An Implementation of Assistant Service for Phone Call Receiver

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Abstract—When a phone call is used to report an accident, there are a caller and a receiver. Phone call reports of 112 and 119 can be one of the examples. Insurance contracts through phone call also belong to the cases. The receivers listen and respond to the callers. In the process of the listening and responding, the receiver may need additional information to manage the reported situation properly. The additional information can be a phone call history of the caller, a manual page for the situation or a best practice for a similar situation. When the receiver can access the additional information easily, the responding to caller can be done swiftly and effectively. The assistant for phone call receiver can operate based on the conversation between the caller and receiver. To implement the assistant, other function like extracting and analyzing report conversation should co-operate with the already existing call receiving system to provide additional information. In this paper, an implementation is described, which extends legacy call receiving system to accommodate receiver assistant service for phone call receivers.

Keywords— Assistant, incident report, Situation

I. INTRODUCTION

In nowadays, there are many emergence reports throughout Korea society for getting helps from public safty service. To improve the public safety services, there were several related studies. Some of the studies focused on preventive measures[4], while others focused on data analysis to classify situations required to provide situation related information[1-3].

Phone call is one of major methods to report emergence situations. When a emergence report is received through a phone call, there is a phone call receiving system. The phone call receiving systems are required to assign the call of a caller to a receiver, provide telephonic communication and have the receiver respond to the event report. When a person calls to public safety agency phone number like 112 and 119, the phone call is connected to a receiver through the call receiving system. The receiver gets the report from the caller, write the summary of the report and create a directive information for dispatch agents. There are several studies which analyze the summarized incident reports written by the phone call receivers[2,3].

Fig.1 shows components of phone call receiving system like 112. When a phone call arrived to a receiver, the agent is connected to caller through receiving system. The agent can access various information related to the phone call during the receiving process. For example, the agent can access the history of phone call for the caller, other events around the event location and other internet web services like search, map, et cetera. Some of the information like phone call history may be provided by the receiving system automatically. The receiver decide whether is required dispatching forces to on-site based on the incident situation. Once, the dispatching forces to the event location is determined, directive information is written and delivered to the team to dispatch. The directive information may include a report summary, a caution information, location information and identification of dispatching team.

Fig. 1 Components of Receiving Report

While a receiver responds to a caller, the receiver may need some information related with the reported situation. When the receiver executes keyword searching for a situation, the receiver should provide input keyword. During the receiving process, it may be somewhat bothering to input search keyword for a receiver. If there is an assistant which analyze the incident reporting conversation and perform searching the related information for the report, it can reduce the burden of the receiver. Recently, the performance of Speech To Text(SST) function is good enough to be adopted in business area. It is possible to recognize the conversation between caller and receiver using SST technology. In section II, a design is described, which extends the underlying phone

call receiving system to provide the receiver assistant services. In section III, an implementation of the design is described.

II. CALL RECEIVING SYSTEM WITH ASSISTANT

To provide assistant service to phone call receiver, the underlying phone call receiving system can be constructed as shown in fig.2. The phone call receiver has conversation with caller via call receiving system during the call receiving process. After determining dispatch forces to on-site, the received incident report delivered to dispatched forces through the dispatch system. The dispatch system is operated to send forces to the incident location. The dispatched forces may be selected by dispatch system on the criteria of how much time required to arrive at an event location. The agent in charge of dispatching may not be the phone call receiving agent. In some application system, the roles of receiving phone call and dispatching forces are assigned to different posts of duty. In that case, after the receiving process is completed, the result of the receiving is passed to dispatch system.
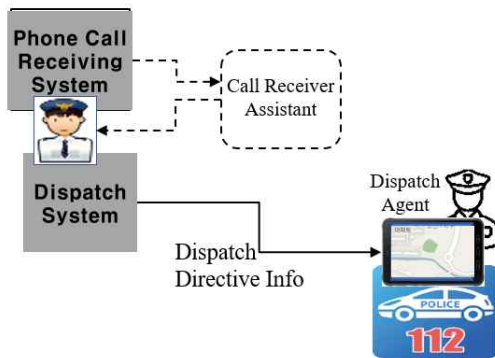

