CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 INTRODUCTION

This chapter presents the significance of the proposed framework for adaptive personalized e-learning, the results obtained in the proposed work and provide suggestions for future research. This research was primarily motivated by the growing demand for effective Adaptive and personalized learning system. In the remainder of this chapter, the contribution of the work and the areas for future work are sketched out.

6.2 HIGHLIGHTS OF THE WORK DONE

This research work offers fresh inspiration for fundamental algorithms that are finding new applications in the area of adaptive and personalized learning system to provide Personalized and Adaptive learning Framework for conceptual knowledge representation and retrieval of contents based on conceptual search of individual personnel providing both the personalized learning contents and adaptive contents using personalized ontologies and appropriate concept maps.

A brief survey of the adaptive personalized learning approaches available in the literature is discussed in the introductory chapter and the motivation for the present work is also brought out.

A new adaptive E-learning framework is developed to provide adaptive learning content to the learners by creating concept maps. The Framework involved the process of creating learner profile, distribution of study materials, online examining, text pre-processing, text matching and
dimensionality reduction, getting score values through Fuzzy and Neuro Fuzzy techniques, concept extraction and concept map generation. The suitable study material is provided based on the knowledge level of the learners through the ontology generation process, as the knowledge level varies for every learner. In the generated ontology the inclusion of the user preference on topics helps to get the knowledge levels of the learners. The learners are provided with learning contents for a topic of their choice from the area of their interest and their knowledge level is assessed through online tests on these learned topics. The online test document undergoes text preprocessing tasks like document parsing, stop word removal, parts of speech tagging, stemming and filter specific linguistic patterns.

The knowledge level of the learners understanding is measured to the possible better accuracy using the soft computing paradigm namely Neural network and Fuzzy logic by comparing the online test document with the provided learning content. Based on the score values obtained, the knowledge level is determined. The adaptive E-learning technique provides a learning path to the learner with least interaction with the instructors. So the instructor need not waste their time to determine the learner knowledge level. Moreover, the instructor is able to get the current knowledge level of the learner through automatic concept map generation and provides content dynamically until the user becomes familiar with the content.

The efficiency of the learner profile ontology and Concept map generated for the users entering the adaptive E-learning system are evaluated in terms of the TP (True Positive), TN (True Negative), FP (False Positive) and FN (False Negative) values to find out how the link between the nodes are made. The Performance of the system is measured in terms of the statistical measures, Sensitivity, Specificity, Accuracy, Strength, Precision and Ontology F-Measure. The Learner Profile Ontology has shown better
performance efficiency. The generated ontology reaches 81% accuracy and 93% sensitivity. Moreover, the Precision and Ontology F-Measure values attain above 82% of efficiency. The system produces better concept maps in terms of efficiency and accuracy.

The adaptive e-learning system performance is evaluated and compared with the existing E-learning methods. With the sample of 40 users, 20 users are trained with normal E-learning methodologies (control group) and the remaining 20 users through the proposed adaptive learning method (test group). The E-learning improvement obtained for the proposed E-learning method over the existing E-learning technique was compared to pre and posttests. The performance values obtained shows adaptive E-learning is better and it is well accepted by the users. The adaptive E-learning environment improvement is compared by means of varying the techniques used within the system. Here, the proposed technique using Neuro Fuzzy logic systems and Fuzzy systems is compared with the existing e-learning systems. From the results, it is demonstrated that adaptive E-learning shows 25% better improvement than Fuzzy and other E-learning methods. The sensitivity measure produces the peak value of 97%. Accuracy produces average 85%, Strength produces 76%, Precision produces 86.5% and Concept Map Measure produces 90%. Statistical measure values of the performance have evidenced that the Neuro Fuzzy technique is better than Fuzzy logic and the proposed Neuro- Fuzzy logic has produced better concept maps than the Fuzzy and other existing techniques.

The proposed framework for the creation of personalized ontology model has provided personalized content to the learners by mining the personalized model using modified incremental spanning algorithm. The key feature of this innovative work is to create ontology by means of collecting information from the user background knowledge using Local Instance
Repository (LIR) and user concept knowledge discovery using Library of Congress Subject Headings (LCSH) for each learner. The novel method has used various procedures such as the creation of the learner profile, personalized ontology generation, ontology mining through Inc Span$^+$ algorithm, concept extraction, revision of skill level and content sharing. The provision of appropriate study materials is based mainly on the skill level of the learners by means of the ontology creation procedure as the skill level changes for every learner. The skill level and the user’s interest on subjects is decided precisely by the creation of personalized instructor ontology engendered by the tutor. The results show the performance of this algorithm is better than other algorithms in mining the personalized ontology model of the learner to provide personalized content. This provides a personalized learning path to the learners.

This personalized E-learning technique is able to retrieve the most relevant topics on the requested topic of the user by gaining the information from the local instance repository. The running times are taken to get the relevant content for the user by accessing Local Instance Repository (LIR) and Library of Congress Subject Headings (LCSH). The running time taken by LIR is very much small than LCSH. But by using the proposed technique with Inc span$^+$ algorithm to generate personalized ontology, the running taken by LCSH has been very much reduced. The proposed Inc span$^+$ algorithm is compared with the existing Prefix Span Algorithm. The time consumption for the utilization of LCSH information is very much reduced on using Inc span$^+$ algorithm than the Prefix Span algorithm.

The personalized ontology generated through the proposed Inc Span$^+$ algorithm has given better results than the existing Prefix Span algorithm. The connectivity between the nodes and the extension of generated ontology has been more when compared with the ontology generated through
the existing techniques. The system has shown an increase in accuracy of
generation of ontologies through the proposed Inc Span+ algorithm and shows
better efficiency than the existing techniques. Moreover, the number of nodes
generated is also very much reduced in the existing technique and the links
arising from each node is also limited. This shows the low performance
efficacy in the existing system and our method overcomes this limitation by
having more number of relevant nodes and accurate connectivity between the
nodes with extension.

The proposed method for personalized ontology generation with
Inc Span+ algorithm is compared with the existing prefix span algorithm. It is
seen clearly that all the performance measures obtained by the proposed
technique using Inc Span+ algorithm have attained better evaluated values
than the existing methods using prefix span algorithm. The sensitivity is
above 95%, precision, accuracy and ontology F-measure is above 90%.

6.3 FURTHER RESEARCH

Various E-learning strategies have emerged for the improvement of
the teaching learning process. The existing E-learning system provides same
content to all the learners irrespective of their skill and knowledge level. With
the objective to provide the needy content to the learners based on their
knowledge level, this Adaptive Personalized Adaptive learning system has
demonstrated two types of E-learning procedures particularly, Adaptive E-
learning and Personalized e-learning. Even though the proposed E-learning
environment provides better e-learning, there exist some limitations in both
the techniques. In the adaptive technique, Adaptive content is provided by
knowing the knowledge level of the learners from the automatic generation of
concept maps. The system has been developed for computer science domain.
This can be extended to other domains from this framework. In the
personalized ontology e-learning, the study material is retrieved through the
user search history. Here, the possibilities of the number of learners who could be benefited will not be large enough as the server system is enabled to handle only a limited number of users. Integrating both the E-learning procedures with improved methodologies will provide both the functionalities. The new framework has been proposed which integrates both Personalization and Adaptation is in the early stage with limited functionalities and a full fledged system is the scope of this research.