Attribute Based Ant Colony Algorithm for Adaptive Learning Object Recommendation

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Abstract :- To provide the best online learning to the learner we need to provide the data as per his need and level of learning skills. As we see the adaptive online learning will allow different frameworks for improvement by providing some recommendation in data as per the adapted to results, behaviors, preferences, tastes, learners, without any awareness of it that can be noticed by them. In this project, we have applied the approach of Ants optimization method. We have used the methodology of how the ants traverse their path to search the food as the same way Ant colony algorithm is built and same applied in the project. Using some Learning object (LO) classification the searching parameters are decided. This innovative approach is helpful in improving both the learning achievement and learning efficiency of individual Learners. As we are going to use the Learning object and Learning style as the attributes for searching mechanism that`s why it is said as Attribute-based ant colony algorithm. And it will be an Web-based learning portal which provide an Recommendation facility too. This web-based learning portal was created for learners to find the learning objects more effectively.

Keywords: - Learning object, Learning Style, Ant colony optimization.

I. INTRODUCTION

From the last decade there necessity of E-learning which is seen ever growing day by day. As we can see the every information cannot be available at one place at a time. Hence, considering the same need of E-Learning we have proposed thus paper. E-learning sites are increasing because of the interest which they bring: time, transport and accommodation saving, use flexibility, interactivity etc. Since few years, a new current is interested to adapt pedagogic contents to learners. Hence, it will be most appropriate to offer a tailored contents, and more adapted courses based on preferences and learners abilities. E-Learning is only one kind of way to introduce the optimized solution for searching the path. Many of the people have worked over it to provide the learner`s data as per his learning ability and style. Kolb, Felder and Silverman indicated that students learn in different manners: some of them learn best when visualizing contents, others when listening…etc. Our approach is different from many existing models and brings some contribution, especially when using Ant colonies (adaptive courses) for optimization.

II. RELATED WORK

In the last decade there were many studies were done on simplifying the Learning Object. IEEE, the IMS Global Learning Consortium, the advanced distributed learning (ADL) co-laboratory, and others (MASIE Center, 2002) have produced learning objects standardized works. Currently, the international specification, Sharable Contents Objects References Model (SCORM) (ADL, 2004), that is based on the results of work done by the above mentioned groups, is widely used in the e-learning ecosystem. Many web-based tutoring systems have developed good solutions for allowing the learner to customize the Learning data as per learners need. But all the approaches mentioned focused on the based on using learning activities and education items to predict optimal paths. Thus, if this model can be associated with a sophisticated adaptation technique, such as ant colony optimization (ACO), it will provide an intelligent analysis of the solution that will be best for the Learner to learn the Learning Objects.

2.1 Kolb`s Learning Style Model

David Kolb published his learning styles model in 1984. The model gave rise to related terms such as Kolb`s experiential learning theory (ELT), and Kolb`s learning styles inventory (LSI). Kolb`s learning theory sets out four distinct learning styles (or preferences), which are based on a four-stage learning cycle.
III. ANT COLONY OPTIMIZATION ALGORITHM FOR FINDING ADAPTIVE LEARNING OBJECTS

Ant colony optimization algorithm is a heuristic algorithm in which the artificial ants are used as the agents to traverse the path. Ant colony algorithm is a set of heuristic methods which are applicable to a wide range of different problems. Using such heuristic methods to solve the problem significantly has large possibility of finding high quality of solutions that are more optimized. Such methods also provide the solution in the reasonable time.

One of the problems that could be solved using Ant colony optimization is the Travelling Salesman Problem (TSP). It was the first use of Ant colony optimization which was proposed by Dorigo and was successfully applied over it (Dorigo & Gambardella, 1997).

procedure ACO algorithm

Set parameters, initialize pheromone trails

while (termination condition not met) do

    Construct Solution
    Apply Local Search
    Update Pheromone Trails

End
At each construction step, ant $k$ applies a probabilistic action choice rule, called random proportional rule, to decide which node to visit next. In particular, the transition probability with which ant $k$, currently at node $i$, chooses to go to node $j$ where $g_{ij} = 1/d_{ij}$ is a heuristic value that is available a priori, $a$ and $b$ are two parameters which determine the relative influence of the pheromone trails and the heuristic information, and $N_k^i$ is the feasible neighborhood of ant $k$ when located at node $i$ and the set of nodes that ant $k$ has not visited yet (the probability of choosing a node outside $N_k^i$ is 0). By this probabilistic rule, the probability of choosing a particular arc $(i, j)$ increases with the value of the associated pheromone trails $s_{ij}$ and according to the heuristic information value $g_{ij}$. The role of parameters $a$ and $b$ determine the consideration of pheromone trails and heuristic bias.

