Development of Inference Engine to Automate the Descriptive Examination System

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ABSTRACT
Online descriptive or subjective examinations are becoming internal part of many universities. During the process of online examination the main hurdle is the automatic evaluation of answer sheets. Such examinations are to evaluate the conceptual grasping level of a candidate for how much the concepts are understood in a particular subject. This paper discusses about the inference engine and database storage.

Keywords
E- Learning, Inference Engine, Online Subjective Examination.

1. INTRODUCTION
Web-based learning sometimes called e-learning is anywhere, any-time instruction delivered over the Internet or a corporate intranet to browser-equipped learners. There are two primary models of Web-based instruction: synchronous instructor-facilitated and asynchronous self-directed, self-paced [1] [2] [3]. Instruction can be delivered by a combination of static methods learning portals, hyperlinked pages, screen cam tutorials, streaming audio/video, and live Web broadcasts and interactive methods threaded discussions, chats, and desk-top video conferencing [3].

E-learning comprises all forms of electronically supported learning and teaching aids. The information and communication systems, whether networked learning or not, serves as specific media to implement the learning process [2] [4]. The term will still most likely be utilized to reference out-of-classroom and in-classroom educational experiences via technology, even as advances continue in regard to devices and curriculum.

E-learning is essentially the computer and network-enabled transfer of skills and knowledge. E-learning compromises processes like Web-based learning, computer-based learning, virtual education opportunities and digital collaboration, personalized web learning. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM [3] [5]. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.

While going through the existing system on descriptive examination, we found that there is keen need and scope for developing a full-fledged system. It has commercial as well as social importance as if develop in a proper way, helps to exploit learning and change the scenario of education. This paper focuses on the Inference Engine developed by us for the Automation of the Descriptive Examination System.

DATA COLLECTION

We prepared tutorial on the basis of ready references such as text book, lecture notes etc. Based on the tutorial a sample question papers was prepared. For Those sample question papers key was prepared by the respective expert in that subject.

A Repository of tutorial, question paper, model answer and candidate answer is maintained separately.

1.1 Preparation of Question Paper
The question paper was designed considering the criteria that answer should not lead beyond two to three sentences. Figure 1 shows the snapshot of few questions from the sample paper.

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Course Code: - CSC601
Course Title: Research Methodology **Marks: 10 Marks**
Credit: 4 **Candidate ID:-**

Answer in brief (Each question carries 2 marks each) (10 Marks)

Q1. What is research?

Q2.What is the purpose of research?

Q3. Why to refer research?

Q4. Write any one factor which motivates people to undertake research studies.

Q5. What are the components of research?

Fig 1: Model Question Paper

1.2 Preparation of Model Answer

2.2.1 Online Descriptive Question Data Type
- Define: explain the meaning and (often) provide an appropriate example

- Describe / illustrate: present the main points with clear examples that enhance the discussion
- Differentiate / distinguish: present the differences between two things
- Discuss / explain: present the main points, facts, and details of a topic; give reasons
- Enumerate / List / Identify / Outline: write a list of the main points with brief explanations
- Interpret: present your analysis of the topic using facts and reasoning
- Justify / Prove: present evidence and reasons that support the topic
- Summarize: briefly state the main ideas in an organized manner
- Trace: state the main points in logical or chronological order.

2.2.2 Model answer

The answers were prepared by experts, taking consideration from the tutorial it was observed if more than one way of answering the same question was possible then all those who are considered while modeling the answer

Model Answer

1) What is research?

Ans: - Research is an art of scientific investigation

2) What is the purpose of research?

Ans: - To discover answers to questions

3) Why to refer research?

Ans: - Systematic method

4) Write any one factor which motivates people to undertake research studies.

Ans: - Directives of government, employment conditions, curiosity about new things, desire to understand causal relationships, social thinking and awakening

5) What are the components of research?

Ans: - Defining and redefining problems, formulating hypothesis or suggested solutions; collecting, organizing and evaluating data; making deductions and reaching Conclusions.

Fig 2: Preparation of model answer

2.2.3 Pre analysis of Questions

For pre analyzing, the theme of question for framing boundaries for the answer we have defined questions in two categories i.e. question context and answer context [3].
The sample questions classified in the following categories based on the pre requirement and context requirement to answer the questions.

Q. No	Question	Answer	Question Type	Reason
1	What is research	research is an art of scientific investigation	Question context	The answers are pre-defined by scientist and can be referred through reference material.
2	What is the purpose of research	to discover answers to questions	Answer context	The purpose are varies from person to person or situation to situation.
3	Why to refer research	Systematic method	Question context	The answers are referred by scientist.
4	Write any one factor which motivates people to undertake research studies.	directives of government, employment conditions, curiosity about new things, desire to understand causal relationships, social thinking and awakening	Answer context	The answer depend upon situation E.g. if Drought is there they are working for save water and conservation water project's only.
5	What are the components of research?	Defining and redefining problems, formulating hypothesis or suggested solutions; collecting, organizing and evaluating data; making deductions and reaching Conclusions;	Question context	Answers are predefined and generally referred from books, tutorials etc.

