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Enhanced Search Engine for Automated Multimedia Answer Generation by Harvesting Web Information

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***Abstract*— Search Engine services have increased popularity the past few years. The existing search engines usually provide only textual answers, which are not enough for many questions. Hence, it needs a new proposal Enhanced Search Engine (ESE) to enrich textual answers as well as appropriate multimedia data. The proposed ESE method automatically determines which type of media information should be added for a textual answer. Different from many MultiMedia Question Answering [MMQA] research efforts that attempt to directly answer questions with image and video data. The ESE method is constructed based on textual answers and is able to deal with questions that are more complex. The ESE method is implemented on Multi-Source QA dataset. The obtained results ensures objective of the proposed research work with the help of ASP.NET platform.**

***Keywords*— MMQA, search engine, question answering, reranking, answer medium selection.**

I. INTRODUCTION

Image is a collection of pixels. The pixel is represented in x, y coordinate position for the image with intensity value f. Digital image processing is a subset of the electronic domain where the image is converted to an array of small integers called pixels, representing a physical quantity such as scene radiance, stored in a digital memory and processed by computer or other digital hardware.

Search engines are programs that search documents for specified keywords and return a list of the documents where the keywords were found out. The search engine is often used to specifically describe systems like Google, Bing and Yahoo! Search Engine that enable users to search for documents on the World Wide Web.

Multimedia refers to content that uses a combination of different content forms. Multimedia includes a combination of text, audio, images, animation, video or interactive content forms. A Multimedia Database (MMDB) is a collection of related multimedia data. The multimedia data includes one or more primary media data types such as text, images, graphic objects (including drawings, sketches and illustrations) animation sequences, audio and video. Question Answering (QA) is a computer science discipline within the fields of information retrieval. The QA implementation usually a computer program, may construct its answers by querying a structured database of knowledge or information, usually a knowledge base. The QA research attempts to deal with a wide range of question types including: fact, list, definition, How, Why, hypothetical, semantically constrained and cross-lingual questions.

II. RELATED WORK

The main objectives of literature review are to improve the important research work in the current trends. In the present related research works are analysed in the basis of Automatic question answering, multimedia question answering, multimedia search, community question answering, data selection and reranking. Before going to design my proposed model, the literature studies are essential to define the problem specifications.

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Table 1: Literature Review on Question Answering System

AUTHOR/ YEAR	OBJECTIVES	NOVEL FEATURES	FINDINGS
Aparna et al, 2014,	Performance improvement in multimedia answering by web excavation	Crawling techniques, naïve bayes classifier	Multimedia answer generation
Jeon, 2005, et al.,	Question Retrieval	Comparison among four popular retrieval methods	Translation model performs best
Ming, et al., 2010,	QA content Organization	Clustering Framework	Hierarchical knowledge structures
Nie, 2013, et al.,	Harvesting web information	Query generation is improved	It is not possible for complex queries
Srikanth Y, et al.,2014,	User interaction is reduced	Reranking method is introduced	The optimal results produced
Wang, et al., 2009,	Question Retrieval	Structural representations of questions	Robust against grammatical errors
Xue, 2008, et al.,	Question Retrieval	Proposed a translation-based language model	Significant Performance

The MMQA system leverages the strength of NLP, information retrieval as well as media mining to find precise answer in appropriate media form to reply the given question which is relevant to a range of research topics including QA classification, query performance prediction, complex query search, media data reranking, etc.

The related literature survey are analyzed and shown in Table 1.Even though there are various existing related models are developed, but still it has many issues being not rectified in multimedia question answering system for complex queries. Hence, it needs a new model for QA.

III. PROPOSED METHODOLOGY

The proposed methodology gives the relevant multimedia information for based on the user queries. From the observations made in the literature review, needs to propose a system, which produces more informative search results by selecting the media type automatically.

Proposed System QA Architecture

The proposed system architecture is presented in the Fig 1. The proposed model has five modules. They are

A. Keyword extraction
B. Query generation
C. Answer medium selection
D. Multimedia search
E. Multimedia Manipulation (Selection & Presentation)

