

# Assessment of Answers: Online Subjective Examination

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## ABSTRACT

Question answering is a specified form of information retrieval. Our work comes under closed domain question answering. We are working on assessment of answer for online subjective examination. Examination and evaluation are part of every course module so are even in online examination, objective based examination are already available but subjective examination are in need of time as subjective assessment is considered as best way of evaluation of ones subject understanding & knowledge. In our paper we have discussed two issues related to the answer method i.e. length & paraphrasing. And have obtained a pattern extraction by creating a sequence for a given answer. Our system has a centralized file system which includes the reference material as well as the model answer for questions. These are used for matching and evaluating a candidate's answer. For every correct answer a confidence factor of being positive is assigned when the required selective pattern of candidates answer matches with the model answer.

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**KEYWORDS:** Online Subjective Examination, Paraphrase, Evaluation process

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## 1 Question Answering

Question Answering is a specialized form of information retrieval. Given a collection of documents, a Question Answering system attempts to retrieve correct answers to questions posed in natural language.

Open-domain question answering requires question answering systems to be able to answer questions about any conceivable topic. Such systems cannot, therefore, rely on hand crafted domain specific knowledge to find and extract the correct answers.

Closed-domain question answering deals with questions under a specific domain (for example, medicine or automotive maintenance), and can be seen as an easier task because NLP systems can exploit domain-specific knowledge frequently formalized in ontologies. Alternatively, closed-domain might refer to a situation where only a limited type of questions are accepted, such as questions asking for descriptive rather than procedural information. Our system also comes under closed domain QA where we are supposed for accessing online based subjective examination.

## 2 Subjective Examination

Subjective examination has been a major way of evaluating a candidate's knowledge & understanding about on course or subject in traditional education system for centuries (Minsu Jang et al. 2007). Every university has its own examination pattern based on subjective examination. So in this global era of web based education. We need to consider such examination done online (Hanumant R. Gite, C.Namrata Mahender 2012).

Generally the questions may be considered in the following forms.

- 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

In this paper we have discussed two issues related to examination & a simple Psycho based solution is provided.

## 3 Online Subjective Examination

Our system works on an attempt to consider candidates answer by extracting the required intentional part of an answer to a prescribed template or model answer already provided in the Question answering framework.

There is always an urge to justify an answer is appropriate or not. That is we have to find the confidence level for a given answer, by comparing it to the model answer. That is every word in an answer does not play an important role while evaluation process. To justify such case we have consider answer in one sentence.

### **3.1 Question Processing Module**

- The question type, usually based on a taxonomy of possible questions already coded into the system;
- The expected answer type, through some shallow semantic processing of the question; and
- The question focus, which represents the main information that is required to answer the user's question.

These steps allow the question processing module to finally pass a set of query terms to the Paragraph Indexing module, which uses them to perform the information retrieval.

### **3.2 Answer Processing**

The Answer Processing module is responsible for identifying and extracting the emphasized words which are responsible for the response of the answer.

#### **3.2.1 Answer Identification**

The use of a part-of-speech tagger (e.g., Python POS tagger) can help to enable recognition of answer candidates within identified model answer. Answer candidates can be ranked based on measures of distance between keywords, numbers of keywords matched and other similar heuristic metrics.

#### **3.2.2 Answer Extraction**

Once an answer has been identified, the shallow parsing performed is leveraged to extract only the relevant word or phrase in answer to the question.

#### **3.2.3 Answer Correctness**

Confidence in the correctness of an answer can be increased in a number of ways. One way is to use a lexical resource like WordNet (Synonyms) to verify that a candidate response was of the correct answer type.

### **3.3 One line answer**

In our system we are paying attention for answer accessing majorly by considering length and paraphrasing. One line answer or Define may have a sentence which may have 10 words or 15 words as per the writing style of the candidates so we cannot fix single line answer with fixed number of words used. So only point to be find single sentence is to find the full stop.

For e.g. one line answer, expressed in different mode or synonym based answer etc. (where s is stands for original and t is for its paraphrase)

- s. Tom purchased a Honda from John.
- t. Tom bought a Honda from John.
- s. It was a Honda that John sold to Tom.

