



IMPROVED DESCRIPTIVE ANSWER ASSESSMENT SYSTEM WITH MACHINE LEARNING: A REVIEW

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Abstract: Online subjective tests are very rarely proposed .all the online subjective exams set for the students are pen and paper-based evaluated by the teachers manually. This paper presents a survey on the effective way of online subjective tests. In this, the answers are unstructured data that have to be evaluated. The evaluation is based on the semantic similarity between the faculty's answers and student's answers. Different techniques i.e. TF-IDF, keyword extraction are compared and new technique like LSA, SOM are used to proposed evaluate subjective test assessment of text

Index Terms: *Descriptive type answer, Keyword Extraction Algorithm, Latent Semantic Analysis, Self Organizing Map.*

I. INTRODUCTION

In day to days Education System the complete entrance exam in all different fields is objective tests. Objective tests are all not that sufficient to test the knowledge of students. Students are only judged by the answers that they have marked. In this case, there can be two situations either the answer that is marked is surely known by the student or it can be an assumed answer. So in such situation, we cannot completely judge whether the student is really intelligent or whether it is his/her luck. The student may have some knowledge about the topic but not complete, in such cases to actually test the knowledge of the student, descriptive answers play an important role. But the evaluations of descriptive answers are mostly manual and that becomes too hectic for faculty. To solve this problem of manual checking of subjective answers I have proposed an online evaluation system of descriptive type answers.

Descriptive answers vary from student to student, so in the proposed paper to extract the meaning from the various answers the concept of semantic similarity is used. The Faculty needs to answer along with some compulsory expected keywords in it. The answer will be pruned, stemmed which will reduce the size of the answer, and then converted into vectors and matrix form. Depending upon the keywords used in the answer marking will be done. For this, the mandatory text will be extracted from the database by using various methods such as Term Frequency/ Inverse Document Frequency (TF/IDF). To extract the meaning from the text, techniques like LSA(Latent Semantic Analysis), SOM(Self Organizing Map) are used. The TF/IDF method with LSA semantic work is suitable for information retrieval, text classification, etc. The marks will be assigned using the Cosine Similarity depending upon the value of records. In this paper, the length of the answers will also be taken into consideration while allotting the marks. Then the result will be mailed to the students.

OBJECTIVE

- To develop an online exam system for descriptive-type questions.
- To implement techniques and algorithms that use semantic similarity for evaluation of detailed type answers.

MOTIVATION

- There are many online exam systems, but the existing system can evaluate only objective -type questions.
- There is no online system to evaluate descriptive-type questions. Manual evaluation is time-consuming and very lengthy process.
- The Result will be declared in a very short period of time because calculation and evaluations are done by the machine itself.

II. LITERATURE REVIEW

In any study, the review of previous studies is considered as important for getting understanding the problem, the methodology followed to identify the unexplored part of the field of study under consideration. In this regard, some of the relevant studies have been reviewed in the present study. So following is the list of research paper which research in the field of the answer evaluation system.

Menaka S and Radha N in Dec 2013, "Text Classification using Keyword Extraction Technique" International Journal of Advanced Research in Computer Science and Software Engineering. In this paper they have classified the text using a keyword extraction algorithm. The keywords are extracted using TF-IDF and WordNet. TF-IDF algorithm is used to select the words and WordNet is the lexical database of English used to find the similarity among the words. In this research work, the words which have the maximum similarity are selected as keywords [1].

Sungjick Lee and Han-joon Kim in 2008, researched "News Keyword Extraction for Topic Tracking" Fourth International Conference on Networked Computing and Advanced Information Management proposed a conventional TFIDF model for keyword extraction. It involves cross-domain filtering and term frequency (TTF) for extraction [2].

Ari Aulia Hakim, Alva Erwin, Kho I Eng, Maulahikmah Galinium, and Wahyu Mulia in 2014 researched "Automated Document Classification for News Article in Bahasa Indonesia based on Term Frequency Inverse Document Frequency (TF-IDF) Approach" In this paper they works on the TF-IDF algorithm which create a classifier that can classify the online articles [3].

Stephen Robertson in Oct 1 2004, researched "Understanding inverse document frequency: on theoretical arguments for IDF" explains the understanding concepts of IDF" [4].

