

**DEVELOPING A VIRTUAL TECHNICAL SUPPORT AGENT FOR THE
OPEN-OFFICE WRITER**

**An Independent Research Presented to
The Faculty of the Computer Studies Division
Ateneo De Davao University**

**In Partial Fulfillment
Of the Requirements for the Degree
Bachelor of Science in Information Technology**

BY

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MARCH 2007

Abstract

Artificial Intelligence has been a subject of debate for decades. “Can computers think?” is the question that is often asked. It is not yet certain if it is possible to develop a system that can truly “think” but the proposed study seeks to develop a system that can truly “talk”. In addition, the study seeks to use the natural language processing capabilities of an AI chatter bot to render technical support. With the advancement of voiceXML and by incorporating the AI engine Program E used by the existing bot Alice, developing a Virtual Call Agent for technical support can be made possible.

Keywords:

ALICE, Natural Language Processing, Chatter Bot, Artificial Intelligence

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Chapter I

INTRODUCTION

1.1 Background of the Study

In the past few years, Artificial Intelligence has been a subject of research and study. The number of artificial intelligence projects has significantly escalated. However, only a few have made it to the spotlight, much less the software market. In the late 1960s, Joseph Weizenbaum created Eliza, one of the first programs that attempted to communicate in natural language. Today, similar programs proliferate in the World Wide Web. They are now referred to as chatter bots or Intelligent Agents.

The proponents have come across an open source project called Artificial Linguistic Internet Computer Entity (henceforth referred to as ALICE) whereby the proponents have developed special interest upon. ALICE is an artificial intelligence chatter bot, developed by Dr. Richard S. Wallace with the help of the Alicebot free software community. ALICE is designed to communicate to users using natural language processing. It is programmable, utilizing a mark-up language called AIML or Artificial Intelligence Mark-up Language based on the specifications of XML.

Among the numerous chatter bots, ALICE is the one that caught the proponents' attention. What makes ALICE unique from the other bots is the robustness of the AIML engine from which it was built upon. AIML describes a class of data objects called AIML objects and partially describes the behavior of computer programs that process them. AIML objects are made up of units called topics and categories, which contain either, parsed or unparsed data. Put simply, AIML allow users to customize ALICE and even create their own chatter bot.

ALICE or similar bots have been used in several websites for entertainment purposes and even for FAQs. However, the proponents find it a waste for a truly advanced chatter bot such as ALICE to be used for such primal tasks. Thus, the proponents have decided to propose a study that introduces chatter bots in the call center scene, particularly the technical support domain. Given some customizations to the AIML engine, specifically Program E, developed by Paul Rydell, and added the outstanding text-to-speech (henceforth referred to as TTS) and speech-to-text (henceforth referred to as STT) capabilities of Voxeo Prophecy Voice Platform, a virtual call agent inspired by ALICE shall then be able to accomplish the common tasks of a human technical support call agent.

1.2 Technology Application Context

The following are the technological issues, problems undergone by call centers in offering technical support and several limitations of ALICE:

- Chatter bots like ALICE are developed by a community of AI researchers and programmers alike. However its full potential as an AI entity has not been realized. Practical use for AI agents has not been found as of the moment.
- VoiceXML is an emerging technology. Several call centers use this technology solely for IVR systems. Some call centers even develop rudimentary VoiceXML applications to accommodate callers; relay simple messages using TTS and speech recognition then route calls to designate call agents when necessary. However, the idea of combining VoiceXML and artificial intelligence has not been conceived.
- VoiceXML requires a grammar which is a set of anticipated user utterance from which the semantic interpretation would be derived. The grammar however is generally static. Hence, it should be pre-programmed. Uncommon terms such as names are therefore impossible to interpret.
- Call centers have been known to offer jobs to the large unemployed populace. However only a small percentage of the applicants make it to the workplace. And a large percentage of the hired call agents leave the call center after the termination of the six month contract. Therefore, there is a shortage of call center agents.
- The original developer of the PHP implementation of the Program E AIML engine cannot be reached and e-mail addresses posted in Sourceforge.net are

outdated. The original website of the Program E project has been left idle since 2001.