IV. SYSTEM ARCHITECTURE

![Fig.4.1. System Architecture](image_url)
We have developed the architecture for such users those who wants the data as per their needs. The architecture consists such learning skills & learning objects using which the system can easily recommend the user for any learning object.

In Fig. 2 system architecture the user needs to be registering himself & while registration his complete profile will be created which includes his learning objects style & his level i.e. beginner, intermediate or any expertise.

After registration process if the user login’s for first time then at that time there is no history is present about his searches, but, as his login period & searches for any object increments the user’s history is maintained & next time the system will recommend some related topics to the recent searches.

In the normal procedure the user simply inputs search string & then the both distance algorithm & heuristic algorithm are applied over it. Finally, the paths which having shortest distance and which following match rule those are shown to the user.

V. THE ADAPTIVE PROCEDURE FOR AACS ALGORITHM

We have proposed the pseudo code for the Attribute based Ant Colony System, in which different procedures are shown:

procedure Attribute_ACS //main procedure
Initialize_Parameter //sub-procedure 1
while (condition not terminate) do
Construct_Solution //sub procedure 2
Heuristic_Decision_Rule //sub procedure 3
Update_Pheromone_Trails //sub procedure 4
if (Match the adaptive rule) then
Daemon_Actions //sub procedure 5
end while
Recommended_Learning_Object //sub procedure 6 end procedure

VI. MODULES OF THE PROJECT

Module 1: System Module

In this Module we are going to implement the system view (designing) with proper validations and login authentication.

Module 2: Add Learning Objects Module

This Module is used to add learning objects into database using module 3.2.

Module 3: Search Tutorials Module
3.1 Ant Colony Algorithm Module
This module is used to search user query into database using Ant Colony optimization Algorithm.

3.2 Database Service Module
Using this module adding learning objects into database and get tutorials from database.

Module 4: Crawl Google Module
If ant colony didn’t find any related tutorials, this module searched the same query on Google and display the results.

Module 5: Recommendation Module
5.1 Recommended Searches Module
This Module is used to give recommended search query/result to user according to user’s previous searches.

VII. ADVANTAGES

- Eliminate guesswork:
  No guessing must be done about what the learner’s preferences are how he would like to study.
- Get faster answers to your educational requirements:
  Users can quickly get answers to their educational questions, rather than spending hours reading through volumes of unrelated data.
- Get your study needs fulfilled when and where you need them:
  Today, most of e-learning systems are accessible 24x7 through internet. Our system provides a unique user login for each registered user and keeps track of their progress.
- Get insight into learner behavior:
  One of the great benefits of adaptive e-learning is that primary importance is given to the behavior and preferences of the learner which helps in providing useful material to them.
- Identify learner’s learning patterns:
  Adaptive e-learning keeps track of user’s learning through time and adapts accordingly.

VIII. DISADVANTAGES

- Theoretical analysis is difficult.
- Complexity
  Another disadvantage of adaptive e-learning could be its complexity in implementation.
- Limited use
  Like all improved technologies, adaptive e-learning that to with AACS is not implemented practically and is not in much use today.
- Time Consuming Implementation
  Many learners in today’s fast paced educational scenario are not patient enough to wait for the execution of AACS for recommendation for learning objects. It requires good implementation time and learner’s general habit is to look for material they exactly want rather than complete process of learning.

IX. APPLICATIONS

1. Technology can help students learn more effectively and can improve their efficiency.
2. It supports better decision making to decrease learning time.
3. For student with disability e-Learning can be particularly beneficial and liberating.
4. Promote Learning by doing: adaptive e-learning involves greater participation from learner side in the learning process.
5. Be intelligent and adaptive, and empower the teacher.

X. CONCLUSION

In this paper, we propose an adaptive learning platform, ANT COLONY SYSTEM, which takes personalization information into consideration, including individual educational level and learning styles. ANT COLONY SYSTEM is an environment that can assist teachers to develop courses and provide learners with suitable educational objects to improve their learning performance. In this work, we used a method based on ant colony algorithm. Ant colonies Algorithm remains a fine tool to solve combinatory problems. Data sharing on pheromones is the highlight of such technique, where each search comes over to enrich the collective knowledge. Its implementation, learner’s domain knowledge level and learning objects attributes can provide an adaptive solution to learners. The experiment conducted by us is only at its beginning. Now, we work to optimize all parameters, the first results will be discussed in our future work. E-learning implementation of the same would be particularly beneficial and liberating especially for student with disability. Use of multiple algorithms for generation of better learning paths can improve this implementation and provide more accuracy. Collaborative filtering would provide an added advantage to the current implementation.

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