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A Survey Paper on Document Recommendation in Conversations

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Abstract:

This paper is addressed towards extraction of important words from conversations, with the objective of utilizing these watchwords to recover, for every short audio fragment, a little number of conceivably relatable reports, which can be prescribed to members, just-in-time. In any case, even a short audio fragment contains a mixed bag of words, which are conceivably identified with a few topics; also, utilizing automatic speech recognition (ASR) framework slips errors in the output. Along these lines, it is hard to surmise correctly the data needs of the discussion members. We first propose a calculation to remove decisive words from the yield of an ASR framework (or a manual transcript for testing) to coordinate the potentially differing qualities of subjects and decrease ASR commotion. At that point, we make use of a technique that to make many implicit queries from the selected keywords which will in return produce list of relevant documents. The scores demonstrate that our proposition moves forward over past systems that consider just word recurrence or theme closeness, and speaks to a promising answer for a report recommender framework to be utilized as a part of discussions.

Keywords — **Document recommendation, information retrieval, keyword extraction.**

I. INTRODUCTION

This document is a template. An electronic copy can Humans are encompassed by abundance of data, accessible as records, data stores, or mixed media sources of information. Access to this data is adapted by the accessibility of suitable web indexes, however when these are accessible, clients frequently don't start a search action, in light of the reality that their current action does not permit them to do as such, or in light of the reality that they are not mindful that applicable data is accessible. We suggest a novel technique in this paper of suggesting archives just-in-time that is identified with clients' present work. At the point when these tasks are primarily conversational, for instance when clients take part in a meeting, their data needs can be understood by the keywords present in speech, acquired through continuous automatic speech recognition(ASR) engine. These certain implicitly generated questions are utilized to recover and suggest reports from the Web or a local Storehouse, which clients can decide to, investigate in more detail if they discover them intriguing.

The focus of this paper is on figuring framework for utilization in meeting rooms/conferences where information is to be fetched in-time to assist involved people in better understanding of the topic. This framework will be including speech to text translation, extraction of words from this text, formulating implicit queries from the words and fetching documents from the available storehouses relating to the words in the queries.

II. EXISTING SYSTEM

Existing system uses automatic speech recognition (ASR) engine to obtain text version of audio and then select few keywords from it based on the reoccurrence number. The technique introduces errors because queries are generated wrong.This way, it is difficult to infer precisely the information needs of the conversation participants and irrelevant documents are recommended more.

Moreover, the existing system tries to find exact match for the keyword in the query and ignores all the related documents. This fetches very few or no documents at all. There is also need to maintain huge repository of documents.

III. RELATED WORK

A. *Remembrance Agent: A continuously running automated information retrieval system.*

1) *Authors: B. Rhodes and T. Starner*

Remembrance Agent (RA) is a program which can display list of documents relevant to user context. It runs without continuous user interaction. RA basically used to give suggestions to user which can be pursue or ignored as desired. Computer waits for user interaction, RA uses such wait cycle to perform search information which is relevant to user's current scenario. RA reminds about relevant data of user task. RA gives suggestions in one line description at bottom of screen.

EMACS-19, lisp used as front-end for RA. Front-end displays one-line suggestions and number used to indicate its relevancy. Full text document can be available and can be obtained if requested. A program which is used as back-end for RA, produces suggestions for given text query from pre-indexed documents. SMART is used to decide suggestions for RA, depending upon common word frequency.

This system has two sources of suggestions. In first, first three lines print suggestions from last year's personal email (approximately up to 60MB). And second, last line prints suggestions from 7MB files entered over past few years. RA should suggest documents similar to keywords in query. This works on 'scopes', which are centred on current location of cursor. There are three types of scopes used in RA. First scope is around the last thousands of words. Second is around the last 50 words. And third is around the last 10 words. Scope coverage, time updates are customizable by user.

B. *Enforcing topic diversity in a document recommender for conversations.*

1) *Authors: M. Habibi and A. Popescu-Belis*

In our project, we also focus on building concise, diverse and relevant lists of documents which provide information to the users according to their need.

From this paper, we get the concept of merging lists of documents which are retrieved through multiple implicit queries which are formed for short conversations fragments.

