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AN ANALYSIS OF THE DOCUMENT SUMMARIZATION AND WORD CLASSIFICATION TOOLS AND TECHNIQUES IN A SMART ENVIRONMENT

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ABSTRACT

The requirement for advanced learning is quickly expanding with the successful granularity of learning objects. Recovery of taking in materials from savvy condition encourages the student to have a customized experience utilizing order calculations. The computerized learning articles are put away in a neighborhood vault in the brilliant design. The structure includes versatile specialists that assume a fundamental job in anticipating the instinctive idea of the student, which encourages the student to get the focus on content. Content recovery depends on the archive summarisation and word grouping, which is proposed utilizing order calculations like substance comparability calculation. Successful personalization is acquired by better exactness as far as accuracy and review. Archive rundown is finished utilizing arrangement calculation at first dependent on the kind of record recovered by the student. The word arrangement dependent on the recovered report is additionally prepared with a pre-handling technique that is utilized in the area philosophy. The closeness of the topical terms recovered aides in arranging the record and showing the substance to the student for increasingly customized involvement. Further, this substance, which is put away in a brilliant structure, incorporates versatile operators, which help in giving a synchronous correspondence between the clients taking a shot at comparative issues simultaneously and gives continuous substance to the client dependent on the inquiry even while the client is moving in various areas. The substance comparability calculation gives better exactness of recovered information in this way, giving the accurate record mentioned by the student. The examples of the information order give the normal the consequence of the recovered information, which includes report synopsis dependent on the word grouping. The outcomes have demonstrated that the student has a superior natural involvement with the focused on record wherein the student shows signs of improvement personalization. Progressively keen operators can be included for a student just as a creator to make the framework increasingly customized and give better joint effort. The grouping calculations alongside bunching of records got after synopsis can yield better precision for enormous informational collections.

1. INTRODUCTION

Enhancing e-learning systems is challenging for mostresearchers and practitioners. In the past few years, much architecture has been framed using learningobjects which are related to intelligent agents to improveteaching-learning performances. The framework toobtain a smart, collaborative design for the system is themain objective1. The design involves intelligent agentsfor more personalized, intuitive, global, contextual, andcollaborative system2 This design is proposed to overcomethe dumbness and intuitively handle the habits and desireof individual users. The structure and work process of the smart system isto achieve a multimodal collaborative system. The systemdesign also focuses the learner's habits and helps to recallthe learner's previous interaction

and errors and thenpresent the new content and the process. The system alsoaims that completion of coursework does not mean thatlearning is impossible thereafter and hence it involves thelifelong availability factor of data to the learner. The design of the system also responds to thedifferent learning styles, desired expectation and speedof the individual user using personalization agents3. Thelearning objects used are expected to functions such asreusability and extension of objects depending on theindividual's desire4. Various agents are deployed fordeveloping the architecture5. Existing systems provide less support for developing a completely integrated andefficient e-learning environment which meets the needsof individual learners based on the choice of learning.Existing systems require a huge amount of time to developvideos, slides and all other learning materials which canbe compiled and stores in the repository6.Agents efficiently hide the difficulty of complex tasksand they perform tasks on behalf of the user to educate themand also help the users to monitor events and procedures.The agents used in designing the system perform thesefeatures for its unique behaviour, when learners interactconcurrently. The system is to be flexible in retrievingcontent for a large variety of systems and different queriesbased on the different grade and difficulty levels of user7.Agents with various characteristics for a ubiquitouslearning environment in the smart environment exhibit: Collaboration helps learner to interact with the systemand also helps to identify a particular topic before thelearner spends too much time or is lost or misunderstooda particular topic.Learning objects for intelligent agentshave been identified to support learners and to providebetter learning outcomes based on their interest. Some ofthe current approaches which help in effective learningare the IEEE (Learning Object Metadata) LOM-the firstmodel created and now considered to be too simple. The attributes of IEEELOM are extended for variousresearch perspectives. Sharable Content Object ReferenceModel by Advanced Distributed Learning initiative (SCORM ADL) - This existing model is considered tobe too difficult but its implementation is considered tobe very consistent. This model proves efficient in termsof learning objects retrieval9. Virtual Mentor System-focuses and suggests that better learning outcomeshave been identified compared to traditional class roomsettings. This is used widely for many online courses. Synchronized Multimedia Integration Language (SMIL)was developed by the World Wide Web Consortium(W3C). This standardization was adopted by the WorldWide Web Consortium and is an easy-to-learn.XML-style, allowing easy design and providesbetter annotation with respect to metadata extraction.Researchers have given about fuzzy search, instantsearch and proximity ranking of documents andprocess of annotating documents based on these searchtechniques10,11. These methods can be integrated to getbetter search result and to achieve efficient space and timecomplexities.The National Science, Mathematics, Engineering andTechnology (SMETE), is constructed to meet learner'sand educator's need. This is identified for multidisciplinarylearning and provides presentations in education andtraining process. It also focuses on interactive learningwith different resources.

