Information Ranking in Real-Time for Summarizing Emergency Calls

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***Abstract*—Summarizing emergency calls needs to be processed in real-time. Before a conversation is over, the value of a newly acquired statement should be determined. At the same time, the objective of the call, which is to obtain the information on the emergency situation, should be achieved. In this paper, a method of information ranking in real-time is proposed. This method summarizes an emergency call by extracting keywords and calculating the weights of the keywords with their frequency and relations with other words. The keywords are sorted with the weights and assigned to properties of a dialogue model. From the constructed dialogue model, statements which are not related to the conversation's topic can be pruned.**

Keywords-information ranking; summarization; emergency call; real time.

I. INTRODUCTION

One of the most important contributions of summarizing documents is the reduced complexity for human understanding. With the help of technologies in storing and compressing data, the size of documents especially text based documents is free from the requirement for summarization. However, as the meanings of data are revealed when recognized by humans, acceptance by human is one of the most important criteria for evaluating the value of the data. Most summarizations, which are automatically executed by machines, are worked on completed documents such as articles, news, essays, and books. However, in real world, summarizations are performed for documents in progress. Students note key sentences in lectures. Reporters sum up addresses in press conferences. A debater needs to analyze the opponent's opinion and respond to it in real-time. The same restriction exists in responding to emergency calls.

In order to confirm the correct situation of the emergency, the call receiver needs to control the dialogue to acquire the required information. When a conversation loses the point, it should be interrupted and returned to the original objective. In this paper, we propose a summarization based information ranking method. As this method summarizes and determines the topic of an unfinished document, it can be properly applied to report emergency calls which require prompt response before the conversation is over.

The rest of this paper is organized as follows. Section II describes the types of summarization and the dialogue model as background. Section III proposes the main idea of this paper. Section IV concludes this paper.

II. BACKGROUND

A. Summarization

The types of summarization can be classified as shown in Table I [1]. Three criteria are used to identify types of summarization. One is the level of expressions [2]. The expressions in a summary can be either reused from the original document or rewritten. Another is the coverage of summarization [3]. Determining what is important in the original document depends on a viewpoint. Reflecting on the viewpoint makes for a different summary. The other is the number of documents [4]. A summary of series and a summary of an event are different.

The proposed method is classified as a query-based extraction summary for a single document.

TABLE I. TYPES OF SUMMARIZATION

Category	**Types of Summarization**	
	Name	***Description***
Level of expressions in summarization	Extraction Summary	Important words or sentences from the original document are extracted and the set of such keywords becomes the summary.
	Abstraction Summary	Novel expressions are written by analyzing the extracted keywords semantically. Concept generalization, Part-Whole replacement, Metonymy, and Semantic unification are the examples of generating abstraction.
Coverage of summarization	Generic Summary	All the information in the original document are included in the summary.
	Query-based Summary	Only the information which is related to the given query is included in the summary.
Amount of documents	Single Document	Summarization is performed on a single document.
	Multiple Documents	Summarization is performed on a set of documents.

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B. Dialogue Model

Every conversation, even a chitchat, has its objective. The objective is achieved by sharing information. Dialogue Model is a structure of information to be shared in the conversation [5]. It consists of six components such as *Who*, *What*, *How*, *Why*, *When*, and *Where*. When dealing with emergency calls, *Who*, *What*, and *Where* are mandatory. Even though the additional information such as *How*, *Why*, and *When* is useful to make more reliable and accurate plans for rescue teams, the *Who*, *What*, and *Where* information is enough to send rescue teams to the scene where the emergency situation occurs.

The summarized result is assigned to fill the properties of the dialogue model. By comparing the relations among properties, the conversation can be saved from getting off topic.

III. METHOD

The proposed method consists of three steps, as shown in Figure 1. Summarization is performed with the first step and the second step. In the first step, keywords are extracted from the newly given statement. The keywords are composed of nouns, verbs, adjectives which are used as a complement, and a preposition. In the second step, the weight of each keyword is calculated. This calculation is executed with heuristic rules. There are three fundamental rules. One is that higher frequency corresponds to higher weight. Another is that the keywords in the same sentence share the weight. The last is that the query related keywords have higher weight. As the objective of responding to emergency calls is to acquire information on the situation of the emergency, what is not related to such objective does not have to be summarized. The third step is constructing a dialogue model with the keywords which are sorted with their weight. As described in Section II.*B*, *Who*, *What*, and *Where* are filled on the preferential basis. The prepositions, which are collected in the first step, are used for determining the sluts of the dialogue model. The constructed dialogue model is evaluated for closing the conversation. If the conversation is not over, a new statement is added and the process is repeated.

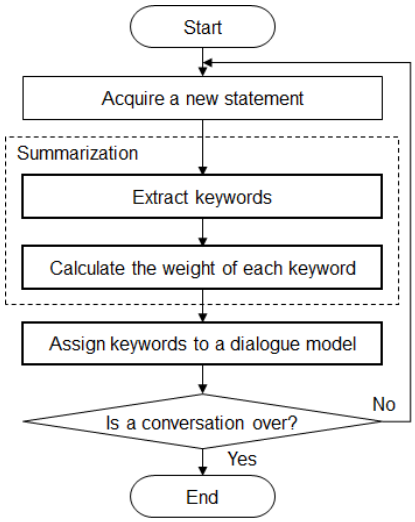

Figure 1. Process flow of the proposed method.

IV. CONCLUSION

Every behavior has its objective. Any behavior which loses its objective or fails to achieve the objective is removed or replaced by another behavior. The objective of emergency calls is to notify the situation and ask for help. In order to achieve this objective, it is important to extract valuable information and evade the wasteful usage of time and efforts. Summarizing a conversation is a key for determining the worth of each sentence. In this paper, a method of information ranking in real-time is proposed. This method summarizes an emergency call by extracting keywords and calculating the weights of the keywords with their frequency and relations with other words. The set of keywords are sorted with the weights and they are assigned to properties of a dialogue model. From the constructed dialogue model, statements which are not related to the conversation's topic can be pruned.

This method assumes that the newly added information is in a grammatically correct form. However, formal sentences are not made in a real conversation. In order to process such broken, ambiguous, and unfinished sentences, a reliable natural language processing module is needed. Thus, the way of processing informal statements will be researched as future work.

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