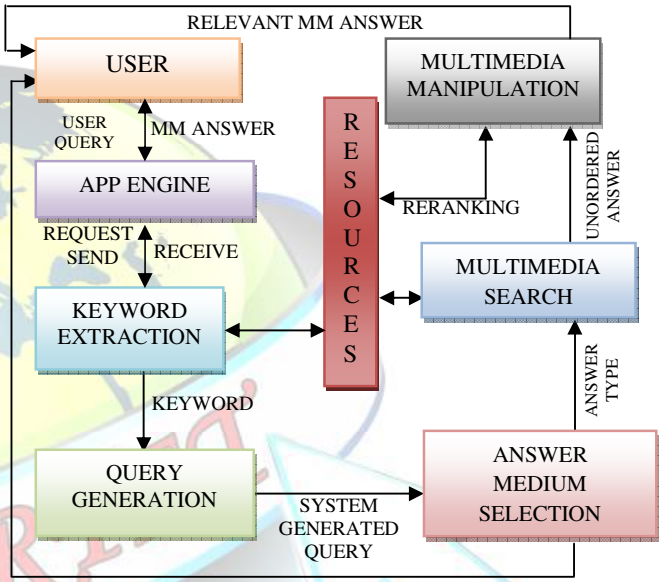

Fig.1 Proposed QA Architecture

KEYWORD EXTRACTION: The users post his question in common language. In order to get the answer from the search engine, it needs to process the question in common language. Since many questions contain multiple sentences and some of the sentences are uninformative. Search engines do not work well for queries that are long and verbose. The question may contain white spaces, breaking lines, blank lines, unwanted words and verbs and needs to eliminate that type of words and select the keyword of that question. Therefore, the proposed algorithm extracts a set of informative keywords from user given query. The Advanced Stemming Algorithm receives the user query and removes all unwanted words. All keywords are stored in array list. If possible to find the abbreviations for necessary words. Algorithms removes repeated keywords and refresh the array list. The same process is repeated until the last queries.

The textual answers are retrieved from database using extracted keywords. Again the keywords are combined for extracted from user query and textual answer. The

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combined keywords are passing to next module query generation.

Advanced Stemming Algorithm

QUERY GENERATION: In order to collect multimedia data, the proposed system needs to generate informative queries. This module generates three queries from the user question, the retrieved text answer and the combination of both user question and the text answer respectively. Which one is the most informative depends on the question and answer. First, the proposed system converts the user question to a query and converts a grammatically correct interrogative sentence into one of the syntactically correct declarative sentences or meaningful phrases. The next step is to select the correct answer.

ANSWER MEDIUM SELECTION: The main module is Answer Medium Selection. The main component is question classification. It helps to identify the answer type. It predicts whether the textual answer should be enriched with media information and what kind of media data should be added. Specifically, the proposed system categorizes it into one of the four classes: a) only text, which means that the textual answers are sufficient, b) text + image, which means that image information needs to be added, c) text + video, which means that only video information needs to be added and d) text + image + video, add both image and video information. That means the proposed scheme automatically collects images, videos or the combination of images and videos to enrich the original textual answers.

Question-Based Classification Since many questions contain multiple sentences and some of the sentences are uninformative, the proposed scheme to extract the core sentence from each question. The classification is accomplished with two steps. First, categorize questions based on interrogatives (some starting words and ending words) and in this way the proposed method can directly find questions that should be answered with text. Second, for the rest questions perform a classification using a naive Bayes classifier.

Table 2. List of Interrogative words

Interrogative Word	Category
How + adj / adv, Be, can, will, have, when, be there	Text
what, where, which, why, how to, who, etc.	Need further classification

The query can be classified into five core classes, such as yes or no, choice, Quantity, Enumeration, and Description. The first three classes can be put into a category that can be answered with only text based on the interrogative words. However, remaining two classes need further analysis using Naïve Bayes classifier. If the complexity of the verb is more, it needs to be answered with video or image. Table 2 shows the interrogative words. The proposed method also extracts a list of class-specific related words in a semiautomatic way. The proposed method first estimate the

//*Advanced Stemming Algorithm*//
Input : User Query
Output : Extracted Keywords
Step 1: Split the user query based on the white space between them and pass them into array list
Step 2: Initialize the for loop and remove the stop words
Step 3: Find the abbreviations
Step 4: Remove duplicates
Step 5: Complete the words if possible to add prefix or suffix
Step 6: Pass the available keywords to an array
Step 7: Repeat until last queries
Step 8: Stop the process.