2. SYSTEM MODEL

2.1 Generic Architecture

The generalized architecture for an e-learning systemis given in Figure 1. This architecture gives the overalland general interaction of learner and author in alearning environment with a centralized

content storagemanagement system. The storage of content is based onlearning management system architecture. The learningcontents are stored in the form of learning objects. The granularity of these learning objects gives moreaccessibility to the learning contents based on the requestof the learner12,13. The storage of contents and retrieval oflearning objects is based on the content stored and thequery based extraction of data based on the learner'sinterest. Figure 1 gives the overall architecture of thee-learning environment.

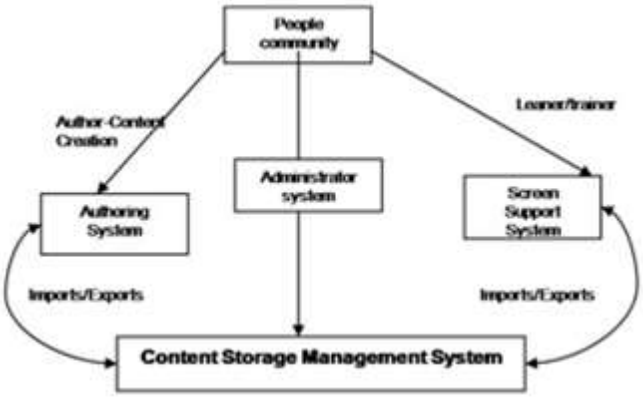

Figure 1. Generic e-learning architecture.

The role of agents in e-learning has proved betterpersonalization. The characteristics of agents involvedin e-learning are discussed for enhancing the proposed system model with agent interaction. An intelligent agent isa program that helps to enhance better learning usingcharacteristics such as autonomy, better socialbehavior, reaction to users, and proactive behavior. Agents work on their own and have a high degree ofcontrol over their actions and internal state. This helpsin better personalization when learning object retrieval isbased on agent interaction. Interaction with learners andsystem shows the intuitiveness of the user for effectivelearning14. Agents perceive their requests and respond at the same time to changes that occur in their environment. This helps in updating the information changes whichoccur in the learning management system. They also helpin communicating with the learner and author side. Software agents are programs that are defined as anentity and carry out tasks in an organized way as givenby the user and also react for the other existing entitiesinvolved in the process. They function in a particular agentplatform that has other agents and processes15,16. Theseagents learn from their experiments, and they communicatewith other agents. Agents play an important role as theyare responsible for user-friendly interface and providemaximum intuitiveness. The agents to be consideredfor a general architecture can be listed as the agents forinstructors, lesson planning, and resource planning, andtutoring. According to the general strategy, a systemusing intelligent smart agents in a learning environmentshould abide by the following categories of agents, such asdiagnostic agent, interacting agent, collaborating agent, and social agent17,18.

