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## Conversational Agents

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### Abstract

*This tutorial describes what conversational agents are, why they are needed and how they can be implemented by using agent technology.*

### 1. Introduction

Conversational agents are the agents, who have the properties of the agent, and they have the capability of communicating with other systems. They can either communicate with other agents or other software systems or in special case communicate with humans in a natural way.

As we see applicability of technology on our lives to make our jobs easier. The natural way in humans is to find information by communicating with other humans. As we become dependent on computer technology to find information for us and provide services to us, we are looking more towards technology to provide easier ways to us to interact with machines. Speech Act Theory is one such field where we can use our voice to issue commands.

*A conversational agent is a new technology whose purpose is to facilitate communication between people and technology and to assist people in what they need. To accomplish this they interact with humans in natural language. Conversational agents use conversation and in some cases movement and facial features. The advantage is that the person doesn't need to understand special computer commands in order to get help from machines. The agent will use the normal human communication input to understand the user request and process information as an output.*

### 2. Why use Agent technology?

The system needed for designing solution for this type of situation needs to be autonomous which can interpret and make its own decisions. It should be intelligent enough to search the knowledgebase in intelligent way and come up with a solution. It also needs to adapt to the new requirements for some particular type of information. These are all characteristics of agents and agent technology is a natural answer for finding solution for this kind of problem.

### 3. Conversational Agents

Conversational agent is the intelligent software system that emulates people to communicate information to a user in natural way [1]. There are different types of conversational agents based on the type of communication mechanism they use to interact with humans. They can use speech or text and also embodied agents use body movements and facial features to convey information to the user.

They use natural language and are usually limited to small domain of information. The use of natural language is a convenient way to give information from the agent..

#### **4. Analysis of Conversational Agents**

These types of agents have basic components that are needed for its operation.

These are [1]:

- We would need some kind of input mechanism for getting input from the user. The input can take various forms such as text entry, speech recognition. Text input is the most common and easy to understand and implement. On the other hand speech recognition is much harder to implement. Good speech recognition is customized to the user.
- The agent needs natural language parser, which can interpret either natural text input or speech. The parser turns user language into string format, which can be fed to the agent system for processing.
- We need knowledge based system that can interpret the user request and can provide some kind of relevant, useful information that can be output back to the user. Some of the common approaches to do this knowledge based processing are:
  - A common approach is to use string matching to analyze the user input. The agent finds common strings and words from the data dictionary matching those that are input from the user. Popular example is the help menu that is part of the various professional software, which provides software related help based on user's text input.
  - Case Based Reasoning ( CBR) This is another important approach for knowledge management. It is specifically applicable in the electronic commerce as a way to provide useful information to the clients looking for that type of information. In this approach the agent retrieves and adapts a previous solution and applies it to the problem. If there is no previous case then the problem of responding to the user input is done with rule-based decision making. When the answer has been given, the response is stored in the database. If the response is positive from the user's perspective then, it is stored as a successful. If the response was not satisfactory, then it is stored as a failure. A common applicability in an e-commerce application is in web-based shop where customer is provided with all related useful information that he may be interested in purchasing.
  - Ripple Down Rules (RDR) is another approach that generates responses. This is a mechanism for incrementally enhancing the scripts of conversational agents. The user can correct or change any responses from the agent over time. The RDR system records these changes as exceptions to for the particular user.
  - Batch Learning by Induction over examples is another approach where logs of human interactions are stored and common patterns in those interactions are sought. These patterns are used to construct a set of rules or decision tree for generating responses to the user. Eventually these rules will describe the user-preferred behavior of the system.
- The last component is the output of the system where the output is translated back into the information understood by the user.