Fig. 2. Extended Components of Receiving Report

The assistant service can be provided for the receiving and the dispatching. While the phone call receiving agents can access the information required to respond to callers, the dispatching agents may access the information to send forces through assistant service. In the view of implementing assistant service, the system structure has no big difference between the receiving and the dispatching. So, the design for the receiving is described in this paper. For the assistant for the receiving, the underlying phone call receiving system can be modified as shown in fig.2. Phone call receiving system is connected to the assistant to input the incident reporting conversations. The assistant analyzes the input and sends the result of analysis to the receiver. The receiver takes steps required to receive the reports of caller referring the information provided by the assistant.

The functions required to implement assistant can be consisted as shown in fig. 3, which consisted of the parts depicted as dashed line and phone call receiving system in fig. 2. In the fig. 3, the call receiving system is consisted of phone and receiving call function in dashed line box. Out of the box, there are newly added functions. The new functions are consisted of 5 different types. Each of the functions are required to implement the dashed line components in fig.2. Following is the details of each type.

A. Speech Extractor and speech recognier

The speech extractor collects the speech data of reporting conversion, While a phone call receiver talks with a caller via telephone, audio data of conversation is generated. Speech extractor detects the data and extracts them for further analysis. Once, the audio data is extracted, the data are sent to speech recognizer. Speech recognizer takes audio data of speech and generates text for the data. Speech to text(STT) is the function of the speech recognizer. The generated text is sent back to speech extractor. Then speech extractor sends the text of speech to service gateway.
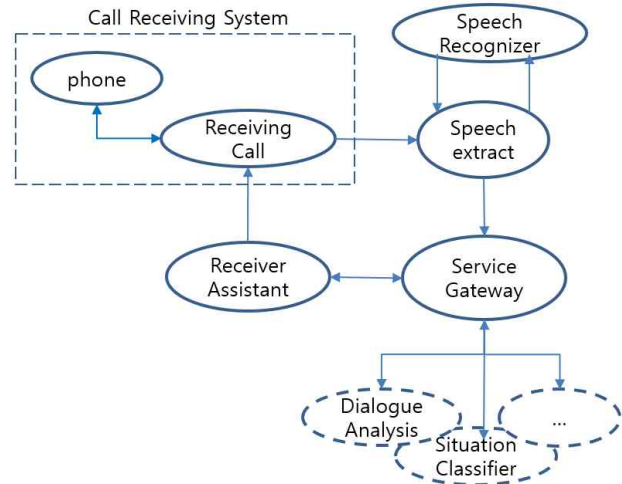

Fig. 3. Components providing Assistant Service

B. Service Gateway

Service gateway provides interfaces for two functions. One is for speech extractor, the other is the receiver assistant user interface. For speech extractor, the service gateway takes the text of speech as an input and calls various service subordinate functions for the input according to sequence of business logic. After all necessary steps are taken, the results of the sub-services are accumulated and then sent them to receiver assistant user interface. In addition to the service for speech extractor, the service gateway also takes requests from the receiver user interface. When the requests are received, the service gateway determines sub-functions which is required for the requests and calls the sub-functions. After getting results from the sub-functions, the results are sent back to the receiver user interface.

C. Sub functions of Service

Sub-functions are not shown out of service gateway. When an interface of the service gateway is called, the interface provides a service for caller using the sub-functions. Analyzing the text of STT to extract keywords and topics can be an example of sub-functions. Classifying situations of report to determine what measures should be taken is also another example. There can be various sub-functions to implement services provided by interfaces of the service gateway.

D. Receiver Assistant User Interface

The assistant user interface shows information gathered by the service gateway to phone call receivers. The receivers can access the information generated by reporting conversations. The receivers may interact with service gateway to get more information. The receiver assistant services are provided through the interface between the phone call receiver and service gateway.