Fig 3: Pre analysis of question

1.3 Candidate Answer

Each candidate was given copies of the model question paper which is plain text file. The candidate was instructed to solve the paper in a given simulated time after completion of the text all the candidate answer were merged into one file and every candidate answer was represented by unique id for e.g. answer for first candidate as s1 for second s2 and so on. This snapshot is given in fig 4.

Candidate Answer

Q1. What is research?

Model Ans: -

1) (Research is an art of scientific investigation)

2) (Research is a scientific and systematic search for pertinent information on a specific topic)

Student Solved

S1) work on hidden knowledge

S2) Research is the mother of all knowledge and the method, which man employs for obtaining the knowledge of whatever the unknown.

S3) Research is process to find the reason behind any known thing.

S4) search for knowledge, scientific investigation

S5) A scientific and systematic search for pertinent information on a specific topic.

Q2.What is the purpose of research?

Model Ans:-

(To discover answers to questions)

Student Solved

S1) Find out truth which is hidden

S2) Each research has its specific purpose, whatever questions in mind research give the answer.

S3) 1) Quaracity 2) Need 3) Study 4) To get money

S4) Discover answers to questions through the application of scientific procedures & find out the truth which is hidden.

S5) To discover answers to questions through the application of scientific procedures

Fig 4: Candidate answer

2. INFERENCE ENGINE

For evaluating or accessing candidate answer then is a need of a query processor. Thus we developed an Inference Engine.

The inference engine has majorly divided into three components 1) Repository & knowledge base 2) Query processor 3) user interface.

2.1 Repository & knowledge base

The repository is the collection of all answers collected from each user. While knowledge base unit contains separately the model questions and model answers.

2.2 Query processor

It takes the answer from the user interface, frames the required query for processing.

2.3 User interface

It provides an interface for interacting with the inference engine. It is the main GUI of our system.

The inference model fetches the candidate answer in the processing unit & extracts its relative answers from the model answer & by processing [the processing part is explained is next section] decided about the correctness of the answer.

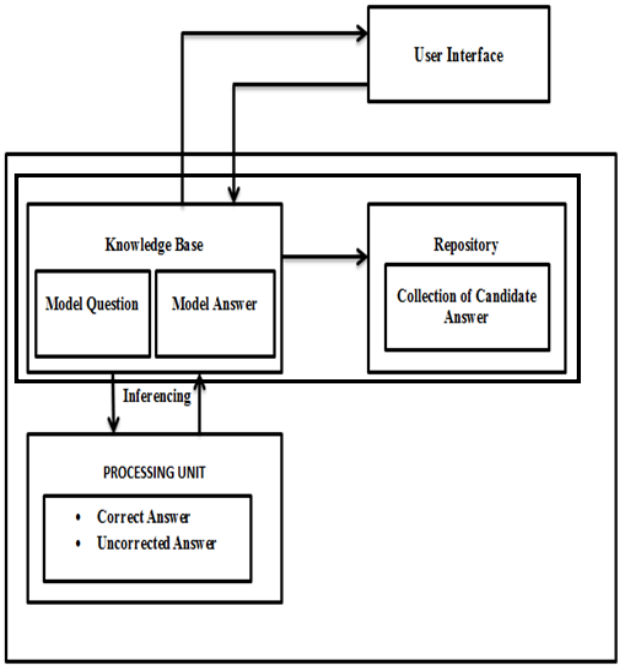

Fig 5: Architecture of Inference Engine

Here our model question and model answer is stored in the plain text format in the respective repository.

3. PROCESS

The inference process follows the following steps.

The first two steps are for the objective based question while steps three onwards are the process used to access the answers.

- Stage 1: First the question style checked if it is yes / no format than the model answer related to those questions are called up for appropriate matching.

- Stage 2: If it is one word answers then again the model answer are called up and a matching process is carried out. In case of spell mistake we applied hamming distance to calculate the rate of error, if its distance from the model answer is less than two we accept it as correct else the word is rejected an the answer is accessed as wrong.

- Stage 3: One sentence based answer has to firstly check if they are in the same sequence [sequential form] as in the given model answer. Then we evaluate it as correct but for following case the process ignores if conjunctions or prepositions like ‘is’, ‘the’, ‘an’, ‘and’ if are missing are ignored and term the candidate answer as correct.

- Stage 4: If the sentential form is different then we check for it synonym representation provided in our knowledge base system.

    - a. If sentential words used like “part” for “component or session” such cases are checked using wordnet dictionary if the appropriate meaning match’s than the answer is accepted else rejected.

    - b. The whole sentence, sentential meaning was checked with already stored in the database meaning termed to be right are considered else are left. Considering the model answer written in various form and these are written termed by ranking using the confidence factor provided by our system which was generated looking at the appropriate references like books articles for that answer used.

All the efforts are basically to reduce the complexity occurring during the representation of information. The collected information is then represented in an intermediate form, like first order predicate or conceptual dependency for removing complexity for further processing.

4. CONCLUSION

In this paper issues related to the difficulties about the subject examination is discussed in brief. A complete overview of the online subjective examination is discussed with the major focus of this paper was on the description of processing and knowledge base creation. A complete description about the inference engine and its components were discussed using suitable example. Samples of model question, model answer, candidate answer were given to indicate that for further processing we still require a non complex representation of the data.

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