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FEATURES AND PROBLEMS OF VIRTUAL COMMUNICATION BY MEANS OF CHATBOTS

The paper analyzes peculiarities of simulating human speech behavior during communication process, develops a communication model, determines main functions and principles of a chatbot operation and illustrates the use of a chatbot.

Keywords: artificial intelligence, virtual companion, chatbot.

Introduction

The issues of application of virtual communication systems, based on artificial intelligence, have been studied for many years. Virtual communication is a problem of current importance due to quick access to information, the ability of concurrent operation in a multi-user system, of information exchange, interaction in order to solve any problems, learning support, communication with customers and business partners, conducting analytical studies, collection of the necessary information, improvement of professional skills and other advantages.

The main issues in creating communication systems is development of a communication model, a model of a participant in communication, development of means, first of all semantic and pragmatic ones, for the environment description (a language model, a user model, environment model, a communication system model). Therefore, in order to solve these problems, it is necessary to determine operation principles, peculiarities of simulating human speech behavior in communication process, to develop a communication model, to write a chatbot program.

Among the virtual companion software there are programs created on the basis of artificial intelligence. For development of such programs it is necessary to have knowledge of psychology as well as of principles of building human speech phrases. Moreover, if language restrictions and subject area are correctly identified, the existing methods could be used to obtain systems suitable for communication. In terms of the theory of language and communication it is necessary to develop semantic description of the structures of texts and sentences. In terms of the environment model the main limitation is absence of means for representing a dynamically changing world. This is connected with the problem of a statement system perception and with training the system.

The paper aims at analyzing the peculiarities of human speech behavior during communication process and chatbot writing.

Main functions of a chatbot and its operation principle

Bot is a computer program used to input-output messages and to perform various functions. Bots perform the following basic functions: service, informational and entertainment and utility functions [1]. Let us consider them in detail. Service functions of bots include running logs of the chat, observing rights of the participants, ensuring security measures, providing the possibility of the conference with more than two participants if there is no such a function in the protocol. Informational and entertainment functions, provided by bot, could be reference, dictionaries, virtual companions, games. Bot also uses utilities, e.g. a calculator, a commentator, search.

Support of bots is implemented by the protocol of a respective chat. Bots are developed for IRC protocols, instant messaging service and other chats. IRC (Internet Relay Chat) is an application-level protocol for real-time messaging. Instant messaging system (IM) is a real-time instant messaging service via Internet (IMS). Online consultant programs (OnlineSaler) and client programs (Instant Messenger, IM). Client programs could be used in order to organize textual group chats or videoconferences, to provide textual and voice messaging, to exchange images, video, to provide various activities such as cooperative games or painting.

Chatbot operation principle consists in realization of the following steps: the bot receives incoming messages, analyzes them and sends the results and/or executes a command [1].

Thus, chatbot communication is realized by inputting messages and outputting the response (opinion) of the interlocutor. There could be two variants of carrying on a talk – ordinary conversation or discussion of an

important issue. However, unlike human conversations, the program does not possess a flexible intellect. So, most virtual companions are programmed to conduct a simple conversation. Such programs belong to the class of programs with a natural-language interface [1]. Processing of a human natural language, especially of a conversational style, is an artificial intelligence-related problem. The problem of creating chatterbots based on artificial intelligence, which could simulate human intellectual activity, remains open today.

Unfortunately, modern virtual companions provide only a partial solution of the problem of simulating human conversation. The knowledgebase forms a basis of their operation. In the simplest case it contains sets of possible questions of a user and corresponding answers to them. The most common methods for choosing answers are in this case as follows: responding to the keywords (e.g. if the user's phrase contained words "apple", "plum", "berry", the program could respond with "Do you like fruit?"); coincidence of the user's phrase with that included into the knowledge base. The program could also take into account the word order (e.g. if the user's question is "Which fruit contain more vitamin C?" the program's answer might be "Citrus fruit"). Chatterbots cannot use phrases saturated with pronouns, e.g. "To what extent is it yours?". In such cases programs analyze preceding phrases of a user and choose the most appropriate answer. Selection of synonymic words could also be a problem.

