VJER-Vishwakarma Journal of Engineering Research www.vjer.in
Volume 2 Issue 4, December 2018 ISSN: 2456-8465

Elate An Intelligent Therapist Chatterbot

[1]Akanksha Patil, *BE-Computer, VIIT Pune*
[2]Kshitija Pandit, *BE-Computer, VIIT Pune*
[3]Anuja Tatpuje, *BE-Computer, VIIT Pune*
[4]Aishwarya Nerlekar, *BE-Computer, VIIT Pune*
[5] Mrs. L.A.Bewoor, Professor, Computer Engineering, VIIT Pune

Abstract- "ELATE" is a chatter bot which initiates the chat on its own that means it is self-initiating therapist chatter bot . The chat system of ELATE will focus on motivating the end user by having positive textual conversation. As the meaning of the word elate is making someone happy , thus our chatter bot's chat system is designed in such a way which might help end user to elate their emotional state and feel good about themselves . In the era of fierce competition where everyone feels the need of encouragement, ELATE might prove fruitful as an intelligent and motivating chatter bot. There are many chatter bots in market which provide motivating happy chats, but also come with limitations and drawbacks. Our main focus is to work on the prior limitation of already established chatter bot products , so as to create a human-like intelligent chat system. Also, unlike other chatter bots, ELATE will consists of sentiment analysis unit, on the basis of this unit chat will be initialized. Sentiment analysis will be done on the basis of twitter account's tweet of user(in case user has a twitter account) or else user will be asked a set of questionnaire which will be further analysed for user's mood detection. User's sentiments will be categorized in three groups viz. positive, neutral and negative. According to obtained sentiment analysis results chats will be fired at user.

Key words- Artificial Intelligence, Sentiment, Analysis, Text Analysis, Natural language processing, Chatter bot, Named-entity recognition, POS tagging, Corpus, Clustering

I. INTRODUCTION

A. Definition

Chatter bots are software programs that simulate an entity, usually a human counterpart of defined characteristic or non-specific characteristics, with whom the user can interact in a conversation either using textual, auditory or mixed means of communication. Chatter bots are often designed to emulate a human-like conversation.[8]

B. Literature Survey

Alan Turing, a British computer scientist affirmed that if a machine can imitate a human and impersonate its behaviour convincing the other person involved in a real-time conversation that he is interacting with a human (not a machine), then the machine is intelligent.

Joseph Weizenbaum, the German computer scientist and Professor at Massachusetts Institute of Technology took a keen interest in Alan Turing's work on his well-acknowledged article '*Computing Machinery and Intelligence'* [1]. As a result, ELIZA was developed by Joseph Weizenbaum [2] in 1966 which is considered to be the first chatter bot in the history of computer science.. Eliza was directed at tricking its users by making them believe that they were having a conversation with a real human being. It was designed in such a way so as to imitate a therapist who would ask open-ended questions that is the questions were formulated rather than being selected from predefined questionnaire

ELIZA uses pattern matching technique and substitution methodology to replicate human-like conversation that is it operates by identifying key words or phrases from the user's input and the formulate a response/reply on the basis of identified keywords from pre-programmed responses. For example, if a human says that 'I am feeling sad'. ELIZA would pick up the words 'feeling' and 'sad', and respond by asking an open- ended question 'How long have you been feeling sad'. This way ELIZA simulated the human-like conversation by understanding the intent of human replies and accordingly responding to them similarly the way human would have replied .This proved to be a noteworthy impact on natural language processing and artificial intelligence.

Similarly, Parry was developed by American psychiatrist Kenneth Colby in 1972[3]. The program likewise Eliza , mimic a patient with paranoid schizophrenia that is a disease in which patient misinterprets others and is obsessively anxious . Parry attempts to simulate the disease and its natural language program is designed in a way to emulate the individual suffering from schizophrenia. Parry responses are triggered by presumptions, attributions and by altering the weights assigned to textual inputs. PARRY was validated against Turing test, and was successful to outwit 52% psychologists by making them believe that they are conversing with actual schizophrenic patient.

Dr. Sbaitso was one of the earliest efforts of incorporating A.I. into a chatter bot which was developed by Creative Labs for MS Dos in 1992.It is known for its full voice operated chat program which would converse with the user as if it was a psychologist.