- t. John sold a Honda to Tom.
- s. Tom bought a Honda from John.
- t. John sold a Honda to Tom(Atsushi Fujita 2005)

Answer can be stated in an 'n' way but few words only have intended meaning for the particular answer. Some issues in such answer.

- Such words may have replaced by its synonyms.
- The sentence is paraphrased.

For considering a bit more complexity of an answer we have also performed processing on multiline answer. Here the reflection or impact of paraphrasing can be seen more clearly.

### 3.4 Multi line answer

Same case is with answer the question is detail or Brief. We cannot fix the size of paragraphs or pages. Generally a restriction of words will be provided so every answer has to be in the given length, but still there is a huge range for example single sentence answers we may say can have almost 20 words i.e. we can answer it with a single word to 20 words and all are valid, only more than 20 words will not be considered as desirable answer.

E.g. what does distributed operating system manages?

- A distributed operating system manages a group of independent computers and makes them appear to be a single computer.
- A distributed operating system handles a set of autonomous computer also makes them emerge to be a single system.
- A set of independent systems are integrated to make them appear to be single computer.

### 3.5 Paraphrasing

In our work may be single line answering or multiline following points in paraphrasing are focused during the evaluating process.

Paraphrasing (synonym based, lexical / structural based, alteration based)

- Paraphrasing of common nouns to their synonyms
- Paraphrasing of common nouns to their definition statements
- Paraphrasing of verbs to their synonyms
- Paraphrasing of verbs to their definition statements

We are paying more focus on the intention answer compared to the focus of question. We tend towards the expected answer as per the requirement of the focused issue or the object. Following table 1 shows the focused or intended portion or words in a few answers in our system.

Question No.	Keywords	Right answer	Wrong Answer
Q1	manages/handle computer/CPU/processor/system between/among user/client	5	5
Q2	Quick/fast/rapid/ immediate Predictable/knowable Response/reply/ reaction/ answer Events/action	8	2
Q3	group/cluster/set independent/self computer/CPU/processor/system make/create/build appear/become visible/show single/distinct computer/CPU/processor/system	8	2
Q4	Program/ agenda/ plan in/during execution/ finishing/ completion	10	0
Q5	some/few/various/several event/result/occurrence/interrupt occur/happen/takes place	7	3
Q6	some/few/various/several process/procedure/course/method running/executes at/by/on all/every utilization/use/operation	6	4
Q7	select/few/various/several processes/procedure/course/method queues/row/line	7	3
Q8	compact/solid extremely/very/tremendously efficient/capable/able by/via/through design/plan/intend	3	7

TABLE 1 – Answers with emphasized words

## 4 Representation of intended answer

A question can be assumed in many ways as per the candidate understanding and the strength of vocabulary plus the expressive nature of the candidate. As an answer to be correct can take any form but the intended meaning should not change, the way of answers are paraphrased for an intended answer for representing the importance of word in a particular answer and the number of ways of answering, we have chosen a simple state transition diagram to represent the answer, for e.g. following question

Question:-

What is main objective of real time operating system?

Has such expected answer as per the reference material provided.

Answer:-

1. Quick predictable response to events.
2. Return correct result within time constraints.
3. Responds to input instantly.
4. Response time very short.

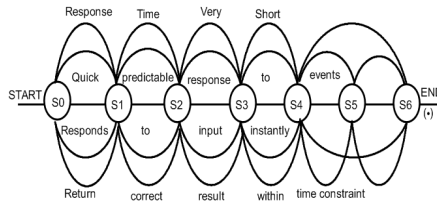


FIGURE 1– State transition diagram

## 5 Our system

The candidates are taken as a text file and separately stored under a folder which is unique for each candidate.

We maintain a centralized file system where the reference materials and the model answer for each question is kept.

### 5.1 The Evaluation process

The candidate answer is first extracted from the file and a sequence state transition is generated i.e. nothing but a state transition diagram using the given input for example.

As we have conducted exam on ten candidates for twelve questions, we had a verity of cases to adhere the paraphrased answer.

In general the process start with POS tree along with sequence extraction of the candidate answer which is compared with the model answer.

