Automated Customer Care Service System for Finance Companies

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Automated Customer Care Service System for Finance Companies

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In general, to obtain information about a product one should visit the company or contact the company via a phone call or some sort of a communication type, for example E-mail. Even so under normal circumstances the customer will receive the necessary information sent by a human being. There can be many disadvantages in this method. At the onset if a particular customer gives a phone call to the company the customer will have to wait for a considerable time. This is obvious because due to lack of human resources and phone lines there may be a question of customers waiting to get connected to the company line. On the other hand if a customer sends an email, the reply for the email will take time because the particular email should be perused by another human being at company in order to reply. These are few disadvantages apart from human errors that can happen. Ultimately as a result of above detrimental facts a faithful customer could get unsatisfied and lose confidence on a particular company. However, in the system that we are going to introduce, a particular customer can get any type of information in real time by the Aid of the Artificial Intelligence in the form of text/voice or E-mails. The advantages over the other method are that the customers will not have to wait for a reply, there are no space for human error and more importantly the company can use their human resources in other activities while the system takes care of the Customer care unit at least partially. Further, this system will be help to people who needs the immediate customer care assistance and will be able to get help by their own without involved human agent in another party for their assistance

Keywords- Natural Language Processing, Artificial Intelligence, Explicit Semantic Analysis, Sentiment Analysis, Automatic Speech Recognition, Spoken Language Understanding.

I. INTRODUCTION

This research project was implemented in order to overcome the difficulties faced by the companies and customers in their interactions. One of the specialties in our system with compared to the previous work that had been done in this area is that it can be localized to a particular company and it can answer specific questions in addition to the basic static questions. Moreover this new system will be capable of understanding and answering questions raised by customers who are poor in English.

A. Research Question

It has been identified that there exist several real world customer care process with various issues such as, how system can help customers quickly and save customers time and give better solution for their problems without having any human involvements; How to implement fully functional & quality customer care system for customer satisfaction; How implement an intelligent system to identify various user questions and work with poor English knowledge person.

II. LITERATURE REVIEW

As far as the current AI systems are concerned there aren't any systems which are specifically localized and in most cases these systems offer answers only to the basic static questions of the organization. NLF AI agent however will answer not only basic static questions but also handle the dynamic questions too as it is a specialized system on a particular organization. More over this system will engage with customers than that of current type of AI systems which are not specified for the particular company.

Artificial intelligence (AI) customer care agents are mainly based on two specific areas,

A. *Natural Language Processing (NLP).*
The Natural Language Processing is focused on developing efficient algorithms to process texts/voice and to make the information accessible to clients. Since text can contain

information at many different granularities, from simple word or token-based representations, to rich hierarchical syntactic representations, to high-level logical representations across document collections, it seeks to work at the right level of analysis for the application concerned [1].

B. *Artificial Intelligence (AI)*

Artificial Intelligence (AI) is the key technology in many of today's novel applications. In this system it is used to apply AI when NLP fails to get an answer from data bank. Also it is ranging from banking systems that detect attempted credit card fraud, to telephone systems that understand speech, to software systems that notice when you're having problems and offer appropriate advice [2].

The proposed AI agent combines the natural language, task planning and business ontologies in order to fulfil its tasks. The system plans the methods in order to find systematic solutions to a particular customer problem ensuring satisfactory in both sides the client and the company. In order to ensure that the necessary work has been done, our agents will converse with customers guaranteeing that the required information for either sides are acquired in order take a decision. As a whole our aim is to provide a better quality and a cost effective customer service and to improve business competitiveness.

One of the challenges inherent in natural language processing is teaching computers to understand the way humans learn and use language. Identify the exact meaning of the input with multiple meanings. In the course of human communication, the meaning of the sentence depends on both the context in which it was communicated and each person's understanding of the ambiguity in human languages. This sentence poses problems for software that must first be programmed to understand context and linguistic structures [3].

C. *Voice Recognition.*

If we consider a conversation done using a microphone the voice of the customer is not the only sound that is arising from the input. There are various types of noises which add from the input along with the voice. Thus the next challenge is distinguish the customer voice from other voices. Afterwards identifying the question, analysing the text/voice using natural language processing should be accomplished. Then the most suitable answer is selected by the aid of the base/data bank. This system will be able to identify and handle ambiguity questions, patterns of questions in different points of views, distinguish between same and different questions, relationships between questions and totally out of scope questions. After completed the system, it should able to identify any kind of a question from the customer and response it without having any mistakes.