2.2 A Smart Agent-based System

Task Agent: A task agent is involved in doing customizedtasks like providing information and knowledge byinteracting and communicating with other task agents19,20. Performance Monitoring Agent: The agent isresponsible for monitoring the work done by the learner. Thishelps in

identifying the intensity of the learning of the learner. Personalization Agent: This agent is identified as a user interface agent between the user and the agent-basedlearning environment21. The individual learner can bepersonalized by a querying process, an indexing process, and an evaluation process.Collaborator Agent: Collaborating agents are usedto encourage collaboration between e-learning usersand improve the interaction and accuracy of theircollaboration22,23. These include suggesting collaborationwhere appropriate collaboration agents can identify thetasks of the user in the learning environment providesynchronous communication for the users who areworking on similar problems at the same time.Resource Identifying Agent: The need of the resourceidentifying agent is to locate the educational resourceswhich are present abundantly in the web and to retrievethem based on the topics, resources, and location of thecontent based on the learner's methodology, which theysupport24,25.Learner Centred Agents: They are responsible formaking the learner's interaction with the learningenvironment to be very effective and problem-free. Thepurpose is to communicate a personalization agent and thecollaborating agent to enhance learning26. The learner-centered agent is responsible for getting feedback fromlearners about the effectiveness of the targeted learningmaterials and continuously keeps track of the learningoutcomes27.The learning object repository is responsible forstoring learning objects, and metadata which are usedfor annotating. Annotation tools are used for creatingmetadata records, searching learning objects, aggregatinglearning objects into composed learning materials.

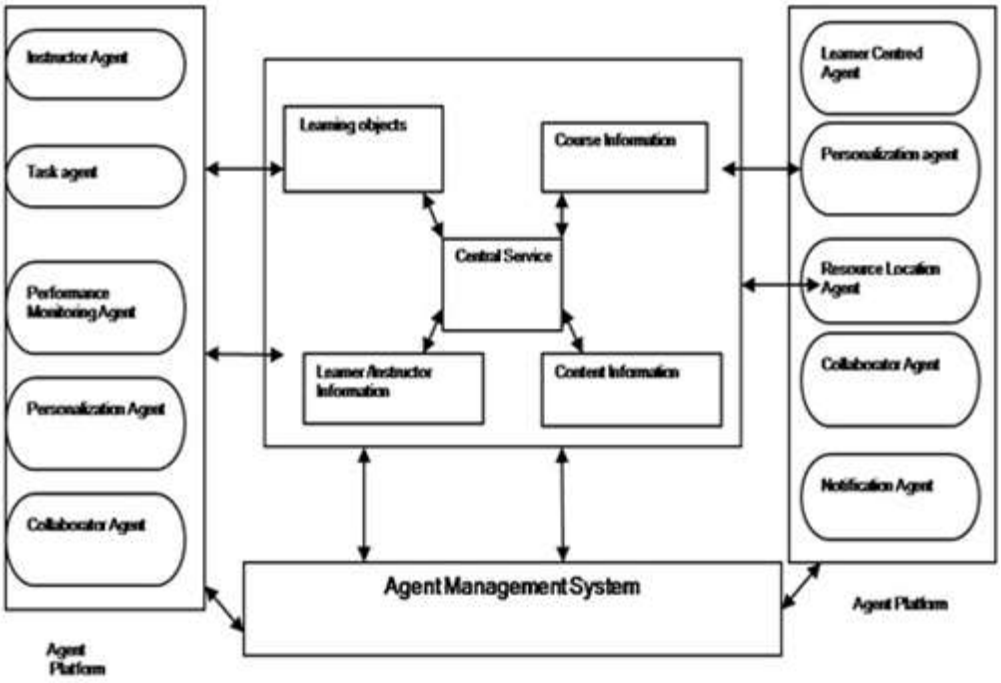

Figure 2. Smart agent-based architecture.

