

“A Framework for Restricted Domain Question Answering System using advanced NLP tools and software”

Shilpa Sharma*, Prof Manmohan Tiwari**

M. Tech Student, RKDF, Indore, Madhya Pradesh, India*

Department of Computer Science, RKDF, Indore, Madhya Pradesh, India**

Shilpasharma8@gmail.com*

Abstract:

Question and Answering System is one of the major research are in Natural Language. Main challenges of Question and Answer system gives exact answer of question which give by user. Question and Answering system can be classified into three category are open domain, closed domain and restricted domain. Using advanced Natural Language Processing tool we will be developed a framework for question answering system. In this paper we work on restricted domain question answering system. Proposed system work on keyword and question matching and return precise answer of question.

Keywords:-Natural Language processing ,information retrieval , semantic similarity , restricted domain , answer extraction, answer ranking

1. INTRODUCTION:

Although the set of documents which are retrieved by the search engine contain a lot of information about the search topic but it may or may not contain exactly that information which the user is looking for [1].The basic idea behind the question answering system is that the users just have to enter the question and the system will retrieve the most appropriate and precise answer for that question and return it to the user. Hence in those cases where the user is looking

for a short and precise answer, question answering System plays a great role rather than Search Engines, which usually provide a large set of links of those web pages which might contain the answer of that question. A typical Question Answering system can be divided into 3 modules namely: Question Processing module, Document Processing or Information Retrieval module and Answer Processing module. Each **Processing and Information Retrieval** module contains several sub modules and these modules use several Natural Language Processing Techniques in order to extract the proper answer. The usual Question Answering system is designed to answer simple wh-questions like “who”, “what”, “when”, “where”, etc. But the recent QA research focuses on extending the system to answer complex questions, summary questions, opinion questions etc. The paper proposes a Question Answering system that answers simple factoid, wh-questions by using a technique called Semantic Role Labeling.

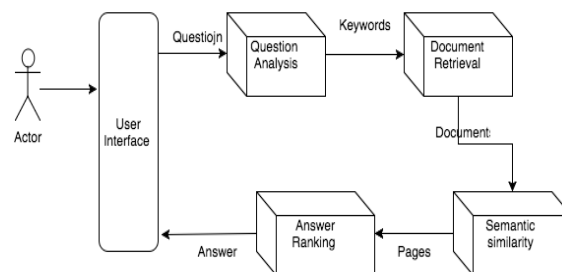


Figure 1. Block Diagram Question Answering System

The rest of the paper is organized as follows. The next section describes the general architecture of a Question Answering System. Section 3 discusses some of the related works in this area. The proposed system architecture is described in section 4. The paper concludes with the experimental setup and results.

2. ARCHITECTURE OF A QUESTION ANSWERING

In this section we describe the architecture of our system. The overall architecture of the system can be subdivided into three main modules: (1) pre-processing, (2) question template matching, and (3) answering. Each module is described in detail in the following subsections.

Question Answering Systems can be classified on the basis of the domains over which it has been constructed.

- Open Domain Question Answering
- Close Domain Question Answering
- Restricted Domain Question Answering

Open domain question answering systems are domain independent. It relies on general ontology and world knowledge. Usually these systems have a large collection of data from where the required answer is to be found out. Since in case of Open Domain question answering information content is not of particular domain it can answer questions of various fields however here deep reasoning is not possible [3].

Close domain question answering systems deal with questions in a specific domain [3]. LUNAR and BASEBALL are the example of close domain QA systems. In this case the data set contains a very limited amount of focused and

structured information. Hence in case of close domain question answering systems deep reasoning is possible but the problem with these systems was that due to the very small size of data set they are not more than a "Toy Systems"[4].

Research in restricted-domain question answering (RDQA) addresses problems related to the incorporation of domain-specific information into current state-of-the-art QA technology with the hope of achieving deep reasoning capabilities and reliable accuracy performance in real world applications. In fact, as a not too-long-term vision,

3. LITERATURE SURVEY:

In most of the research papers [4, 5, 6] LUNAR [7] and BASEBALL [8] have been discussed as the earlier developed question answering systems. However there are various question answering systems which have been developed with different concepts since the idea of QA System has been coined

In a system developed Athira P. M, Et.al [10], presented an architecture of ontology-based domain-specific natural language question answering that applies semantics and domain knowledge to improve both query construction and answer extraction.