Designing a machine that mimics human behaviour, particularly the capability of speaking naturally and responding properly to spoken language, has intrigued engineers and scientists for centuries. Since the 1930s, when Homer Dudley [4], [5] of Bell Laboratories proposed a system model for speech analysis and synthesis the problem of automatic speech recognition has been approached progressively, from a simple machine that responds to a small set of sounds to a sophisticated system that responds to fluently spoken natural language and takes into account the varying statistics of the language in which the speech is produced. Based on major advances in statistical modelling of speech in the 1980s, automatic speech recognition systems today find widespread application in tasks that require a human-machine interface, such as automatic call processing in query-based information systems that do things like provide updated travel information, stock price quotations, weather reports, etc. The field of AI was founded at a conference that took place in Dartmouth College, in 1956. The conference was held by John McCarthy, Marvin Minsky, Allen Newell and Herbert Simon together with their students; they held the conference with the aims of exhibiting how they used computers to solve classroom problems such as algebra. (Madureira & Reis, & Marques 2013, 17). After the conference, the government initiated research to find out new ways of solving problems and making decision -making a simpler task. In 1960, the defense department had conducted a lot of research in this field, and it had developed more methods of making decision making easier [6].

III. METHODOLOGY

This section represents the technologies and tools which are being researched in order to develop the Automated Customer Care system. This research will deal with natural language processing voice detection and analysing test. Studies on linguistics are important in identifying individual words in a customer's voice. Studies on phonetics of a language can also be made use of in this project. Literature survey will help to decide on the most suitable tools and software's that can be used at an optimized outcome. Some design decisions will consider few possible technologies which considering performance as a predominant fact and vice versa. All the references including references that are against the concepts of the project will be mentioned.

A. *Speech Recognition System*

The process of speech recognition system typically

consists of two phases:

    i. Training
    ii. Recognition

B. *The Speech Dialog Circle*

When consider the problem of communicating with a machine,

should consider the cycle of events that occurs between a spoken utterance (as part of a dialog between a person and a machine) and the response to that utterance from the machine. Figure 1 shows such a sequence of events, which is often referred to as the speech dialog circle, using an example in the communications context.

The customer initially makes a request by speaking an utterance that is sent to a machine, which attempts to recognize, on a word-by-word basis, the spoken speech. The process of recognizing the words in the speech is called automatic speech recognition (ASR) and its output is an orthographic representation of the recognized spoken input. The ASR process will be discussed in the next section. Next the spoken words are analysed by a spoken language understanding (SLU) module, which attempts to attribute meaning to the spoken words. The meaning that is attributed is in the context of the task being handled by the speech dialog system. (What is described here is traditionally referred to as a limited domain understanding system or application.)

Once meaning has been determined, the dialog management (DM) module examines the state of the dialog according to a prescribed operational workflow and determines the course of action that would be most appropriate to take. The action may be as simple as a request for further information or confirmation of an action that is taken. Thus if there were confusion as to how best to proceed, a text query would be generated by the spoken language generation module to hopefully clarify the meaning and help determine what to do next.

The query text is then sent to the final module, the text-to-speech synthesis (TTS) module, and then converted into intelligible and highly natural speech, which is sent to the customer who decides what to say next based on what action was taken, or based on previous dialogs with the machine.

All of the modules in the speech dialog circle can be 'data-driven' in both the learning and active use phases, as indicated by the central Data block in Figure 1. A typical task scenario, e.g., booking an airline reservation, requires navigating the speech dialog circle many times - each time. Being referred to as one 'turn'-to complete a transaction. (The average number of turns a machine takes to complete a prescribed task is a measure of the effectiveness of the machine in many applications.) Hopefully, each time through the dialog circle enables the customer to get closer to the desired action either via proper understanding of the spoken request or via a series of clarification steps. The desired action either via proper understanding of the spoken request or via a series of clarification steps. The speech dialog circle is a powerful concept in modern speech recognition and understanding systems, and is at the heart of most speech understanding systems that are in use today.
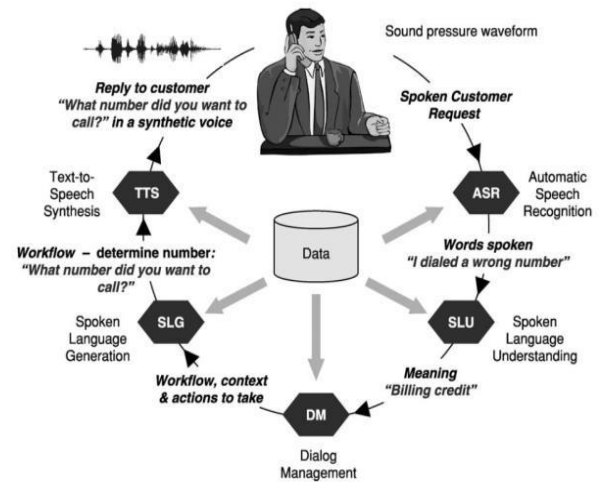