The goal of the method used in this paper is to obtain a unique and precise list of documents that can be recommended to the users in real time. The obtained list should cover the maximum number of implicit queries and thus topics.

The proposed method rewards:

a. **Topic similarity** – It means selecting the most relevant documents to the conversation.
b. **Topic diversity** –It is related with covering of the maximum number of implicit queries and topics in a precise and relevant list of recommendations when more than one topic is discussed in the conversation.

ACLD (Automatic Content Linking Device) system is used as framework for this document recommender system. The ACLD system monitors the conversation, and forms queries based on the keywords detected by a real-time ASR system. The queries are then fired periodically for retrieving documents. Thesedocuments are thenrecommended to the users according to their needs.

The diverse merging of retrieved document lists is done here. It is the process of generating a short, diverse and relevant list of recommended documents. This list should cover the maximum number of topics of each conversation fragment.

The method proceeds in two steps:

a. **Document and Query Representation:**

The queries and the corresponding list of documents from the Apache Lucene search engine are first represented using topic modelling techniques.

b. Ranking Documents:

Documents are then ranked by using topical similarity and rewarding the coverage of different lists.

C. *A Speech-based Just-in-Time Retrieval System using Semantic Search*

1) *A. Popescu-Belis, M. Yazdani, A. Nanchen, and P. N. Garner*

In our project, we are using a just-in time retrieval system for extraction of useful information. We are using ACLD i.e., Automatic Content Linking Device (ACLD), a just-in-time document recommendation system for meetings, for our project.

From this paper, we get the concept of our recommendation system ACLD.

a. What is ACLD?

ACLD is a recommendation system which is used for analysing spoken input from one or more speakers and retrieving relevant documents.

b. Content Linking: Scenarios of Use

One of the main scenarios of use for the ACLD is for meeting rooms. The ACLD performs search of relevant documents for people in the meeting without interrupting the discussion flow.

In other scenarios, ACLD is used for live or recorded lectures. The ACLD provides related and relevant documents obtained from various repositories required for the lectures.

c. Description of the ACLD

Following functions are performed by ACLD system:

i. Document Preparation and Indexing:

It involves mainly the extraction of text, and then the indexing of the documents.It is done using Apache Lucene software.

ii. Sensing the User's Information Needs

The AMI real-time ASR system is used for the ACLD system. A pre-compiled grammar is one of its main features. This feature allows maintaining accuracy even in real time on a low resource machine.

iii. Querying the Document Database

The Query Aggregator is used for retrieving the most relevant documents from one or more databases using ASR words. Semantic search is for the current version of the ACLD, while for previous versions word-based search is used.

iv. Semantic Search over Wikipedia

Our method for semantic search mainly focuses on improving the relevancy of the retrieved documents, and increasing the robustness of system to noise from the ASR. The graph-based model of semantic relatedness is used for document retrieval.

v. The User Interface (UI)

The UI mainly aims to make all information produced by the system available to user in a configurable way. It allows the users to use a larger or smaller amount of information according to their needs.

The ACLD is the first just in time retrieval system to use involuntary speech. It also supports access to multimedia documents and web pages using a robust semantic search method.***User Interactions with Everyday Applications as Context for Just-in-time Information Access***

1) *J. Budzik and K. J. Hammond*

In our project, one of the main functions is information retrieval. This retrieved information can be used for obtaining relevant and related documents.

It is observed that our interactions with everyday applications, such as, word processors, web browsers etc. gives rich contextual information that can be used to support just in time retrieval of relevant documents.

From this paper, we will get the concept of just in time information retrieval by using user interactions with everyday applications as a context.We are using Watson system as an example for obtaining more clear view about just in time information retrieval.

Previous efforts in building context for information access can be classified into four classes:

***a.* Relevance feedback in information retrieval:**

In systems supporting relevance feedback, the user starts with a standard query and then judges the result, usually by judging a result as relevant or not relevant.

The result of user's judgment is used to customize the original query by casting positive or negative search terms.

