Utilization of Artificial Intelligence in Call Centers

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Abstract

In November 2014, IBM Japan, Ltd. and Mizuho Bank, Ltd. issued a press release on the Watson computer system that utilizes artificial intelligence (AI) to support call center operators. Since then, the expectation that AI will be used in the call center sector of major companies has been increasing rapidly. This article introduces AI technology that is being used effectively in call centers now and AI technology that is expected to be widely introduced within the next few years. NTT Software's ForeSight Voice Mining technology is also described.

Keywords: voice mining, artificial intelligence, call centers

1. Introduction

NTT is actively researching and developing four artificial intelligence (AI) domains [1]. Of those domains, NTT Software is focusing its efforts on Agent-AI. Specifically, NTT Software is developing human-like agents that assist operators in call centers. NTT Software launched a product named ForeSight Voice Mining for call centers in May 2014. The product utilizes voice recognition technology, natural language processing technology, and voice mining technology developed by NTT Media Intelligence Laboratories. Since releasing the product, NTT Software has been offering it mainly to call centers of major financial institutions in cooperation with NTT business companies.

In November 2014, IBM Japan, Ltd. and Mizuho Bank, Ltd. issued a press release on the Watson system that uses AI to support call center operators [2, 3]. Watson is defined as a cognitive computing system that understands/learns natural languages and supports a human's decision-making process. Since this press release, there has been a growing awareness of AI and of Watson in the call center sector of major financial institutions, and consequently, the number of inquiries to NTT Software asking about the capabilities of NTT's AI technology has rapidly increased. We introduce in this article the AI functions that ForeSight Voice Mining provides.

2. AI functions of ForeSight Voice Mining

ForeSight Voice Mining utilizes various AI element technologies developed by NTT Media Intelligence Laboratories such as machine learning and natural language comprehension. It therefore provides functions that are useful in various business fields. These functions include a response knowledge recommendation function to support operators' work in call centers and an automatic call summary function to support the after-call work of operators. These functions are implemented with the image of virtual agents (human-like agents). For example, call center operators can see on their computer screen messages from a virtual agent offering help or suggestions during their phone conversations with customers.

2.1 Response knowledge recommendation function to support call center operators

Operators in call centers refer to various information and use know-how based on their experience to solve the problems of customers when answering calls. An issue that arises with less experienced operators is that they tend to frequently place calls on

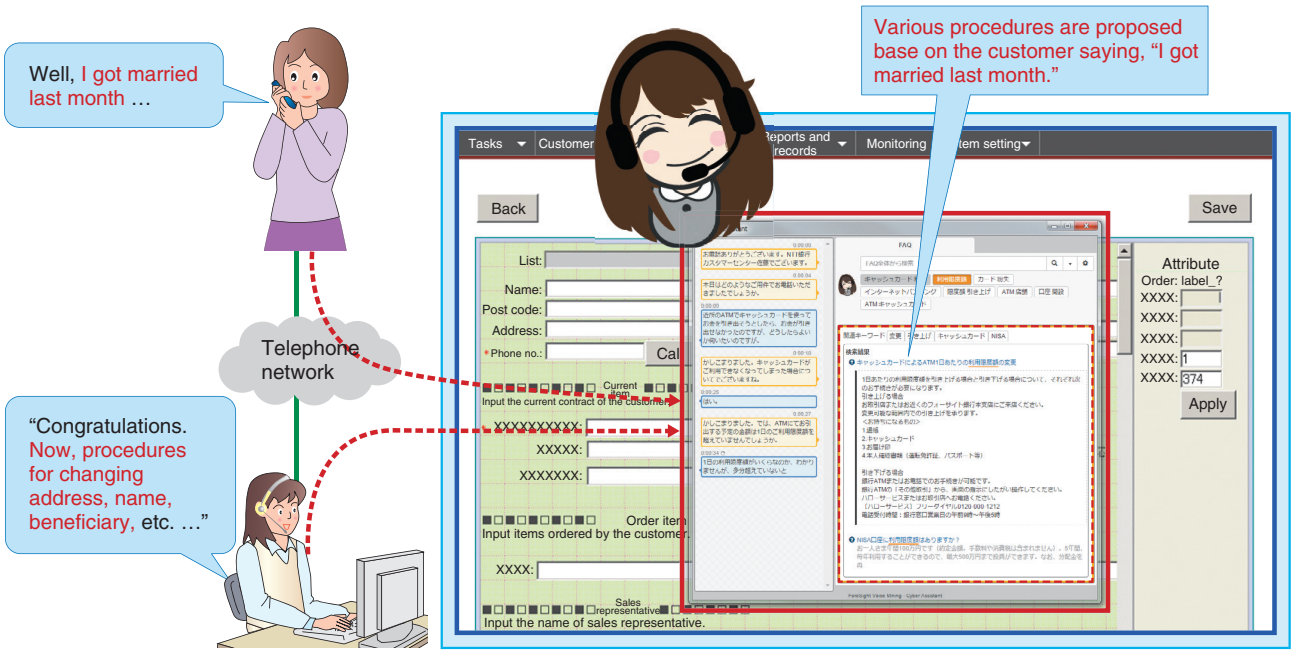

Fig. 1. Response knowledge recommendation function.

hold or to prolong the response time in order to refer to such information, and this makes customers impatient and increases the operating cost of call centers.