If exact terms are found in candidates answer as per the model answer & its key terms it is evaluated as correct else we try to find the key terms which are there in the model answer and are part of candidates answer then its semantic analysis is done using a word net dictionary that provides the density of each word in a given sequence, if that get a match for more than 50% words in a sentence it is also termed as correct else declared as wrong.

This density of words are keywords of the answer which are stored in our key terms those are the words which are given high confidence so that they are to be considers as positive words to reflect the correct meaning to the answer.

A sample answer of 10 candidates is given in table 2 for the question “When the process does goes into waiting state?”

Candidate No.	Candidate Answer	Answer Right/ Wrong	Reason
1	When the execution time of process gets complete the process goes to waiting state.	Wrong	Meaning Change
2	When some events to occur after running state then process go in waiting state.	Right	--
3	When process is ready to execution and it has to wait for some event then it goes to waiting state.	Right	--
4	The processes go in waiting state. When for some event to occur such as an I/O completion or reception of a signal.	Right	--
5	When process is in running as some <b><i>intrupt</i></b> are created then process is waiting state.	Wrong	Spell Mistake
	After automatically correcting using Word Net dictionary	Right	Correct
6	The process is waiting for some event to occur [I/O completion or reception of a signal]	Right	--
7	The process go in waiting for some events to occur (such as I/O completion or reception of a signal)	Right	--
8	Waiting for some events to occur.	Right	
9	---	Wrong	Not Attempted
10	A process executes it changes state as we know that process task. As if process is executed and process is waiting for some events to occur then we can say that the process is in waiting state.	Right	--

TABLE 2 – Paraphrased answer for given question.

From 10 candidates stated, three were wrong. Candidate 1 answer was incorrect due to semantically be different from the model answer, while a Candidate 5 answer has spell mistakes. But using word net option it can be automating corrected by providing semantically same answer and candidate 9 has not attempted the answer thus to be taken as wrong answer.

For verifying the answer for its appropriateness a confidence factor was provided for each answer, as per the sequence of pattern match found between the candidate and model answer. If the density of matching is more than or equal to 50% then the answer was termed to be correct and it is known as positive confidence else a negative confidence is provide for the mismatched and the answer is termed to be wrong.

Following table 3 shows the confidence factor for the evaluated answer.

Q No.	Model Answer	Right Answer	Wrong Answer	Positive confidence	Negative confidence
Q.1	Software that handles computer hardware, Intermediator between user hardware,	5	5	50%	50%
Q.2	quick predictable response to events	8	2	80%	20%
Q.3	Group independent computers make them appear to single computer	8	2	80%	20%
Q.4	A process is a the unit of work in a system, Process is a program in execution	10	0	100%	0%
Q.5	The process is waiting for some event to occur	7	3	70%	30%
Q.6	Some process running at all times to maximize CPU utilization.	6	4	60%	40%
Q.7	Job, ready, device, waiting, i/o, priority	6	4	60%	40%
Q.8	Selecting processes from these queues, A process is migrates between various scheduling queues throughout its lifetime.	8	2	80%	20%
Q.9	Windows CE, Minix 3	10	0	100%	0%
Q.10	Interrupts	10	0	100%	0%
Q.11	Compact and efficient by design, They are designed to operate on small machines like PDAs with less autonomy.	7	3	70%	30%
Q.12	Kernel	9	0	90%	10%

TABLE 3 – Answers with confidence level



In our sample set of questions descriptive and describe type of questions were not considered. The overall efficiency of evaluation for our sample set was found to be 70%.

## **Conclusion**

Online subjective examination is need of time. It is too complex due to the expressive power, vocabulary used and understanding of the subject is involved of every individual and all this causes large variations in the writing style of an answer person to person. Thus variation of length words, form of sentence all matters while evaluating the answer. Online examination is a type of closed domain question answering as it limited to course applied. In our work we have focused on the intended part of answer required to verify a particular answer as correct. Word has great emphasis in our system, POS tagging was also performed while extraction of words for better accuracy.

Overall performance of our system was found to be 70%. Major constraint of our system is brief, short note, described in detail, discussed type of question including mathematical formulas, diagrams, examples were not considering as a part of question answering.

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