Teuvo Kohonen, Samuel Kaski, Member Krista Lagus, Jarkko Salojärvi, Jukka Honkela, Vesa Paatero, and Antti Saarela in May 2000, "Self Organization of a Massive Document Collection" IEEE transactions on neural networks. In this paper describes the implementation of a system that can organize vast document collections according to textual similarities. It is based on the self-organizing map (SOM) algorithm [6].

Helena Ahonen, Oskari heinonen in 1998, researched "Applying Data Mining Technique for Descriptive Phrase Extraction in Digital Document Collection" IEEE International forum on Research & Technology Advances in Digital Libraries . In this paper data mining method apply to text analysis task such as descriptive phrase extraction, they present a general framework for text mining, the framework follow General Knowledge Discovery (KDD) to pre-process texts based on the intended use of the discovered result & introduce a weighting scheme that helps in purging redundant or non – descriptive phrases [7].

P.Y.Hui, and H.Y.Meng in 2014, researches, "Latent Semantic Analysis for Multimodal User Input With Speech and Gestures". Audio, Speech, And Language Processing IEEE/ACM Transactions, used LSA for semantic explanation of a multimodal language with speech and gestures. This paper describes work in semantic interpretation of a "multimodal language" with speech and gestures using latent semantic analysis (LSA) [9].

Vimala Balakrishnan and Ethel Lloyd-Yemoh in august 2014 did research on "Stemming and Lemmatization: A Comparison of Retrieval Performances". Lecture Notes on Software Engineering. In this paper They compare document retrieval precision performances based on language modeling techniques, particularly stemming and lemmatization. Stemming is a procedure to reduce all words with the same branch to a common form whereas lemmatization removes inflectional endings and returns the base or dictionary form of a word. Comparisons were also made between these two techniques with a baseline ranking algorithm (i.e. with no language processing). A search engine was developed and the algorithms were tested based on a test collection. Both mean average precisions and histograms indicate stemming and lemmatization to outperform the baseline algorithm. Stemming techniques including the Paice/Husk stemmer, Porter's stemmer, and Lovin's stemmer. As for the language modeling techniques, lemmatization produced better precision compared to stemming, however the differences are insignificant. Overall the findings suggest that language modeling techniques improves document retrieval, with the lemmatization technique producing the best result [10]. Yuan-Chao Liu, Chong Wu, Ming Liu in august 2011 researched "Research on fast SOM Clustering for text information" .In this Paper fast SOM clustering technology for Text Information In the feature extraction phase, several methods were discussed to find the semantic similarity. For this proposed fast SOM clustering technology for text information [11].

Meena K and Lawrance R in 2014 researched “Evaluation of the Descriptive answers using the hyperspace Analog to language algorithm and self-organizing Map”. IEEE International Conference on Computational Intelligence and computing research. These works focused on the online evaluation of the descriptive answer which will eliminate the discrepancy in that manual evaluation. The HAL algorithm is used to separate categories of the word [12].

Shweta M. Patil and Prof. Ms. Sonal Patil in march 2014 researched “Evaluating the student descriptive answer using Natural Language Processing”, International Journal of Engineering Research & Technology (IJERT) In this, the system can perform grading as well as provide feedback for students to improve in their performance. The techniques for automatic marking of free-text responses are categories into three main kinds, Statistical, Information Extraction and Full Natural Language Processing [13].

P.Willett researched in July 2006 “The Porter stemming algorithm: then and now”, Program, .In this paper author presented a simple algorithm for Stemming English Language Word [14].

Ankita Patil and Prof. Achamma Thomas in Jan 2017 researched “A Survey of Effective Technique for Subjective Test Assessment” International Journal on Recent and Innovation Trends in Computing and Communication. In this paper, the answer is unstructured data which has to be evaluated. The evaluation is based on the semantic similarity between the model answer and the user answer. Keyword extraction methods such as TF-IDF, CRF model & Query focused method are used. Ontology method and Context-based method are used author conclude that CRF model & LSA is an effective method for extraction of keywords & assessment of the subjective test [16].