***b.* Systems that use user profiles:**

User profiles can be aggregated by gathering terms based on rating documents. The information gathered in a profile remains across retrieval sessions where it may be accordingly casted to the user's query.

***c.* Word-sense disambiguation:**

Some systems focuses on reducing ambiguity by involving explicit word-sense disambiguation on the user's part, or by using approved information intrinsic in the hypertext documents structure.

***d.* Knowledge engineering approaches:**

In such approaches, user's behaviour in a particular application is modelled and then explicit queries are associated in a particular state of tasks.

Implementation of Watson: an information management assistant:

i. Concept of Information Management Agent (IMA):

IMAs discover user's interaction with everyday applications and try to predict their information needs using a model of the task in execution.IMAs then accordingly accomplish these needs using the text of the document the user is operating and a insight of how to form queries to acknowledged information retrieval systems, such as, Internet search engines, abstract databases, etc. IMAs represent a just-in-time information system in which information is provided to users according to their needs without explicit requests.

ii. Implementation of Watson:

Watson is the first IMA built. It has several application adapters, which are used to obtain access to an application's internal representation of a document. These adapters are used to produce a document representation, which is sent to the Watson application when required.Then, Watson alters the original document representation into a query, and decides appropriate sources. This query proceeds in the form of an internal query representation and is sent to preferred information adapters. Each information adapter converts the query into the source-specific query language and performs a search.

Watson represents a task context as a collection of words associated with the current document of users.Thus, by referring this paper we get the concept of information retrieval using user's interactions with everyday applications as context.

IV. PROPOSED SYSTEM

We propose a system where, instead of directly selecting some reoccurred words from Automatic Speech Recognition (ASR) output, we will process the output with the help of various functions. At first, the noisy words such as articles, etc. will be removed from the text version of conversation. Then, a function will select the words from the text and store it in a SET, so that we will obtain all the unique words. The proposed methods are tested on basis of relevance with respect to audiopieces from the Fisher, AMI, and ELEA conversational corpora, ranked by various human critics.

These words are then clustered. Various clustering algorithms are been tested. We will be using k-means for the system as it is simpler to implement and this won't put much load on the system, which in turn will reduce processing time.

The clusters will be made based on topical similarity and co-occurrence of words. Later, one query will be implicitly formulated from one cluster, i.e., various topically different queries qill be generated producing in return more precise recommendations.

Also, presenting the list of documents to user in user-friendly way is a prime task. We will be using a two column GUI for showing documents to user. They are:

1. Documents relevant to keywords in queries.
2. Documents that maybe related to keywords (based on co-occurrence of words).

The technique used removes errors at various stages on processing. Also ranking of documents before displaying to user helps user in accessing them.

V. SYSTEM ARCHITECTURE

Figure 1 shows user conversation recorded by ASR system reduces noises from it and output of ASR send further. Then various keywords are extracted by keyword extraction method. Then clustering of diverse keywords is done. Further these keywords are identified or matched by implicit queries. By ranking of documents, the recommendation of related document can be easily made.

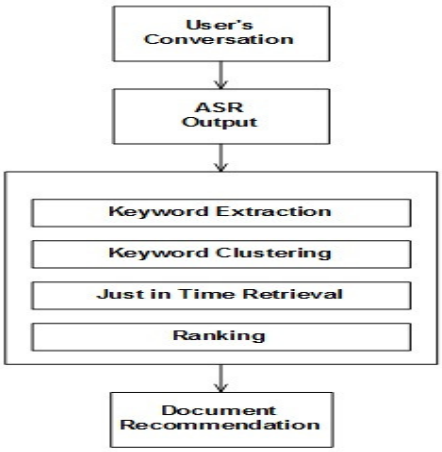

Figure 1
SYSTEM ARCHITECTURE

VI. CONCLUSION

The proposed system architecture has four stages of processing after ASR output is obtained. The main criterions to judge a just-in-time recommender are speed and precision. Extracting the keywords by using a diverse keyword search algorithm helps in maintaining topic diversity and providing useful recommendations. As the speed of processing is fast enough for live conversation tracking and extraction, it has many practical applications. Implicit queries and just-in-time document retrieval makes system useful in meetings and conferences.

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