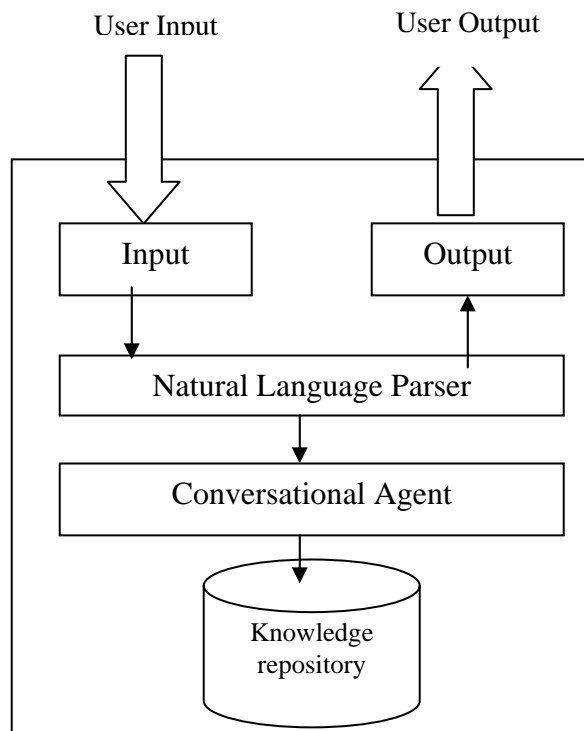


Fig 1 Conversational agent constituents

## 5. Implementation of Conversational agent by using Agent based technology

The reason to choose Agent technology is because conversational system needs to be autonomous, intelligent and learner and good adaptor. In addition to that it should be able to find services of other existing agents and communicate with them to find out useful information for the client.

The basic elements of the entire system would be all the components described earlier and some kind of communication protocol and a user interface with the client. In case of an Internet application it can use SOAP protocol over TCP/IP as a communication protocol.

The domain of the conversation agent could be limited to only specific type of information, in that case it can store it locally in the knowledge repository. If the conversation agent has the requirement for providing wider domain information in that case it will interact with multi agent systems to get their services.

In this case, we would also need a facilitator agent, which can help locate domain specific agents to get their services to the conversation agent. The conversation agent would look in its own local repository to find its own domain specific information. If it cannot find information locally, it will do a lookup in the facilitator agent to see if other agents offer that type of service. It will communicate with that client to find the necessary information. The conversation agent is common to various front end user clients. It could be a speech input system or a text input or even it can be embodied agent.

## 6. Technology

*Open agent architecture* (OAA) can be used for this type of application. In place of *Natural language parser*, *NL* (natural language) to *ICL* (inter agent communication language) Agent can be used for interpreting natural language from user. This agent can then communicate with conversational agent in inter agent communication language such as *KQML* by using *KIF* as interchange format.

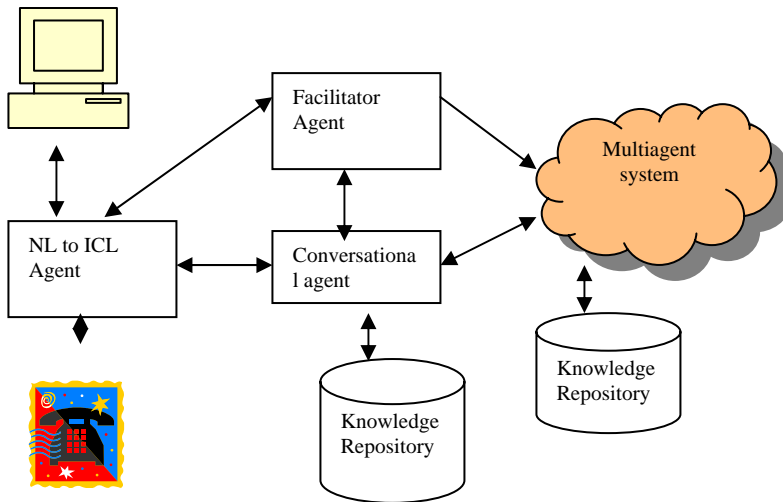


Fig 2 Conversational agent Design

## 7. Conclusion

Conversational agents are extension of agent-based technology for human computer interaction technology. Conversational agents are important type of agents, which can find wide usefulness in human-computer interaction applications. As the speech parsing technology makes more reliable, this type of technology will find more applicability. Possible uses of conversational agents are in e-commerce applications, replacing the touch tone phone automated services with voice recognition service agents, Tutoring people on any kind of computer application use, automatically answering frequently asked questions.

## 4. References

1. Tutorial on conversational agents, Steve Daeninck, Course SENG 609.22, 2002
2. Agents on the web, Conversational Agents, Michael N. Huhns, Munindar P. Singh, , *IEEE Internet Computing*, volume 1, number 2, March/April 1997, pages 73-75.