Figure 1: The conventional speech dialog circle

An alternative way to interact with a computer for a human is speech recognition when compared to conventional methods such as textual input through a keyboard. A finely planned system can possibly replace the usage of keyboards and mouse. This can especially assist the following:

i. People who have little keyboard skills or experience, who are slow typists, or do not have the time or resources to develop keyboard skills.
ii. Dyslexic people, or others who have problems with character or word use and manipulation in a textual form.
iii. People with physical disabilities that affect either data entry, or ability to read (and therefore check) what they have entered.

A speech recognition system consists of the following:
i. A microphone, for the person to speak into.
ii. Speech recognition software.
iii. A computer to take and interpret the speech.
iv. A good quality soundcard for input and/or output.

The speech recognition systems used in public services such as in phone-based automated timetable information or ticketing purchasing can be implemented directly without much adjustments. In contrast, systems used in computers are used to provide services for individual personals, for example personal word processing.

Word processing needs a sort of a training in order to use them where the individual trains the system to words or word fragments which is usually coined as "enrolment". At the very depth of this process lies the translation part. Most software's disintegrates spoken words in to phonemes that is into basic

sounds from which syllables and words are built up. Then these phonemes are perused in such a way that it tries to "fit" the processed phoneme string into an acceptable/standard phoneme string or structure that the software can find from a dictionary.

There is a common misunderstanding that such a system can be used in out of scope purposes. In this case the system has to be trained to recognize the distinctive features of the speaker such as speed, pitch and volume. Even after training the speaker's voice should be vivid in order to be recognized by the system and to translated at the end. In most cases speech recognition software's can be used only with a single computer, however it is possible to alternate a particular system to use in a network.
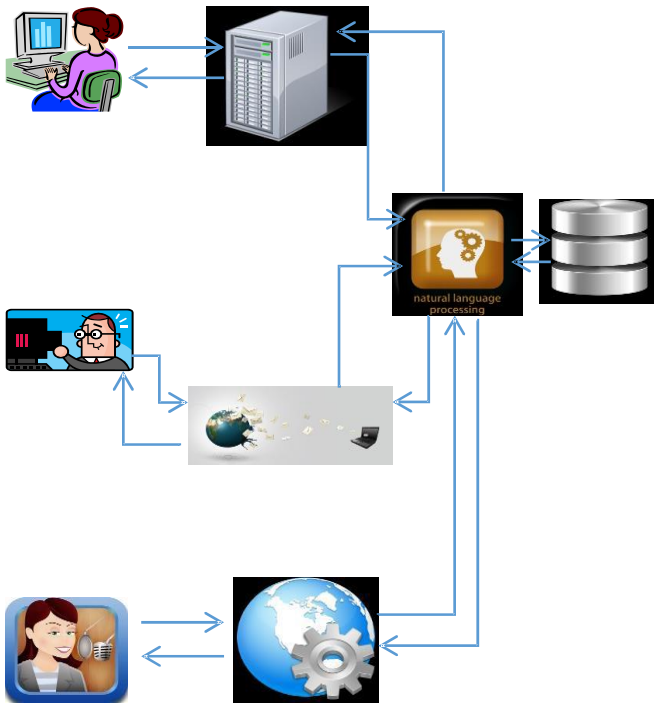
Figure 2: System Diagram