Meena K. and Lawrance R in 2016 researched “Semantic Similarity Based Assessment of Descriptive Type Answer” 2016 International Conference on Computing Technologies and Intelligent Data Engineering. In this paper assessment algorithm uses for semantic similarity for the evaluation of detailed type answer. Stemmed words are converted to vectors using a semantic method, latent semantic analysis (LSA). Vector obtained from the semantic method are clustered using the self-Organizing Map. Cosine Similarity is used to measure the similarity between two vectors based on that value returned by the similarity measures and marks will be awarded [17].

Birpal Singh J. Kapoor and Shubham M. Nagpure in June 2020 researched “An Analysis of Automated Answer Evaluation System Based on Machine Learning.”, have analysed the automated answer using keywords and automated grading also declared in this paper using content-based similarity, natural language processing [19].

Summary: In the above study, it is observed that for descriptive type answer evaluation method various research are already done by many researchers, they used various algorithm like TF IDF, Self-Organizing Map, HAL, NPL is used, and various method like semantic analysis, Stemming is used, with this help I am implementing descriptive type evaluation system with the help of machine learning using the algorithm and various method like Latent Semantic Analysis, Cosine Similarity, term frequency/inverse frequency, Self Organizing Map Clustering, stop word removal are used To improve the descriptive type evaluation system.

III. PROPOSED WORK The proposed work is an educational-based system. In this system, the online exam will be descriptive, unlike other objective online exams. The system will be managed by the exam system admin. The teaching staff will conduct exams and students will be involved in solving the tests.

3.1 Describe Main Objective

- To develop a descriptive type of answer checker filter.
- To develop auto checking system for descriptive types of answer
- To reduce the time consumption in results generation for university exams
- Provide an efficient and fast way for descriptive types of examination

3.2 Define Problem Statement

Nowadays the online examination is only get conducted an objective type of question and answers. There is not any system existing to get the answering for the descriptive type of examination so that it is necessary to stop the traditional ways of taking an exam because it is time-consuming so it is best to get the solution that will automatically generate results by efficient pattern matching technique. Old-style exams taking a long time for results evaluation and will require large human resources to manipulate.