2.3 Smart Framework for Mobile Agents forE-Learning

Agent-based learning systems are used globally. Smart useof resources in different places is possible. Users do notneed to know where the resources are located. The smartframework provides uninterrupted access to the localor remote data, which is required to complete

labouriouscalculations28. Recovery protocols, during failure, transactional guarantees such as atomicity, restoration of operational state after a failure is a few constraints infor e-learning. Services to a smart framework could bemassive, and this may cause bottlenecks and dynamiclearning-agent systems. The proposed framework showsthe need of mobile agents for retrieving the content fromthe repository. Figure 3 shows the proposed frameworkwith mobile agents in a grid environment. The proposedframework exhibits the following definitions.

2.3.1 Minimized Communication CostsDistributed computing interacts between multiplecomputers through a network. Thereby the cost forcommunication for learning technology is reduced29.Asynchronous deployment: After moving to migrate to the destination-side computer, a mobile agent doesnot interact with the source side, and if a connection ornetwork is lost on the service providing side, the agentworks efficiently and reaches the destination.

2.3.2 Direct Access

The agent directly executes on the system in which it is, and it can be directly accessed. This is very helpful indetecting the failures and also prevents the installationdelays, which may be caused due to network problems30.

2.3.3 Dynamic Behaviour

Mobile agents can choose their destination and can beused while it is required. This can be done dynamicallyand is very useful in smart environments with limitedresources.

2.3.4 Easy Access to Distributed ApplicationsStandalone programs can be easily modified usingagents since the mobile agents carry information todifferent computers. In Figure 3, the smart framework with mobile agentsis shown. Domain ontology is deployed for the storage ofcontent in the smart framework. This helps the user toretrieve the content from the repository even if the useris moving. The mobile agent helps in the continuationof data retrieval on the go from the domain ontology. The contents which are learning objects are stored in therepository where the user registers in a regional grid. Theintermediate agents interact with the mobile agent tokeep the process in continuation.

3. CONTENT SEARCH IN A SMART ARCHITECTURE

Courses are not designed in terms of learning objectsand storage of learning objects in a repository. Themajor challenges contribute the methods to decomposecomplete course into meaningful learning objects, todecide on levels of granularity, to represent such levels, and to show relationships among and between relatedlearning objects at different levels of granularity.

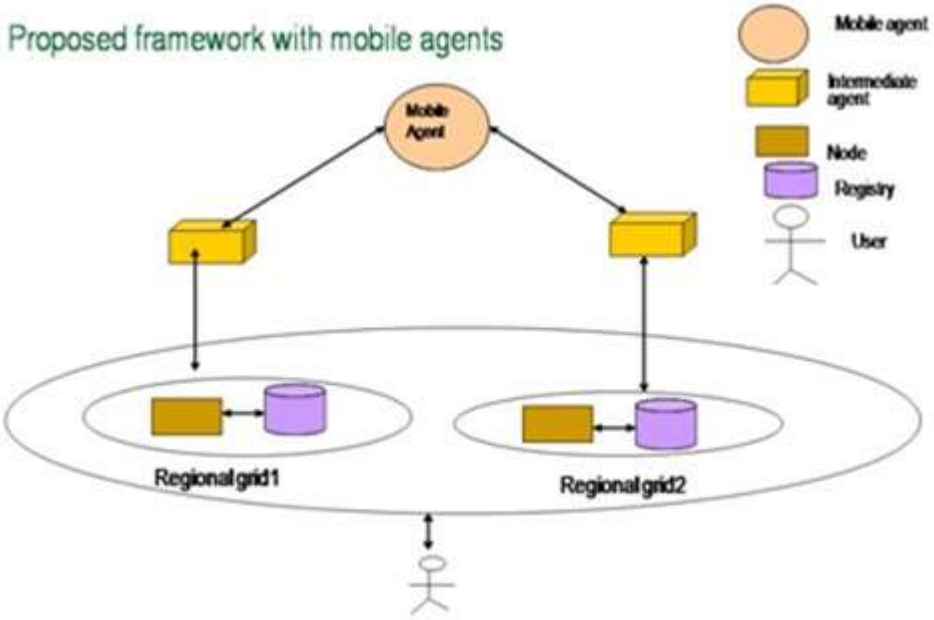

Figure 3. Smart framework with mobile agents.