A.   Approaches To Speech Recognition

Basically there exist three approaches to speech recognition. They are,

i.   Acoustic Phonetic Approach

ii.   Pattern Recognition Approach

iii.   Artificial Intelligence Approach

Artificial Intelligence Approach (Knowledge Based Approach)
The Artificial Intelligence approach [7] is a hybrid of the acoustic phonetic approach and pattern recognition approach. In this, it exploits the ideas and concepts of

Acoustic phonetic and pattern recognition methods. Knowledge based approach uses the information regarding linguistic, phonetic and spectrogram. Some speech researchers developed recognition system that used acoustic phonetic knowledge to develop classification rules for speech sounds. While template basedIn this, it exploits the ideas and concepts of Acoustic phonetic and pattern recognition methods. Knowledge based approach uses the information regarding linguistic, phonetic and spectrogram. Some speech researchers developed recognition system that used acoustic phonetic knowledge to develop classification rules for speech sounds. While template based Approaches have been very effective in the design of a variety of speech recognition systems; they provided little insight about human speech processing, thereby making error analysis and knowledge-based system enhancement difficult. On the other hand, a large body of linguistic and phonetic literature provided insights and understanding to human speech processing. In its pure form, knowledge engineering design involves the direct and explicit incorporation of expert's speech knowledge into a recognition system.

This knowledge is usually derived from careful study of spectrograms and is incorporated using rules or procedures. Pure knowledge engineering was also motivated by the interest and research in expert systems. However, this approach had only limited success, largely due to the difficulty in quantifying expert knowledge. Another difficult problem is the integration of phonetics, phonotactics, lexical access, syntax, semantics and pragmatics. Alternatively, combining independent and asynchronous knowledge sources optimally remains an unsolved problem. In more indirect forms, knowledge has also been used to guide the design of the models and algorithms of other techniques such as template matching and stochastic modelling. This form of knowledge application makes an important distinction between knowledge and algorithms many levels of human knowledge Algorithms enable us to solve problems. Knowledge enable the algorithms to work better. This form of knowledge based system enhancement has contributed considerably to the design of all successful strategies reported. It plays an important role in the selection of a suitable input representation, the definition of units of speech, or the design of the recognition algorithm itself.

B.   Text analysing system
The study data for which this natural language processing/graph theory (NLP/GT) method was first used originated from a series of semi structured qualitative interviews on participants' experiences using distance education technologies for lifestyle modification/behaviour change. Five interviews were conducted generating over seven hours of recordings. The purpose of this is to document the qualitative analysis

process.

C. Sentiment analysis

This is a common text analysis task. The object is to categorize the overall attitude of a comment. In its most basic form, sentiment analysis categorizes comments as positive or negative. Simple text analytic techniques, such as counting positive and negative words, can give reasonable results in many cases. For example, "The hotel is in a great location with fantastic view of the city." has positive words "great" and "fantastic." Now consider a similar sentence: "Fantastic location and great view." The same positive words appear but the commentator is using sarcasm to make a negative point. Simple text analytic techniques may not catch this [8].

D. Explicit Semantic Analysis

What is the meaning of the word "cat"? One way to interpret the word "cat" is via an explicit dentition: a cat is a mammal with four legs, which belongs to the feline species, etc. Another way to interpret the meaning of "cat" is by the strength of its association with concepts that we know: "cat" relates strongly to the concepts "feline" and "pet", somewhat less strongly to the concepts "mouse" and "Tom & Jerry", etc.

Use this latter association-based method to assign semantic interpretation to words and text fragments. Assume the availability of a vector of basic concepts, $C_1,...,C_n$, and we represent each text fragment t by a vector of weights, $W_1,...,W_n$, where W_i represents the strength of association between t and C_i. Thus, the set of basic concepts can be viewed as a canonical n-dimensional semantic space, and the semantics of each text segment corresponds to a point in this space. We call this weighted vector the semantic interpretation vector of t [9].