- Program E, the PHP implementation of the AIML engine used to run ALICE is underdeveloped and it has a few unresolved bugs. Program E has been uploaded to Sourceforge.net whereby a lot of programmers can download it and update it. However, the version tracker shows that it has not been updated since 2001. Program E has been left idle for several years and it never reached version 1. The following are the specific issues that needs to be resolved:
 - a) The `<that/>` tag cannot be handled correctly by Program E. Garbage text is attached with the legitimate response.
 - b) An AIML file may grow significantly in size. This implies that an AIML file may take up much disk space even for a rudimentary bot.
 - c) The Program E engine can only accept text inputs and respond by outputting text as well.
 - d) Generating unique responses to user input is simply out of the scope of the Program E AIML engine. It is an important feature that the proposed virtual call agent should have for the purpose of rephrasing responses in case the caller cannot understand the uttered response.
 - e) Other AIML engines support JavaScript content. However, Program E does not. Therefore bots built from this engine won't be able to retrieve definitions for uncommon terms which are stored in a database.

1.3 Objective of the Study

Generally, this study seeks to develop a virtual call agent that can engage in a seamless technical discussion with a human caller via a regular phone line or via VOIP software. Specifically, this study aims to address the following issues:

1. To develop an AI entity that can carry out a real-world task such as rendering technical support for the Open Office Writer. As well as to test its effectiveness and usability so that its full potential can be realized.
2. To develop a system that makes use of the emerging technology called VoiceXML. Incorporating VoiceXML with artificial intelligence in building a virtual call agent for technical support, enabling it to generate intelligent responses to complex caller voice input.
3. To develop dynamic grammar using PHP and GRXML to be integrated with VoiceXML to handle complex caller voice input. A dictionary would be created where uncommon terms and their corresponding definitions would be stored.
4. To develop a virtual agent that can communicate with callers who are in need of technical support. Providing an alternative to call centers for human call agents as well as for companies that cannot afford to outsource to call centers or hire call agents to render technical support to their customers.
5. To do modifications to the Program E AIML engine as necessary.
6. To update the Program E engine, resolving the issues cited in the technology application context section. Specifically, the study seeks to do the following improvements to the Program E engine:

- a. Symbolic reduction is achieved by combining GRXML and AIML. Therefore complex sentences or user voice input is reduced to simple statements before it is passed to the AIML engine. Through symbolic reductionism, the length of the AIML file is reduced significantly.
- b. A VoiceXML application will be developed which will handle the caller voice input, convert it to text which will then be passed to the Program E AIML engine. The text response from Program E would then be converted to speech by the VoiceXML voice engine.
- c. Custom AIML tags will be added to Program E to handle repeated user statements. This would also enable the proposed virtual call agent to repeat its previous responses, as well as rephrase it whenever necessary. This would also give the virtual call agent the ability to redirect the call to a human call agent if the caller becomes impatient.
- d. Program E does not support JavaScript or PHP however, Program E supports custom tags. Hence, a custom tag to retrieve definitions of uncommon terms from a database will be created.

1.4 Significance of the Study

Since artificial intelligence is still an emerging technology, companies hesitate to invest in technologies that involve this. Specifically, AI entities are frequently not taken seriously. They are seen merely as hi-tech toys that cannot be entrusted with complex, real-world tasks. Hence, this study aims to test the effectiveness and usability of AI bots in carrying out real-world tasks, particularly in the call center scene. Given that this study is successful, it shall also encourage more application developers to employ AI and intelligent agents in their applications. Furthermore, it would encourage VoiceXML application developers to incorporate AI in their applications, converting their “voice applications” to “intelligent applications”.

Call centers may be the primary beneficiary of this study. This study would test the usability of virtual call agents in the call center industry. Not only allowing their company expenditure decrease considerably but to partly answer their call agent shortage problem as well.

1.5 Scope and Limitation of the Study

The proposed project seeks to develop a virtual technical support call agent for the Open-Office Word processor based on the open-source project Program E without the need for special hardware. The technical support knowledge-base of the proposed bot shall only involve basic operations within the Open-Office Writer (e.g. printing, installation, page setup, etc.). Complex problems shall then be handled or referred to a human operator.

Take into consideration that the proposed system may serve as an alternative to a call agent; however it is not intended to replace the human call agent. There may still be circumstances whereby talking to a human call agent is still more convenient.

The proposed system would not cover the details of call routing which is typically done by IVR systems. In addition, the proposed system would only cater two callers at a time. Call routing, multiple caller accommodation and other complex call center processes are therefore outside the scope of this study.

Since the open-source Program E project has specifications that should strictly be followed by programmers who wish to help in the development of the bot, the proponents have decided not to adhere with these specifications. The proponents would be basing the system on ALICE however major customizations will be done and a new name for the intelligent agent should be assumed during and after the implementation phase of this study.

The proposed system is not intended to be perfect. The system will be fully functional however this does not imply that it can be readily used in a call center. At the end of this study, there may still be flaws and some features that need to be added to the system. Nevertheless, flaws that are currently present in third party projects such as Program E or

Voxeo's Prophecy Voice Platform other than those specified in the technology application context section of this paper shall be outside the scope of this study.

