (IIM)
   - Student Interface Module (SIM)
2. Student Profile Module (SPM)
3. Learning Style Module (LSM)
4. Domain Concept Module (DCM)
5. Course Content Module (CCM)
6. Learning Path Generation Module (LPM)
7. Student Assessment Module (SAM)
8. Adaptive Engine Module (AEM)

The Adaptive Engine Module performs two tasks: the first task is to find all the personal learning paths using adaptive algorithms according to the student's profile. The second task is to retrieve the related teaching material according to the student's learning style.

Proposed Conceptual Framework

Figure 3. Resource Description Framework (RDF) Triple.

In the Semantic Web, ontologies are formal definitions or representations of vocabulary or knowledge to allow the user to define resources classes, resource properties, and relationships between resource class members [2].

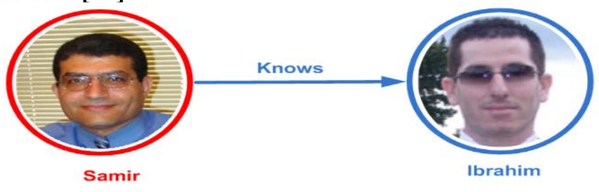

Figure 4. Parts of the Triple.

For example, as shown in Figure 4 the triple "(Samir) (Knows) (Ibrahim)", (Samir) is the subject, (Knows) is the predicate, and (Ibrahim) is the object.

Proposed Conceptual Framework- continued

Using TURTLE syntax, it can be written as follows:

```
@prefix  foaf:  <http://xmlns.com/foaf/0.1/> .
foaf:Samir foaf:Knows foaf:Ibrahim .
```

The language that is used to query ontologies is SPARQL (SPARQL Protocol and RDF Query Language) which is a set of W3C standards for querying and updating data conforming to the RDF (Resource Description Framework) model.

```
SELECT ?Last ?First ?City ?State
WHERE {
    ?student      person:givenName ?First ;
                  person:familyName ?Last ;
                  place:address ?postalAddress .
   ?postalAddress
                  address:addressLocality ?City;
                  address:addressRegion ?State;
                  address:addressRegion ? 'CT';
}
```

We used the dotNetRDF, were dotNetRDF Project aims to create an Open Source .Net Library using the latest versions of the .Net Framework for providing a powerful and easy to use API to work with RDF (Resource Description Framework), SPARQL and the Semantic Web. The primary goal is to provide an efficient method to work with reasonable amounts of RDF in .Net [4].

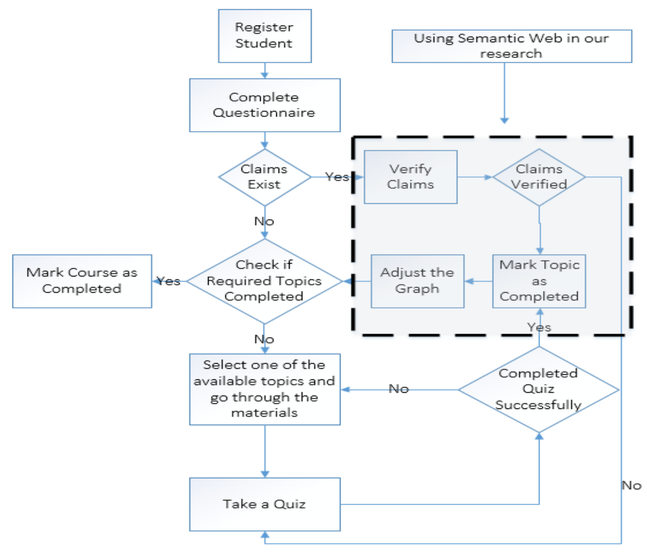

Figure 5. System Diagram

The Semantic Web obtains the information about completed course units which are applied to the Learning Path Graph, and a new optimal path is generated. Furthermore, if the student completes the target module, the student does not have to complete the rest of the modules.

Conclusion

The presented approach is expected to improve the performance of adaptive mobile learning and provides a learning experience to students that is more personalized and dynamic.

References

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