Redefining the size of the learning object in termsof size and free-standing learning objects helps forbetter granularity. The proof of concept is achieved byobtaining personalization and identifying the difficultiesin understanding the levels of granularity and therelationships between them and also to link an adaptiveannotation in e-learning. The learning objects can beclassified for content retrieval and management, assessingand identifying pedagogical activities that reflect thequality of learning objects. The constraints in defining the specification of alearning object are identified as the barrier of sharing ameasurable learning object and also the lack of ontology. The major difficulty lies in identifying the computationalinstructional components of the learning objects. TheLearning Objects (LO's) are stored in the repository basedon domain ontology. The content stored is retrievedbased on the content similarity algorithm, wherein ithelps to identify the set of similar learners based onthe grade level and the intuitiveness of the learner. The similarity of the contents is identified according to the learner's choice of the query, and the similarity is measuredwith the sample code for the set of learning objects presentin the ontology. The content similarity algorithm is usedfor the repository in the smart environment, which showsthe search results for a sample set of data. For the learner'schoice of topic, identify similar learners, and initialize theirvalues and get the learners to feedback based on the relevantlearning object. Then identify the similarity index foreach learner and calculate the similarity cosine. A setof similar learners are identified with a similarity indexwhich is greater than the threshold value. The sequence ofdata classification is shown in Figure 4. Before sending data from the web user to the webserver, the user wants to browse the valid input file to thewebserver. The web server finds the document to pre-processthe data into smaller terms, and repeated wordsare to be calculated and also identify the topical termsrelated to the given document and match with databasewords to find the weight age. The most frequently usedwords are to be stored in the database tables. Finally, sentence formation is done from the extracted terms. Thecompressed document is shown to the web user.

Figure 4. Data classification sequence.

3.1 Sample Results of Search Data in theSmart Environment

The classification algorithm in the domain ontologydeveloped using protégé has proved more efficient fora set of data extracted by the user. The similarity of thecontents is identified according to the learner's choice ofa query, and the similarity is measured with the sample codefor the set of learning objects present in the ontology. The identified results for the different modules with theexpected results are shown in Figure 5.

S. No	Module	Expected Input	Expected Output
1.	User Interfaces	IP address	Connection establishment with web server
2.	Peer Login	Username, Password	Login successful
3.	Client Input	Browse File for document summarize	Checks whether file is valid or not
4.	Content Selection and Filtering	Split document terms	Identify terms related to topics
5.	Context based indexing implementation	Topical Terms	Sentence formation
6.	Data presentation	Short sentences	Condensed version of document

Figure 5. Samples of document classification.

For the set of documents, the accuracy of the retrieved data is given by precision and recall.
Precision and recall are expressed in percentage:
Let A: Number of similar learning objects extracted.
B: Number of similar learning objects not extracted.
C: Number of dissimilar learning objects extracted.
Precision = [A/(A+C)] *100
Recall = [A/(A+B)] * 100

4. CONCLUSION

Learning objects have gained much popularity inrecent years, principally because of their reusability. This paper provides a paradigm for providing effectivee-learning using agents in a grid environment. Skill-basedlearning environments are used to provide practical skillsas well as knowledge development, communication, andproblem-solving activities. It is vital to provide feedbackto the students from these observations based on theiractions, which helps in assessment and helps researchersto understand the learning process. Using differentmethods for tagging and using semantic annotation in smart environments has been investigated for efficientlearning. The deployment of this architecture in a smartenvironment helps better personalization and fasterretrieval of search results. The intelligent e-learningagents have the capability of helping authors to design and schedule courses and obtain learning material locations. The mobile agents have the efficiency in selecting resourcesand providing solutions. On the whole, agents can beused to provide effective collaboration in the e-learningenvironment. E-learning mobile agents can be

used toprovide uninterrupted support to educate learners andalso helps authors in different locations.