1.6 Definition of Terms

1. **Artificial Intelligence (A.I.)** - broadly defined, is concerned with intelligent behavior in artifacts. Intelligent behavior, in turn, involves perception, reasoning, learning, communicating and acting in complex environments. AI has as one of its long-term goals the development of machines that can do these things as well as humans can, or possible even better.
2. **BOT** - an artificial intelligence usually found masquerading as a human user, carrying out repetitive or tedious tasks like responding to email (presumably an abbreviation for robot).
3. **A.I.M.L.** - AIML or Artificial Intelligence Mark-up Language enables people to input knowledge into chat-bots based on the A.L.I.C.E free software technology.
 - a. AIML was developed by the Alicebot free software community and I during 1995-2000. It was originally adapted from a non-XML grammar also called AIML, and formed the basis for the first Alicebot, ALICE, the Artificial Linguistic Internet Computer Entity.
 - b. AIML describes a class of data objects called AIML objects and partially describes the behavior of computer programs that process them. AIML objects are made up of units called topics and categories, which contain either, parsed or unparsed data.

4. **A.I.M.L. Engine/Interpreter** - An AIML engine is a program written in a specific programming language that can interpret AIML files.
5. **Intelligent Agent** - In computer science, an intelligent agent (IA) is a software agent that exhibits some form of artificial intelligence that assists the user and will act on their behalf, in performing repetitive computer-related tasks. While the working of software agents used for operator assistance or data mining (sometimes referred to as bots) is often based on fixed pre-programmed rules, "intelligent" here implies the ability to adapt and learn.
6. **Natural Language Processing** - is a subfield of artificial intelligence and linguistics. It studies the problems of automated generation and understanding of natural human languages. Natural language generation systems convert information from computer databases into normal-sounding human language, and natural language understanding systems convert samples of human language into more formal representations that are easier for computer programs to manipulate.
7. **Virtual Agent** – In customer relationship management (CRM), a virtual agent (sometimes called an intelligent virtual agent, virtual rep or v-rep) is a chatter bot program that serves as an online customer service representative for an organization. Because virtual agents have a human appearance and respond appropriately to customer questions, they lend automated interactions a semblance of personal service.
8. **VoiceXML** – VoiceXML (VXML) is the W3C's standard XML format for specifying interactive voice dialogues between a human and a computer.
9. **GRXML** - Is the acronym for Grammar XML. GRXML provides a standard language for representing speech grammars used by speech recognition engines.

Grammars tell the speech recognizer what words to listen for and in what order they may appear.

10. **XML** - The Extensible Markup Language (XML) is a W3C-recommended general-purpose markup language for creating special-purpose markup languages, capable of describing many different kinds of data. In other words, XML is a way of describing data.
11. **XML-Compliant** – Markup languages that follow the XML specifications.
12. **Platform** – In computing, a platform describes some sort of framework, either in hardware or software, which allows software to run. Typical platforms include a computer's architecture, operating system, or programming languages and their runtime libraries.
13. **Category** - Is the basic unit of knowledge contained in an AIML file. It contains a pattern and a template.
14. **Pattern** – In A.I.M.L., it's the assumed user input anticipated by the bot. Aka Stimulus.
15. **Template** – In A.I.M.L., it's the possible responses programmed within the A.I.M.L. file. Aka Response.
16. **JavaScript** - JavaScript is a script language - a system of programming codes, created by Netscape, that can be embedded into the HTML of a web page to add functionality. JavaScript should not be confused with the Java programming language. In general, script languages such as JavaScript are easier and faster to code than more structured languages such as Java and C++.

17. **PHP** – PHP (PHP: Hypertext Preprocessor) is an open source, reflective programming language. Originally designed as a high level scripting language for producing dynamic Web pages, PHP is used mainly in server-side application software but can be executed from a command line interface or a stand alone GUI. It is the fifth most popular programming language in use today.
18. **Symbolic Reduction(ism)** – Symbolic reduction refers to the process of simplifying complex grammatical forms into simpler ones.
19. **Semantic Interpretation** - Semantic interpretation can be viewed as the task of translating a natural language into a formal meaning representation language.
20. **Grammar** - Is a set of predefined words and phrases used by the voice browser in deriving the semantic interpretation for the user utterance.
21. **Graph** - In computer science, a graph is a kind of data structure, specifically an abstract data type (ADT), that consists of a set of nodes and a set of edges that establish relationships (connections) between the nodes. The graph ADT follows directly from the graph concept from mathematics.