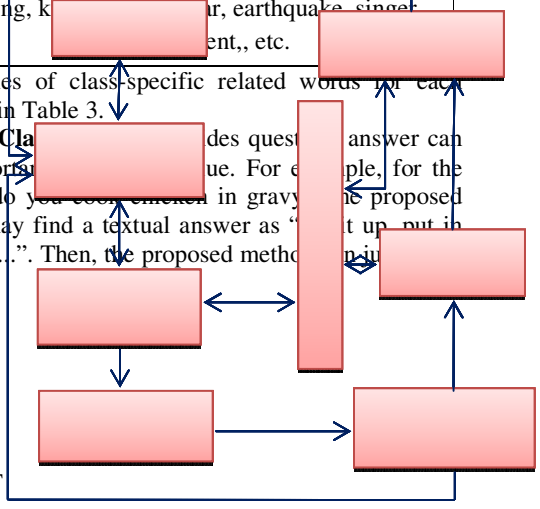
appearing frequency of each phrase in the positive samples of each class. All the phrases that have the frequencies above a threshold are collected.

Table 3. Shows the class specific related words

Answer Type	Class-Specific Related Word List
Text	Population, country, date, name, period, times, rate, age, height, website, birthday, distance, speed, religions, number, etc.
Text + Image	Image, who, color, pet, clothes, look like, photo, largest, appearance, band, what is a, symbol, whom, pictures, logo, place, surface, capital, figure, etc.
Text + Video	How to, how do, how can invented, story, film, tell, songs, music, video, clip, recipe, differences, ways, steps, dance, first, said, etc.
Text + Image + Video	Happened, war, prime minister, president, king, k… ur, earthquake, singer, …ent,, etc.

Examples of class-specific related words for each class are shown in Table 3.

Answer Based Cla… …des quest… answer can also be an import… …ue. For e… …ple, for the question "how do y… …chicken in gravy… …e proposed novel scheme may find a textual answer as "… …t up, put in oven proof dish …". Then, the proposed metho… …n ju…



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/*Attribute Assisted Hypergraph Algorithm/*
Input :Unordered Images
Output :Ordered Images
Step 1: Initialization.
Step 2: Label Update.
Step 3: Weight Update.
Step 4: After obtaining W, update the matrix
Step 5: Let t = t+1. If t>T, quit iteration and output the results, otherwise goto step 2.
Step 6: Until last queries
Step 7: Stop the process.

the question can be better answered with a video clip as the required answer.

MULTIMEDIA SEARCH In the proposed research work, next module is multimedia search. This module receives the informative query and answer type details from the module answer medium selection. Based on the generated queries, this module collects images and videos from database using proposed search engine. Due to the increasing amount of digital information stored over the web, searching for desired information has become an essential task.

Generally, multimedia search efforts can be categorized into two categories: a) Text based search and b) Content based search. The Text based search approach uses a term-based specification of the desired media entities, to search for media data by matching them with the surrounding textual description. The Content-based media retrieval performs search by analysing the contents of media data rather than the metadata. The keyword-based search engines are still widely used for media search. For image and video search, the proposed system adopts the K-Nearest Neighbour graph (K-NN) method. The search engine returns both relevant and irrelevant data. The retrieved data sends to the next module that is multimedia manipulation.

MULTIMEDIA MANIPULATION (Reranking and Presentation): Based on the generated queries, vertically collect image and video data with multimedia search engines. The search engine returns lot of irrelevant multimedia results. Then perform reranking and duplicate removal to obtain a set of accurate and representative images or videos to enrich the textual answers. After reranking and duplicate removal, the optimal multimedia results are presents to the user.

Reranking for Attribute Assisted Hypergraph Method: With the help of proposed Attribute Assisted Hypergraph Reranking construction, the proposed method learns how to reorder the ranked images and returned to the user from search engine.

Attribute Assisted Hypergraph Algorithm

The above algorithm first initializing the values for all parameters. Next it performs updating the label and computing the optimal relevant score (f) for image. Then updating the weight (w) and all matrixes. Quit the iteration and next image is considered. The proposed method extracts the top images after performing reranking process.

IV. PERFORMANCE ANALYSIS

The proposed method is implemented with the help of sql server 2013. in the database have a query, text, image and video field.