IV. RESEARCH FINDING

When consider the core module of this whole system NLP Response Module (NLP Engine) and Data Bank Module act main role in this project. And also these are the main research component of this system. After that regarding to natural language processing module team members designed some NLP hash algorithm to automatically identify synonyms word/voice that comes from customer request. In this case overall natural language conceptual knowledge has been achieved by members of the team. As a 4 members research team we carried out this research during the past 8 months of this year. By in that experience we can able to do a real project as good team players with good confidence. As a result within few months, team members can achieve some planning, problem solving, implementation and project management ability.
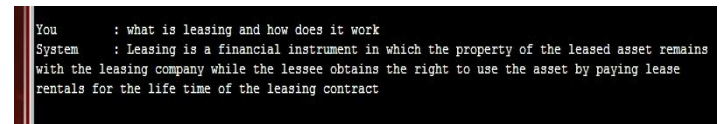
V. RESULT AND DISCUSSIONS

This Ai Agent Is Fully Functional For Text Messages, Emails and Voice
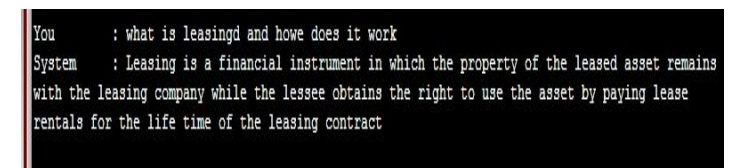
A. Chat Service

i. Greeting Messages
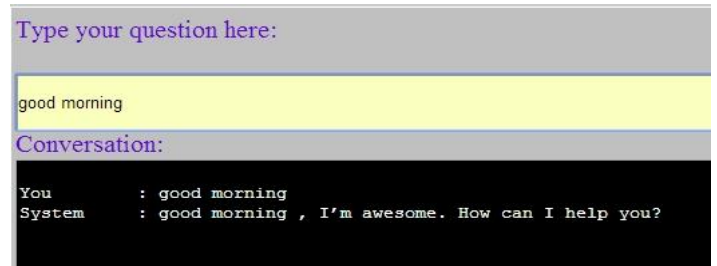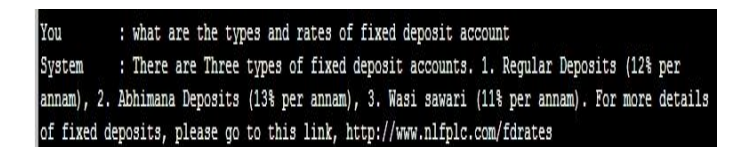

ii. When ask a direct question from the database


iii. When ask a spelling mistaken question
Even though spellings are mistaken system will automatically correct them using Microsoft spell checker application.

iv. When ask a question almost same as it is in the database

v. People ask same question in different ways. When ask the same question mentioned above in different manner, it checks with the database questions and find out what question gives the best match with provided question. Then further clarification system ask from customer "did you mean" this?
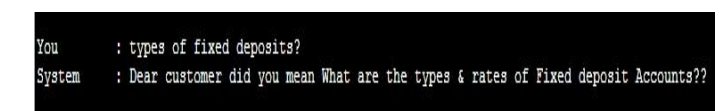
vi. If customer say "Yes", system gives the same answer

provided before, otherwise gives an error message.
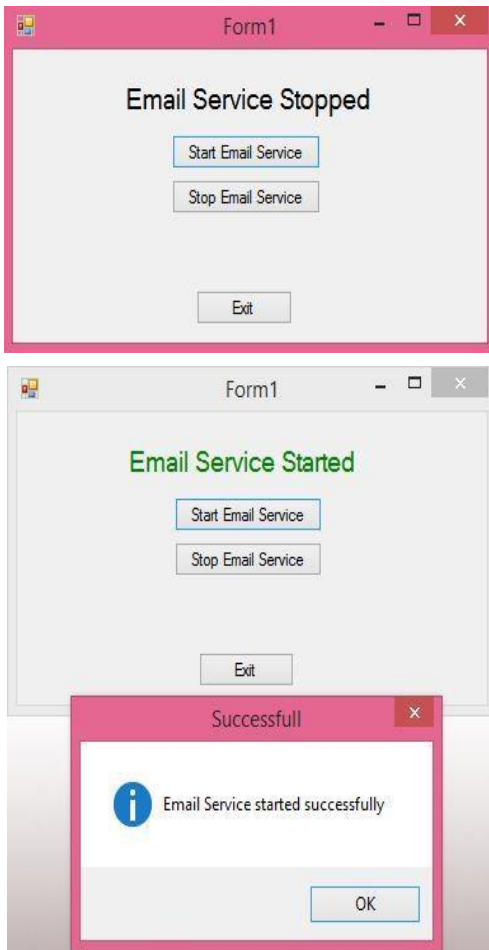

vii.   When ask a non-relevant question

B.   *E-mail Service*

Figure 3: E- Mail Service