Another system developed by Pragisha K. Et.al [11], described about the. It receives Malayalam natural language questions from the user and extracts most appropriate response by analyzing a collection of Malayalam documents. The system handles four each question.

Research and reviews in question answering system developed by Sanjay K Dwivedi Et.al[12] propose taxonomy for characterizing Question Answer (QA) systems, survey of major QA

systems described in literature and provide a qualitative analysis of them.

Table [I] presents comparison about different types of question answering system [22].

S. No	Type of Question and Answering System	Question and Answering System Methods
1	Multilingual Question/Answering	Tokenization and pos tagging., Word sense disambiguation, Answer type identification, Keywords expansion, Semantic Disambiguation
2	Analysis of the Asks Question-Answering System	Query Reformulation, N-Gram Mining, N-Gram Filtering, N-Gram Tiling.
3	Multilinguality, Spatial- temporal context awareness, Textual entailment	Answering architecture
4	A Question Answering System based on Information Retrieval and Validation	Expected Answer Type, Named Entities Presence,
5	A Hybrid Question Answering System based on Information Retrieval and Answer Validation	Module, Hypothesis Generation Module, Document Processing and Indexing
6	A specifiable domain multilingual Question	Answering architecture

In a System developed by Poonam Gupta Et.al [13] A Survey of Text Question Answering Techniques. Question answering is a difficult form of information retrieval characterized by information needs that are at least somewhat expressed as natural language Template Matching Automatic Answering System For

natural languages questions proposed by Pachpind Priyanka Et.al [17], Frequently Asked QA System that replies with pre- stored answers to user questions asked in regular English, rather than keyword or sentence structure based retrieval mechanisms.

4. Proposed System:

Since both the Open Domain QA System and Close Domain QA System have their own pros and cons a new concept of Question Answering has been coined by Molla& Vice do [4] called RESTRICTED DOMAIN QA SYSTEM, which is the midway of these two domains.

We are convinced that research in restricted domains will drive the convergence between structured knowledge-based and free text-based question answering.

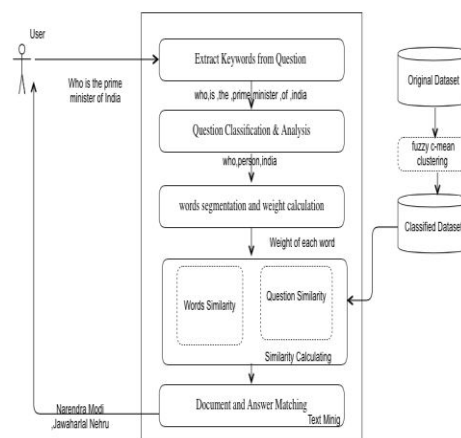


Figure 2.

Proposed System

Our proposed system performs following operations:

1. Question Processing: In this module the given Question is processed to get some important information from it. Steps through which question Processing Module passes

and their descriptions are given below. Steps in Question Processing Module:

- Find the Type of given question using Wh word.
- Find out the expected type of answer.
- Get the Keywords from the Question.
- Find out the Focus of the question.

The first step in the QA System is the Question Processing or Question Classification module. Various information, which we will get through this module, are the Type of Question, Expected Answer Type, Focus or Head Word of the Question and the Question Keywords.

WH word	Question Type		
	Factoid Type	Definition Type	Descriptive Type
Question	Who When What Where Which	How What Why	What

- Document Processing: Once the question has been processed we will move towards the document processing module. In this module the documents which are relevant to the given question are retrieved and processed. Following steps used in document processing.
 - Get the question in hand and search relevant documents using a reliable search engine.
 - Take top relevant documents.
 - Extract the content from these documents.
 - Save these contents in to file
- Answer processing: This module presents algorithms for extracting the potential answer for all the three categories of

questions that is Definition Type of Question, Descriptive Type of Question and Factoid Type of Question.

- Dataset Clustering: cluster dataset using fuzzy c-mean algorithm then process for question and answer processing.