3.3 DFD Diagram

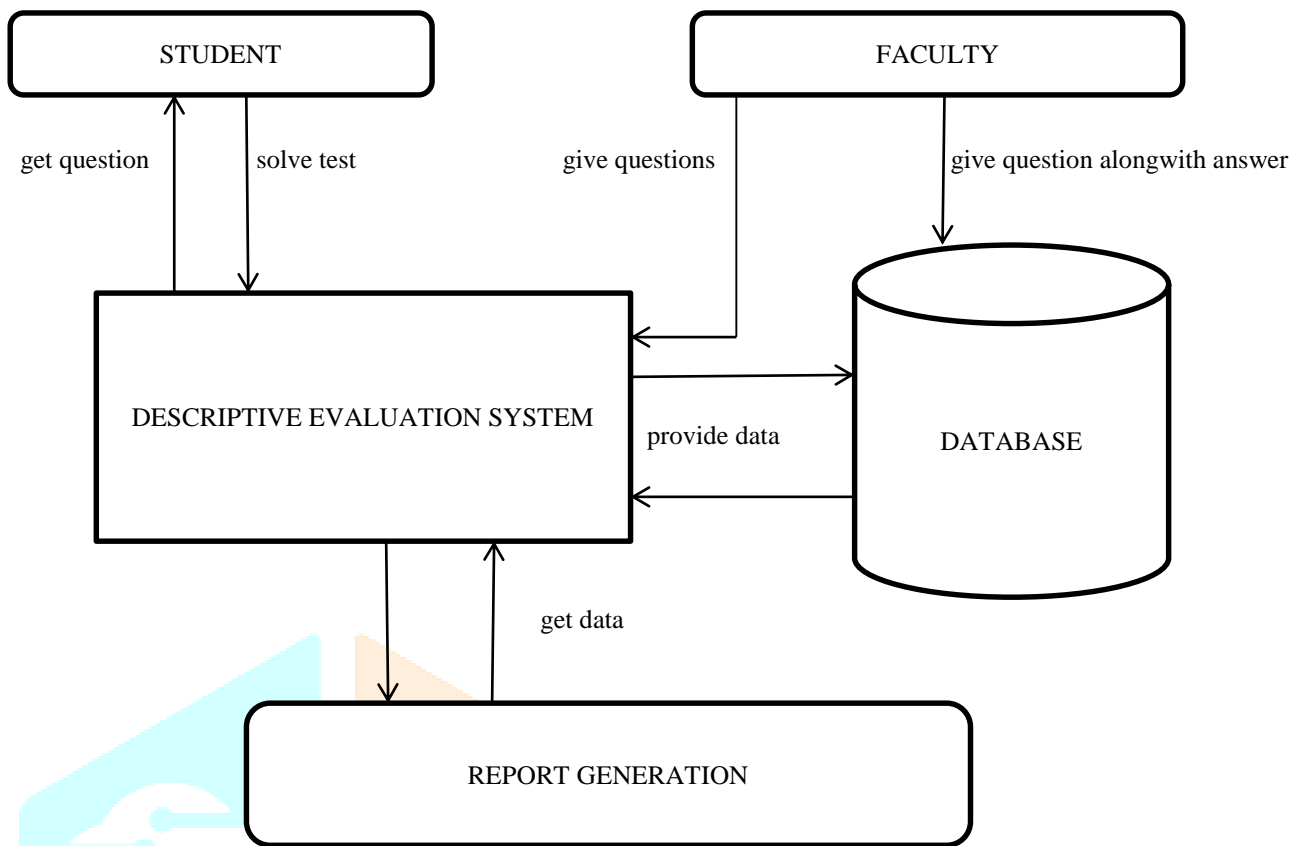


fig. Dataflow diagram for online evaluation system of descriptive answer

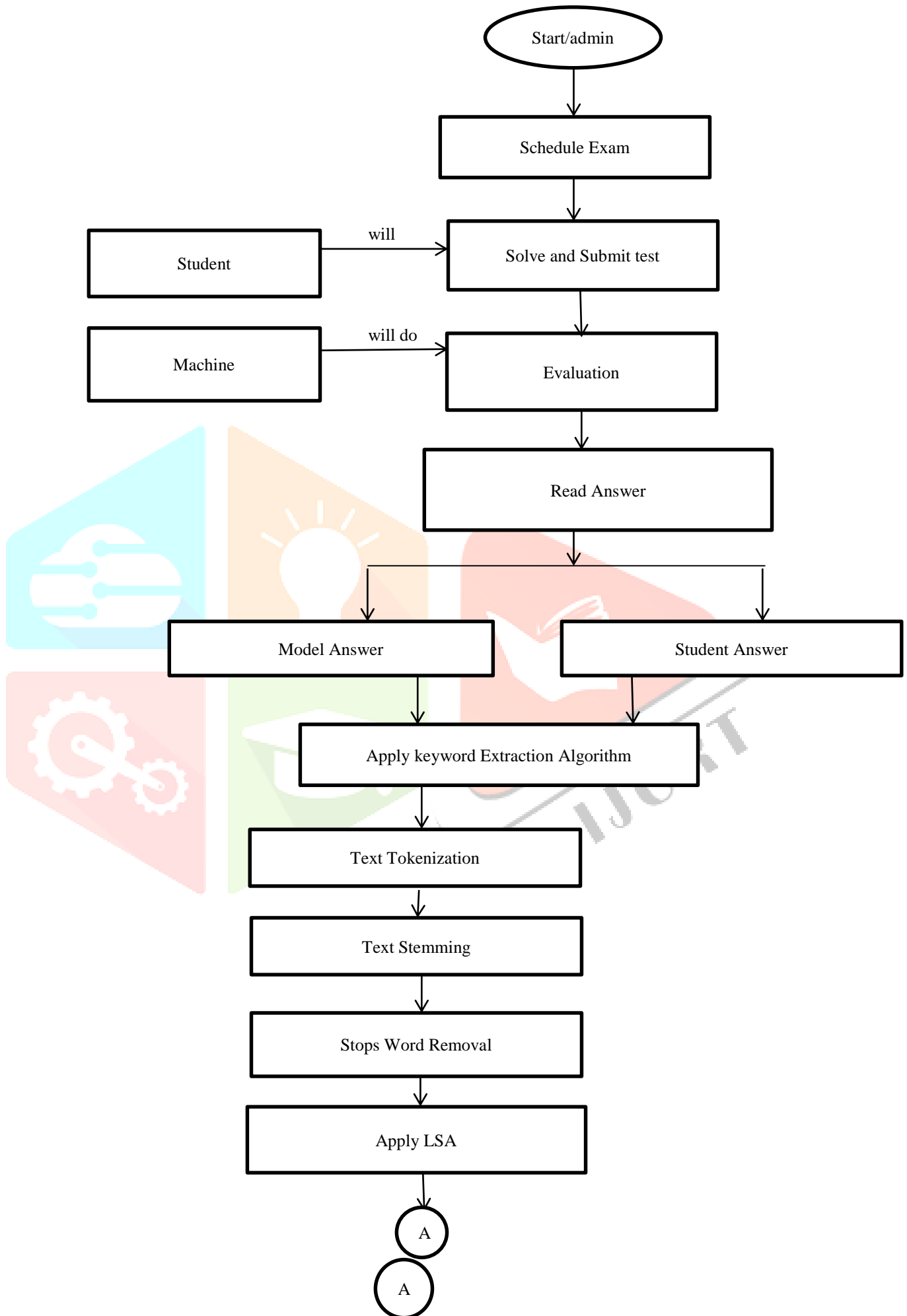
The DFD diagram explains that the faculty will provide questions along with the answers and keywords that will be stored in the database. The questions will be referred to the online evaluation system. The system will provide the questions to the student which the admin has set. Student's answers will be given to the evaluation system where it will be compared with the data in the database and the system will check the answers and it will be passed to the report generation where the marks will be calculated and the result will be sent back to the system which will then will be mailed to the students.