A.L.I.C.E[4] is a ubiquitous natural language processing chatter bot which was developed by Richard Wallace in 1995. Alice emulated a young woman and simulates chatting with a real person over the Internet and tells a user her age, hobbies and other fascinating facts, as well as answering to the user's replies. It was hitherto known as Alicebot and was the first to run on a computer by the name of Alice.

The conversation rules specification in Alice are supported by AIML that is artificial markup language, which uses XML schema. It uses heuristic pattern matching to handle the conversations.

.

II. NEED OF THERAPIST CHATTER BOTS

Mental health care is among the most concerned topics in today's era.[5] And it is often ignored because of our busy schedule and hectic lifestyle. So to help combat this, therapist chatter bots can prove very helpful. The three main reasons why chatter bots can prove fruitful in improving mental health are availability, anonymity and cost-efficiency .One of the most important characteristics of therapist chatter bots is time and location independent counseling as they are deployed as mobile applications which can be easily accessed via smart phones anytime and anywhere, aided with meager or sometimes free of cost aided with negligible waiting times. Chatter bots can be favored in terms of anonymity that avoids denunciation .[11]A being might rather share private mental health issues with a machine than with their family doctor/psychologists/therapist, because they refrain from and are afraid of being judged or misinterpreted by another human being.

III. CURRENT MARKET SURVEY OF THERAPIST CHATTER BOTS

Below table shows the pros and cons of already established therapist chatter bots applications.

Sr.no	Product	Pros	Cons
1.	Wysa	1)Uses pictures and video during chat conversation. 2)Handle redundant chat well but not in efficient way.	1)Asks user multiple choice questions to analyse user's mood. Thus, chat doesn't feel realistic or less human-like. 2)Inefficient use of multimedia, this might annoy the end user.
2.	Woebot[11]	1)Intelligent chat system. 2)Efficient use of multimedia.	1)Paid application and thus not available for everyone to use.
3.	Joybot	1)Chat system is good and entertaining. 2)Rich multimedia data usage.	1)Inefficient multimedia usage, which can be irritating sometime. 2)Redundant chat. 3)Paid application after some tenure .
4.	Eliza	1)Chat system is intelligent.	1)Redundant chats are not handled

		2)Prompt reply. 3) Free and open source software.	efficiently. 2) Chats are mundane and might bore the user.
5.	Siri	1)Assistant Chatter bot with good and entertaining chat system.	1)Being an assistant chatter bot, chat system of siri is not intelligent. 2)Available only for ios smart phone users.
6.	Hike's Natasha	1) 1)Assistant Chatter bot with good and entertaining chat system.	1)Being an assistant chatter bot, chat system of Natasha is not intelligent and delivers annoying chats at times. 2)Available only for Android smart phone users. 3) Chat system is highly redundant.

Table no.1 : Comparison between various therapist chatter bots application

IV PROPOSED MODEL

On the basis of current market survey depicted in above Table no.1 , our chatter bot system will be focusing on following limitations viz.