For today a large number of bots have been developed. The most wide-spread among them are the following: A.L.I.C.E., ChatMaster, Electronic Brain, ELIZA, George, NAI, SkypeTalk and others.

British computer program George has won a Loebner Prize – an annual chatbot competition for the best match of human language.

SkypeTalk conducts a dialog in Ukrainian. The capabilities and knowledge could be expanded since the basic component, brain, is written in AIML language, which enables flexible rewriting of the bot according to one's needs and updating the base. AIML – Artificial Intelligence Markup Language, a subset (a dialect) of XML, is designed for the creation of chatterbots. AIML version, used in A.L.I.C.E., is distributed under GNU GPL license. That is why there are many free realizations of this language [2] as well as of the programs using this language (interpreters). The most actively used interpreter version, program D, is written in Java. There is also a formal specification of the language and XML scheme issued by W3C consortium.

The well-known A.L.I.C.E. program (the author is R. Wollas) has won the main prize of Loebner Prize competition three times – in 2000, 2001 and 2004. It is written in C# language. In order to test A.L.I.C.E., a popular program Skype was chosen as it allows to attach additional modules. With this purpose Skype4COM.dll and AIMLbot.dll libraries are used.

However, in spite of their advantages, A.L.I.C.E. and other programs cannot pass the Turing test. The test was developed by Alan Turing, an English scholar. With this test the possibility of identifying the machine intelligence as a human one is determined. The expert, conducting a test, must determine on the test results if he communicates with a human or with a computer. If an expert takes the computer for a human, the computer is considered to be intellectual one.

Writing a chatbot

Let us consider a chatbot writing example with the application of SkypeTalk program (Fig. 1). The program interface looks like a form with two buttons and two textual windows. Using Skypetalk we initialize a bot and attach it to Skype. SkypeTalk also allows testing a bot. In the first textual field we will enter a text for testing. The second field is intended for displaying the message lag during testing and Skype response. We activate Skype, compile the bot. After starting it and clicking the "Attach to Skype" button the bot will ask for permission in Skype. Then we click "Give access" button. Now the program will conduct a dialog with everyone who writes to it.

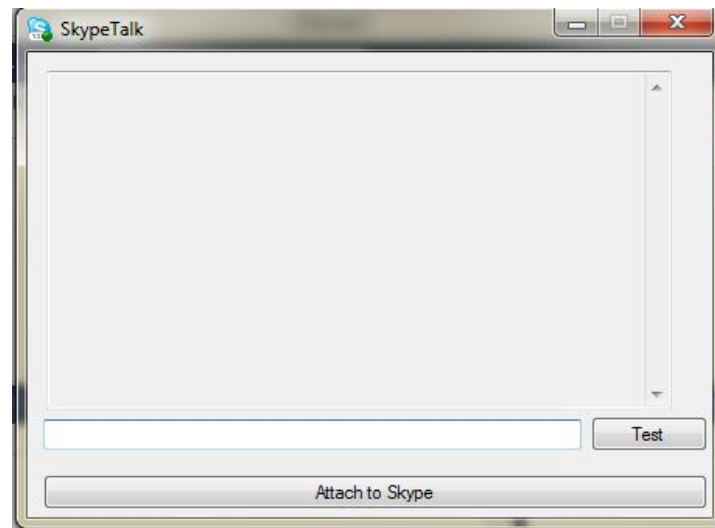


Fig. 1. SkypeTalk program

```

using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Windows.Forms;
using SKYPE4COMLib;
using AIMLbot;

namespace SkypeTalk
{
    public partial class Form1: Form
    {
        // Об'єкт класу Skype
        Skype skype = new Skype ();
        // Лічильник виклику обробника повідомлень
        int count = 0;

        Bot myBot;
        AIMLbot.User myUser;

        /// <summary>
        /// Ініціалізація бота
        /// </ Summary>
        private void botInit ()
        {
            // Створюємо бот
            myBot = new Bot ();
            // Завантажуємо налаштування
            myBot.loadSettings ();
            // Створюємо користувача
            myUser = new AIMLbot.User ("senderUser", myBot);
            // На час ініціалізації відмикаємо введення користувача