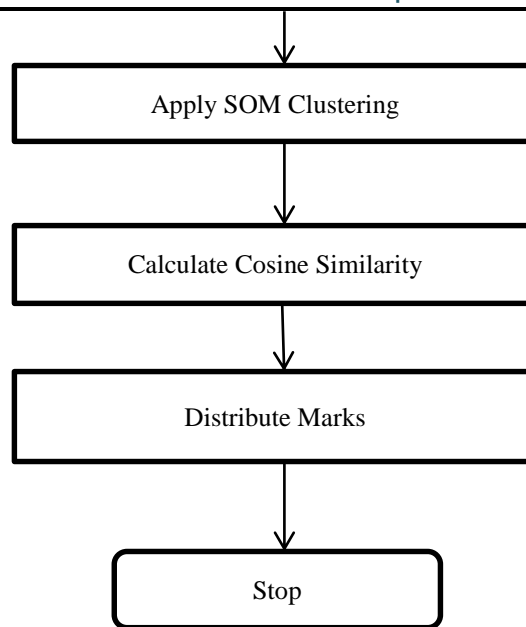
IV. MODULE

A module can encapsulate code and data to implement a particular functionality. It is an interface that agreements the client to access its functionality uniformly and it is easily pluggable with another module that expects its interface. So satisfying all the conditions of what a module is our proposed system will have the following modules:

- Exam System Admin
- Student
- Online Exam Portal
- Evaluation Process

4.1 Online Descriptive Exam Portal and Evaluation





Fig, dataflow diagram

EVALUATION PROCESS

The evaluation process will have both the teacher's answer i.e. model answer and students' answers. Every student's answer will be different. The model answer will be stored in the database. When the student submits its test those answers written by the student will be compared with that of model answer. The system will read both the model and student answer and then extract the keywords using keyword extraction algorithm such TF/IDF (text frequency/ inverse document frequency). Then the text will be tokenized and stemmed and the stop words will be removed. Latent Semantic Analysis will be applied and then Self Organizing Map Clustering will be applied on the text. Marks will be allotted using Cosine Similarity).

CONCLUSION

The existing online exam systems are mostly objective exams because online evaluation for multiple-choice questions is a very simple task. This paper, aims on evaluating descriptive answers. From this paper it is clear that descriptive answers can be evaluated automatically. This will reduce the work of manual evaluation of number of answer sheets. Various algorithms and techniques like TF/IDF, tokenization, stop words removal, stemming, LSA, SOM is used. cosine similarity has effectively contributed in evaluating the student's answers though each student's answer is different. These algorithms will assign appropriate marks to the answer. This technique will surely help the educational system in getting the accuracy for mark allocation. The result will be mailed to the students in a very short time.

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