5. CONCLUSION:

In this paper we have proposed a framework for restricted domain question Answering System using advanced NLP tools and software. This framework can be used to develop a Question Answering System for extracting exact and precise answer from restricted domain textual data set. The proposed framework not only provides a simple and implementable framework for developing question Answering System but also provides a proper flow of data for answer extraction.

Since the proposed model works over keywords and headword and is independent of the question or sentence structure, it has reduced the overhead of question normalization. Moreover since the framework is given for restricted domain, it also handles the issue of word sense disambiguation. The major problem which exists with the proposed framework is that its performance is dependent on the performance of the search engine and the used NLP tools.

6. REFERENCES:

- [1]. Sreelakshmi V, Sangeetha Jamal, Survey Paper : Question Answering Systems, in National Conference on Computing and Communication - (NCCC), March 2014, GEC Idukki.
- [2]. M Ramprasath, S Hariharan Improved Question Answering System by semantic reformulation, IEEE-Fourth International Conference on Advanced Computing, 2012.
- [3]. Ali Mohamed Nabil Allam, and Mohamed Hassan Haggag, The Question Answering Systems: A Survey, International Journal of Research and Reviews in Information Sciences (IJRRIS), September 2012 Science

Academy Publisher, United Kingdom

[4] Molla D., and Vicedo J., "Question answering in restricted domains: An overview", *Computer Linguist*, ppAI-6 1, 2007

[5] Moreda P., Llorens H., Saquete E., & Palomar M., "Combining semantic information in question answering systems", *Information Processing & Management*, pp.870-885, 2011.

[6] Svetlana Stoyanchev, and Young Chol Song, and William Lahti, "Exact Phrases in Information Retrieval for Question Answering", *Coling 2008: Proceedings of the 2nd workshop on Information Retrieval for Question Answering (IR4QA)*, pp. 9- 16 Manchester,UK. August 2008".

[7] Woods W.A, Kaplan R.A, Nash-Webber.B, "The lunar sciences natural language information system" , Final report: BBN Report #2378. Technical report, Bolt Beranek and Newman Inc.,Cambridge, MA., June 1972.

[8] Green RF, Wolf A.K., Chomsky, K. Laughery, "BASEBALL: An automatic question answerer", in: *Proceedings of Western Computing Conference*, vol.19, pp. 219-224, 1961.

[9] Ittycheriah A, Franz M, Zhu WJ, Ratnaparkhi A and Mammone RJ. IBM's statistical question answering system. In *Proceedings of the Text Retrieval Conference TREC-9*, 2000.

[10] Athira P. M., Sreeja M. and P. C. Reghuraj
Department of Computer Science and Engineering,
Government Engineering College, Sreekrishnapuram,
Palakkad, Kerala, India, 678633. Architecture of an
Ontology-Based Domain-Specific Natural Language
Question Answering System.

[11] Pragisha K. "design and implementation of a QA system in Malayalam".

[12] Sanjay K Dwivedi, Vaishali Singh. Research and reviews in question answering system Department of Computer Science, B. B. A. University (A Central University) Lucknow, Uttar Pradesh, 226025, India.

[13] Poonam Gupta, Vishal Gupta Assistant Professor, Computer Science & Engineering Department University Institute of Engineering & Technology Panjab University, Chandigarh.

[14] Kolomiyets, Oleksander. And Moens, Marie-Francine. "A survey on question answering technology from an information retrieval perspective". *Journal of Information Sciences* 181, 2011.5412-5434. DOI: 10.1016/j.ins.2011.07.047. Elsevier.

[15] Moreda, Paloma., Llorens Hector., Saquete, Estela. And Palomar, Manuel."Combining semantic information in question answering systems" *Journal of Information Processing and Management* 47, 2011. 870- 885. DOI: 10.1016/j.ipm.2010.03.008. Elsevier.

[16] Ko, Jeongwoo., Si, Luo., and Nyberg Eric. "Combining evidence with a probabilistic framework for answer ranking and answer merging in question answering" *Journal: Information Processing and Management* 46, 2010 541-554. DOI: 10.1016/j.ipm.2009.11.004. Elsevier.

[17] Pachpind Priyanka P, BornareHarshita N, KshirsagarRutumbhara B, Malve Ashish D BE Comp S.N.D COE & RC, YEOLA," An Automatic Answering System Using Template Matching For Natural Language Questions".