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An Intelligent Behaviour Shown by Chatbot System

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Abstract— **Chatbots are software agents used to interact between a computer and a human in natural language. Just as people use language for human communication, chatbots use natural language to communicate with human users. The main aim of their creation was to resemble a human being in the way they perform said interaction, trying to make user think that they are writing to a human. In this paper, we analyse some existing chatbot systems namely ELIZA and ALICE and then concludes that it is easier to build bots using ALICE because of its simple pattern matching techniques that building one for ELIZA since it is based on rules. Finally, we discuss our proposed system. In particular, the proposed system is the implementation of ALICE chatbot system as a domain specific chatterbox which is a student information system that helps users in various queries related to students and universities.**

Index Terms— **AIML, artificial intelligence, chatbot, natural language processing, Turing Test.**

I. INTRODUCTION

A chatterbot is a computer program which conducts a conversation via auditory or textual methods. Such programs are often created to convincingly simulate how a human would behave as a conversational partner, thereby passing the Turing test. Chatbots are mainly used in dialog systems for various practical purposes including customer services or information acquisition. There are two main types of chatbots available, one whose functions are based on a set of rules and other is the more advanced version which uses artificial intelligence. The former one tends to be limited and their smartness depends upon the complexity of the program. The more complex the program is, the more is the smartness of the bot. The one that uses artificial intelligence, understands language, not just commands, and continuously gets smarter as it learns from the conversation with the people. A chatbot can also perform some basic functions like calculations, setting-up remainders, alarms etc. A popular example is ALICE Bot (Artificial Linguistic Internet Computer Entity), that uses AIML(Artificial Intelligence Mark-Up Language) pattern matching techniques. Turing Test is the one of the most popular measures of intelligence of such systems. This test was proposed by British mathematician Alan Turing in his 1950 paper titled "Computing Machinery and Intelligence" published in Mind. According to this test, when a panel of human beings is conversing with an unknown entity believes that entity is human while it was a computer, then the computer is said to have passed the turing test. A natural language processing (NLP) gives capability of computer allows communication to happen between user-to-computer or human-to-machine and computer-to-computer or machine-to-machine using human natural language.

In our project we are using AIML, which is an XML based language and can be used for interaction between chatbots and humans. The basic unit in AIML is category whose attributes are pattern and template. We tried to implement a domain specific knowledge system to deliver answer to frequently asked questions in University environment.

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II. EXISTING SYSTEMS

We will discuss about two main chatbot systems available with their applications. We begin by discussing the ELIZA chatbot system followed by other system called ALICE.

A. *ELIZA*

The german computer scientist, Joseph Weizenbaum developed the program ELIZA in 1966, which seemed to be able to fool users into believing that they were conversing with a real human. It is considered as the first chatterbot in the computer history. It behaves like a therapist by rephrasing the statements of user and posing them back as questions. It is a natural language processing computer program created from 1964 to 1966 at the MIT Artificial Intelligence Laboratory. It was created to demonstrate the superficiality of communication between man and machine. Eliza simulated conversation by using a 'pattern matching' and substitution methodology that gave users an illusion of understanding on the part of the program, but had no built in framework for contextualizing events. Directives on how to interact were provided by 'scripts', written originally in MAD-Slip, which allowed ELIZA to process user inputs and engage in discourse following the rules and directions of the script. The most famous script, DOCTOR, simulated a Rogerian psychotherapist and used rules, dictated in the script, to respond with non-directional questions to user inputs. As such, ELIZA was one of the first chatterbots, but was also regarded as one of the first programs capable of passing the Turing Test.

ELIZA's creator, Weizenbaum regarded the program as a method to show the superficiality of communication between man and machine, but was surprised by the number of individuals who attributed human-like feelings to the computer program, including Weizenbaum's secretary. Many academics believed that the program would be able to positively influence the lives of many people, particularly those suffering from psychological issues and that it could aid doctors working on such patients' treatment. While ELIZA was capable of engaging in discourse, ELIZA could not converse with true understanding. However, many early users were convinced of ELIZA's intelligence and understanding, despite Weizenbaum's insistence to the contrary.