III. IMPLEMENTATION OF THE DESIGN

To implement the design of section II, a phone call system is required in addition to the functions described previously. When there is no underlying phone call system, the calling and receiving system should be implemented newly. In the implementation here, A Private Branch Exchange (PBX) System called Asterisk developed by Sangoma Technologies is adopted. The PBX software is installed on a PC with i7 CPU and 32G memory in Linux environment. The phones which operate as terminals of a caller and a receiver should be registered in the PBX in advance.
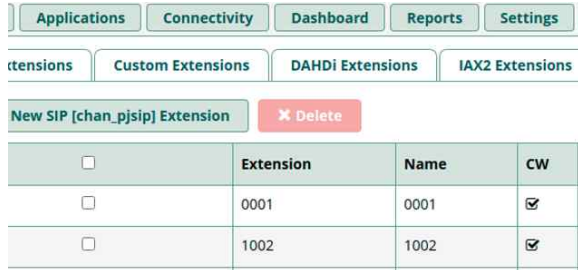

Fig. 4. An Example of registering SIP terminals

Fig. 4 shows that two phone identifications, 0001 and 1002, are registered in the administrator's GUI of Asterisk PBX. Fig. 5 shows phone 1002 is calling phone 0001. A Session Initiation Protocol (SIP) appl called Lip Phone is installed on Android based smart phones.
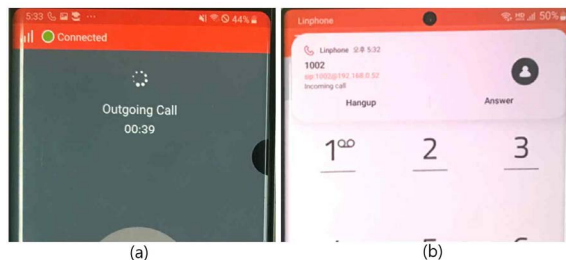

Fig. 5. An Example of calling and receiving

A. Speech extractor and Speech recognizer

The speech extractor is developed with Python 3, which is installed on the same PC as PBX. The extractor detects Real Time Protocol (RTP) packets on the ethernet interface of the PBX installed PC. Fig.6 (a) shows extracted audio data from the PBX, while (b) does the result of speech recognizer which is a 3rd party solution.
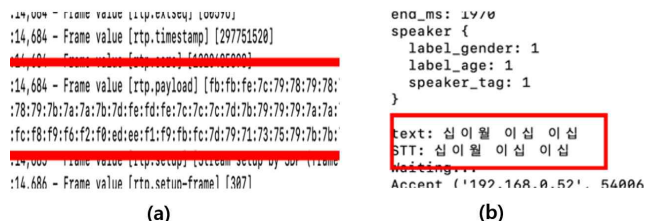

Fig. 6. Result of speech extraction and recognition

B. Service Gateway and Sub-functions

The service gateway is as a web APIs developed with Python 3 and Flask framework. It provides speech extractor a restful API to send text strings of STT. Two sub-functions consisted of analyzing text strings of conversation and classifying situations are also implemented with Python and Flask.

C. Receiver Assitant User Interface

The receiver can access the information from the assistant through the user interface. Fig. 7 shows an example of assistant user interface. The text of STT, situation classification, and related manual contents are provided. The UI is a web page implemented by Python and Flask.

Fig. 7. An Example of User Interface

IV. CONCLUSION

In the process of receiving incident reports, the receiving agents may want to access additional information for managing incoming reports. In this paper, a design is proposed, which can provide the additional information. In the design, 5 function blocks execute phone call data extracting, converting to text, and analyzing the text. Each of the 5 function blocks are implemented and described in section III. The implementation can work with commercial PBX system, while the implementation adopts Asterisk PBX.

The sub-functions of service gateway varies upon the final information arrived at the receiver. Since the final information is under defining and developing, the sub-functions may be added or modified in future. But the structure of 5 function blocks may not be subject to be modified.

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