As a solution to these problems, ForeSight Voice Mining has a function in which a virtual agent listens to the conversation between operators and customers and promptly gives suggestions on appropriate responses to the operator. This function uses voice recognition of calls on a real-time basis and natural language processing technology to display appropriate responses on the operators' computer screens, and it enables operators to automatically obtain appropriate response knowledge during their conversations with customers and to respond to calls more quickly and effectively.

For example, at a call center of a life insurance company, when a customer says, "I got married last month," a virtual agent responds to the word *married* and instantly displays relevant information on the screen of operators such as *Procedures for address change, Procedures for name change*, and *Procedures for beneficiary change*. In this way, sharing the know-how of experienced operators with the entire call center staff enables less experienced operators to work as effectively with customers as experienced operators, improves customer satisfaction, and reduces the operating cost of the call center (**Fig. 1**).

2.2 Automatic call summary function to support after-call work of operators

Call center operators enter the content of their conversations with customers in the system as response records after completing calls. This is referred to as after-call work. The difficulty with this work is that the description of response records entered as after-call work varies widely depending on operators, and the length of descriptions significantly decreases during busy times.

ForeSight Voice Mining has an automatic call summary function in which a virtual agent summarizes the conversation between operators and customers and proposes summarized sentences to the operator. This function realizes role sharing between machines and humans; that is, AI (machine) is responsible for preventing variations in the lengths of descriptions in response records between busy periods and slow periods and variations in viewpoints of descriptions by different operators, and operators (humans) are responsible for handling calls, which requires them to respond appropriately to customers at all times, whether the customer is exhibiting a pleasant or unpleasant manner. In other words, AI is utilized to substitute for and support a certain part of human activities, and AI and humans take charge of their own areas of specialty.

Summaries created by the automatic call summary function can be categorized into two groups; one is *automatic extraction of the nature of the call* to extract the reasons customers called in the first place, and the other is *automatic extraction of important phrases* to extract only important remarks during the call. In this method, summaries created do not depend on the duration of the call and the key points of calls to be recorded in a concise way. Another method called the *unnecessary sentence deletion method* can also be used for the summary function. The function creates summaries by deleting unnecessary sentences (such as greetings and supportive responses) included in conversations. This method has a low risk of missing information to be recorded and is able to record an overview of the entire call. However, with this method, the length of summaries depends on the duration of the call. Because the summary function method to be used is determined according to how the companies will use the summaries later, NTT Software proposes the optimal method for customers depending on their intended use of summaries.

The use of the response knowledge recommendation function and the automatic call summary function described above requires prior learning exercises by using recorded voices of actual incoming calls to call centers as well as response records before applying the functions in actual situations. Prior learning exercises enable the functions to be adjusted to the work of companies where the functions are to be introduced, and regular additional learning after the start of operation improves the ability of the functions to adapt to the work.

3. Technological advances leading to increased interest in AI use in call centers

There was a boom in interactive voice response (IVR) systems based on voice recognition among call centers from the late 1990s to the early 2000s. In Japan, the U.S. firm Nuance Communications, Inc. and other vendors of voice recognition systems promoted the introduction of the IVR system using voice recognition in some innovative companies. Most voice recognition systems introduced at that time were not able to recognize conversations. They only recognized words (or a series of words) registered in the system beforehand. Now, about 20 years have passed since then, and the throughput capacity of computers has dramatically improved, deep neural networks have been introduced in the algorithms of voice recognition engines, and sufficient accuracy of voice recognition has been achieved for conversations speakers (operators and customers) have without even being aware of voice recognition [4]. These advances in technology prompted IBM Japan and Mizuho Bank to issue the press release about Watson in November 2014, which led to the rapid increase in expectations for the use of AI in call centers.

4. Improved corporate image through the use of AI in call centers

In many cases, call centers of companies represent a sector that is costly, and therefore, reducing costs at call centers is a never-ending task. At the same time, however, improving customer satisfaction and maintaining/improving corporate brands require better customer support, and a high-quality customer experience at call centers is an important factor to maintain/improve brands. In other words, for companies that operate call centers, the coexistence of cost reduction and a high-quality customer experience is a consistent objective. Innovative companies are willing to introduce AI (machine) that will take charge of dealing with customers to reduce costs, and they seek to convey the image of being cutting-edge companies that adopt advanced technology quickly. Conventional thinking used to be that a high-quality customer experience could only be achieved when human operators interact with customers. However, this idea is changing, and it is more often thought that improvement of voice recognition and natural language processing technologies will make it possible to achieve a high-quality customer experience in which AI interacts with customers in some areas to a satisfactory extent. Using AI in customer service will make it possible to achieve stable quality in dealing with customers without having to deal with difficulties in securing sufficient human resources. In addition, a company's corporate image will greatly improve if they can impress customers with the high-quality responses of their AI systems. Therefore, innovative companies are now starting to compete in their use of AI to provide customer support.

5. Future development

NTT Software is using the advanced technology of NTT Media Intelligence Laboratories and promoting products and services in which AI directly interacts with customers. For example, NTT Software is pursing virtual agents that understand and properly respond to what customers say when answering calls

and virtual agents that understand and properly respond to sentences input into websites and social networking services by customers. NTT Software believes that such products and services cannot be achieved overnight but can be achieved within a few years, as strong needs for them exist, and technologies to meet those needs are steadily advancing.

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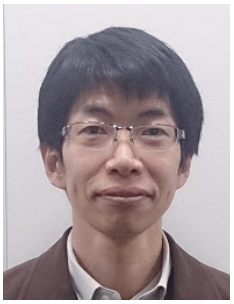

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