B. *ALICE*

ALICE(Artificial Linguistic Internet Computer Entity) is an award winning open source natural language artificial intelligence chat robot which uses AIML(Artificial Intelligence Mark-Up Language) to form responses to queries. It is inspired by ELIZA and an open source chatbot developed by Dr. Wallace, which is based on natural language understanding and pattern matching. It has won Loebner prize three times. It generates responses to the user's query by applying some pattern matching rules. However, it is unable to pass the Turing test, as even the casual user will often expose its flaws in short conversations. The architecture of chatbot consists of two clearly separated parts namely- "chatbot engine" and "language model" which gives us the opportunity to easily implement a chatbot in a newly developed knowledge model. Language model is stored in AIML files. The primary design feature of AIML is minimalism and from all the chat robot languages, AIML is perhaps the simplest. As discussed earlier, the basic unit of knowledge in AIML is category. Each category consists of an input or question, an output or an answer and an optional context. The question is called the pattern. The answer or response is the template. The two types of optional context are called "that" and "topic". The pattern matching is very simple while working with AIML as it consists only words, spaces and wildcard symbols _ and *.

III. WHY ALICE IS BETTER

- ALICE used a simple pattern matching algorithm and a simple pattern template to represent input or output.
- The recursive techniques used in ALICE is considered as the main key point of the system. It is used for simplifying the input.
- In ALICE there is the capability to combine two answers in the case of splitting happened within Normalisation process.
- The most important in ALICE is the pattern matching algorithms, which is easy and depend on depth first search.
- It also has srai tags, which can be used for reducing the pattern and templates.

IV. PROPOSED SYSTEM

We propose a system which will work as an application and give users information about different kinds of university related queries. This application will work using a pattern matching algorithm using depth first search (DFS). In this project, our responsibilities included reading the user inputs and then respond to the query, while trying to keep the conversation related to University environment. The first step in developing the FAQ bot consisted of extensive brainstorming and writing down as many questions as possible. This assisted in allowing FAQ bot to intelligently match pattern (inputs). For doing that we created new AIML files and coupled it with the conversational knowledge base of ALICE bot.

This is the ALICE system architecture:-

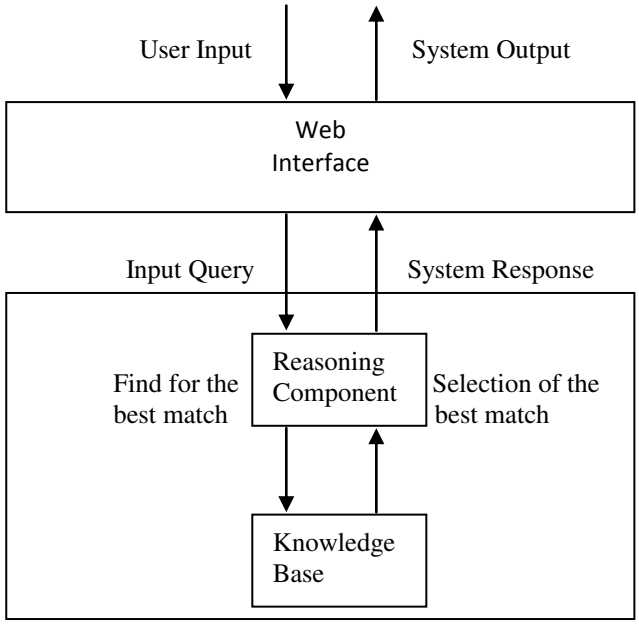

Figure no. 1

Each AIML file start with an <aiml> tag that represents the AIML version being used, and it contains the AIML elements which consists of data objects called AIML objects. These objects are made up of units called topics and categories. The topic is an optional top level element, has a name attribute and a set of categories related to that topic. Each category contains a pattern which represents the user input and a template implies FAQ bot response.

Example from AdmissionInfo.aiml

< aiml version="1.0" >
< topic name= " admission info" >

<category>
<pattern>
What is the admission requirements for University undergraduate programs
</pattern>
<template>
Minimum CET Score should be above cut off.
Minimum percentage requirement in 10^{th} and 12^{th}.
</template>
</category>
..
..
</topic>
</aiml>

The knowledge base will be fed as a set of prior information about university related questions using AIML. In the response generation module, the pattern matching algorithm uses DFS to match a query and it continues till a match is found. The interpreter processes the template that belongs to that particular category and generates the output. System prompts the user to ask if he has another query. If the user has another query, the system will repeat the entire process again otherwise the system will terminate processing.

V. CONCLUSION

To summarize, we have learned about all the existing systems which included ELIZA and ALICE. We found out ways in which these systems can influence our system. ELIZA helped us understand how reframing the questions will make the conversations more human-like. ALICE helped us understand how we can make use of AIML in our system. In this system, the user will be prompted to ask a query which is related to university. The user will write out his query on the platform provided. A range of university/institute related questions and their responses will be coded into AIML and stored into the database. When the user will ask a query, this query will be matched against the various patterns present in the database and the template corresponding to that pattern will be returned in form of text to the user. The addition of this chatbot in the currently available system will make the system more user interactive as it respond to the query entered by user very accurately and precisely because it is a domain specific chatbot system.

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