TEXT QUERY: What is meant by OOPs concept

Fig 2 Shows the textual answer

TEXT + IMAGE QUERY : Who is the founder of microsoft

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Fig 3 Shows the textual answer and image

TEXT + VIDEO QUERY : How to play chess

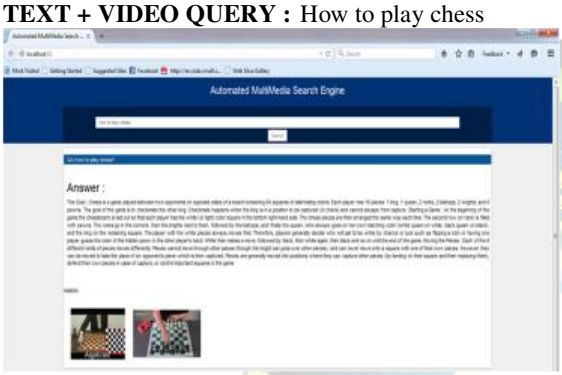

Fig 4 Shows the textual answer and video

TEXT + IMAGE + VIDEO QUERY How do I train my wolf dog

Fig 5 the textual answer, image and video

The below Table 4.6 indicates the comparisons of user expectation details for existing and proposed system.

Table 4 Comparison of existing and proposed system performance with user expectation

Answer Medium	Google	Yahoo	User Expectation	Proposed System
Text	49	55	23	29
Text + Image	26	24	40	39
Text + Video	18	15	22	19
Text + Image + Video	7	6	15	11

From the table 4, it is perceived that the proposed method results for answer medium selection gives the better results.

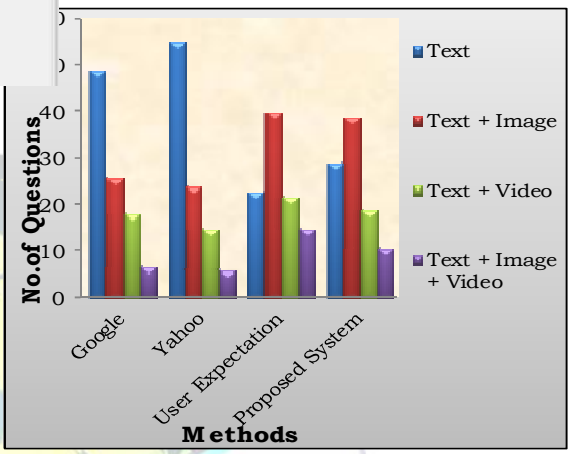

Fig 6 comparison of answer medium selection with user expectation

The above figure 6, shows that the importance of proposed system answer medium. The proposed model gives the better result when compared to existing search engines. Each method

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tested with 100 queries and the answers are labeled with humans.

The table 5 describes the details about reranking approaches.

Table 5 Comparison of different reranking methods

Method/ No.of Images	Bayesian (%) (Exist)	PRF (%) (Exist)	Proposed (%) (AAHGR)
25	70	72	79
50	64	66	73
75	55	58	68
100	50	53	60

The above Table 5 illustrates the different reranking algorithm performance for 100 images. It shows that the proposed Attribute Assisted Hypergraph reranking approach gives better performance results.

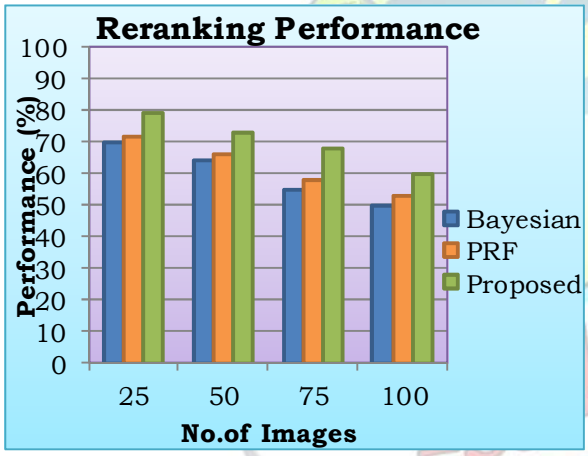

Fig 7 Comparison of different reranking algorithm performance

The above Fig 7 shows comparison of different reranking algorithms for 100 images. It shows that the proposed Attribute Assisted Hypergraph Reranking approach is performed better.

The experimental results are ensured that the proposed model gives better performance while comparing the existing search engines. In India Google and Yahoo are the popular existing search engines. So, the proposed model is compared these two methods. It is sure that the proposed model always gives the better results and ensures the objectives of the proposed research work. It is more benefited to internet users while implementing this proposed research work on internet protocol.

V. CONCLUSION

The existing system approaches mainly focus on narrow domains. The existing system by defaults provides only textual answers and URL's for user queries. The proposed MMQA can be improved the scheme such as developing better query generation method and investigating the relevant segments from a video. The proposed system presents multimedia data along with textual answers. The proposed model gives better performance while comparing to the existing model. For several questions, videos are enriched, but actually only parts of them are more informative than presenting the whole videos that can be misleading. This research work can be extended to audio.

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