```

```

myBot.isAcceptingUserInput = false;
// Завантажуємо файли повідомлень
myBot.loadAIMLFromFiles ();
// Дозволяємо введення користувачеві
myBot.isAcceptingUserInput = true;
}

public Form1 ()
{
    InitializeComponent ();
    botInit ();
}

/// <summary>
/// Приєднуємося до Skype й додаємо обробник повідомлень
/// </ Summary>
/// <param Name="sender"> </ param>
/// <param Name="e"> </ param>
private void buttonStart_Click (object sender, EventArgs e)
{
    // Приєднуємося до Skype, другий параметр true потрібен для того, щоб програма очікувала
    // Поки ми не приєднаємося до Skype, або не дозволимо, щоб програма використовувала
Skype
    skype.Attach (8, true);
    textLog.AppendText ("Initializing Skype ... \r \n");
    // Додаємо обробник повідомлень
    skype.MessageStatus += new _ISkypeEvents_MessageStatusEventHandler (skype_MessageStatus);
}

/// <summary>
/// Відсилаємо повідомлення в Skype
/// </ Summary>
/// <param Name="pMessage"> </ param>
/// <param Name="Status"> </ param>
void skype_MessageStatus (ChatMessage pMessage, TChatMessageStatus Status)
{
    // Інкримінуємо count
    ++ Count;
    if (count == 1)
    {
        textLog.AppendText ("[" + pMessage.Timestamp.ToLocalTime () + "]" +
pMessage.Sender.FullName + "status:" + Status.ToString () + "\r \n");
        // Відправляємо повідомлення з відповіддю на команду
        // Fcommand () – функція обробки команд
        skype.SendMessage (pMessage.Sender.Handle, fcommand (pMessage.Body));
    }
    // Якщо обробник викликаний вдруге, обнулюємо лічильник
    if (count == 2) count = 0;
}

/// <summary>
/// Віддаємо повідомлення боту й отримуємо відповідь.
/// </ Summary>
/// <param Name="str"> </ param>

```

```

/// <returns> </ Returns>
string fcommand (string str)
{
    string result = "";
    Request r = new Request (str, myUser, myBot);
    Result res = myBot.Chat (r);
    result = res.Output.ToString ();
    textLog.AppendText ("User:" + str + "\ r \ nBot:" + result + "\ r \ n");
    return result;
}

/// <summary>
/// Тестуємо локально
/// </ Summary>
/// <param Name="sender"> </ param>
/// <param Name="e"> </ param>
private void buttonSkype_Click (object sender, EventArgs e)
{
    fcommand (textMsg.Text.ToString ());
}
}
}

```

Conclusions

Thus, in the paper we have conducted the analysis of features of simulating human speech behavior during communication process, determined basic functions and principles of chatbot operation in order to develop a communication model. An example of writing a chatbot is presented.

Unique features of the Internet such as speed, operativeness, the possibility of communication between users make it possible to use the Net as a means of communication and to create its interactive forms – chats, forums, teleconferences, E-mail and others. Along with real interlocutors, artificial intelligence programs such as chats, consultants, assistants, entertainment programs, etc. have come to be used. However, in contrast to human conversation, a program does not possess a flexible intellect. Unfortunately, current chatterbots only partially solve the problem of human talk simulation. The vocabulary of most virtual interlocutors is limited and, besides, they lack emotional coloring, timbre of a voice, etc. Therefore, most chatterbots are programmed for keeping a simple conversation. Human natural language processing, especially the conversational style is an artificial intelligence-related problem. A knowledgebase forms the basis of a chatterbot operation. In the simplest case it contains sets of possible questions of a user and corresponding responses to them. Some programs are capable of self-training: extending the vocabulary, conveying certain features of a language and communication style. However, the problem of creating chatterbots on the basis of artificial intelligence, which would be capable of human intellectual activity simulation, remains open to date. Despite their benefits, current chatterbots cannot pass Turing test for computer intelligence compliance with the human intellect.

Unfortunately, at the present stage of its development, virtual communication cannot replace a real one. At the same time, computer technologies have been constantly improved and, therefore, it is probable that over time virtual companions could be capable of replacing real communication.

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