- self initiation based on mood of user
- Intelligent chat
- non-redundant chat

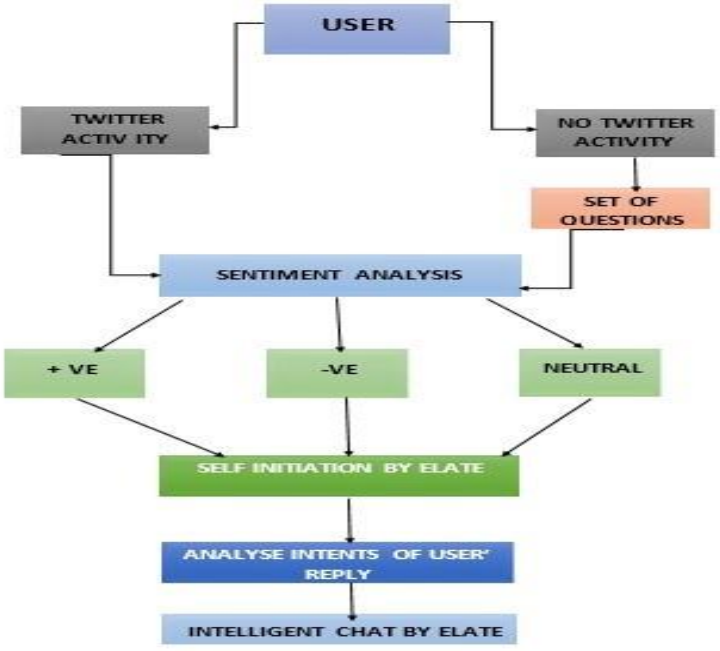

Fig.1 model diagram

Elate chatter bot system architecture consists of two modules based on whether user have a twitter account or not. Module 1 is designed for users without twitter account and it consists of set of pre-defined questionnaires, who's results are analyzed and accordingly chat is initialized. Module 2 is designed for users with twitter account and in this module user's twitter account will be accessed and tweets will be studied to analyze the mood of user in the basis of the tweets it posts.

Results of module 1 and module 2 will be analyses to realize the current sentiment of user. Sentiment of user will be categorized in 3 categories viz. positive, negative and neutral. On the basis of the derived results of sentiment analysis unit , chatter bot will initiate the chat. Unlike traditional and static way of chat initiation will be replaced with more intelligent and understanding conversation starter. Thus, user will feel Chatter bot to be more relatable. Once chat is initiated , user's reply will be taken into consideration for further conversations. For example, if user reply "I am feeling sad", ELATE will first understand the intent of the reply that is sad and accordingly reply. Also, chats will be tailored at real time that is chatter bot's reply will not be chosen from a pool of already defined chats but will be based on the user's reply and the context of replies. Thus, user won't feel like if it's talking to a machine.

Working of Module 1: Application will ask set of 5 multiple choice questions to user. Each question will have 3 options viz. positive , neutral and negative, with every option having a pre-defined score (integer value).Based on the options selected by the user, total score of all question will be calculated. On the basis of total score, user's sentiment will be categorized into three groups viz. positive, negative and neutral. If overall score of user is positive or has more positive inclination then chat will be initiated in positive chat format. If overall score of user is negative or has more negative inclination chat will be initiated in a format which will try to make user positive. If overall score of user is neutral or has more neutral inclination then chat will be initiated in normal way. User's reply will then be taken into consideration for further chat. Application will analyze intent(sentiment) of users reply and thereby generate an appropriate response.

Working of Module 2: Application will ask user for twitter login. Tweets will be extracted from user's account and will be stored in database for further analysis. Sentiment analysis of tweet will be done to deduce the sentiment of the user's tweet .If extracted tweet cite a positive sentiment or has more positive inclination then chat will be initiated in positive chat format. Similarly, if tweet extracted cite negative sentiment or has more negative inclination then chat will be initiated in a format which will try to make user positive. And likewise if tweet extracted cite neutral attitude or has more neutral inclination then chat will be initiated in normal way.

In this way ELATE will initiate the chat with user in more intelligent way, by roughly analyzing the mood of user beforehand.

IV. METHODOLOGY

The system architecture consists of three units. First is sentiment-analysis of tweets and questionnaire, second unit consists of self-initiation of chatter bot and third unit consist of real time chat generation.Third unit is divided into two phases, first phase deals with Twitter tweets Context and Intent Identification and second phase consists of Natural Language Generation.

A. Phase 1: Twitter Tweets Context Identification

For this, we are going to use Standford's CoreNLP kit [11] OpenNLP toolkit to identify the intent of the text (tweet). Thus, text analysis need to be done. Following are steps for text analysis,Information Extraction: Information extraction (IE)[7] process extracts the structured information from unstructured and/or semi-structured machine-readable documents. This activity processes the human language texts by means of natural language processing . Standford NLP toolkit provides OpenIE for the extraction of relation tuples. It is basically a binary relations, from plain text. For example ," John Obama was born in Hawaii" would create a triple (John Obama; was born in;

Hawaii), corresponding to the open domain relation was-born-in(John-Obama, Hawaii).Named Entity Recognition: It mainly use feature extraction. It labels sequences of words in a text which are the names of things, such as person and company names or it can be gene and protein names. This uses one or more machine learning sequence model. For e.g. For English, by default, this recognizes named (PERSON, LOCATION, ORGANIZATION, MISC).Categorization: It is the task that labels natural language texts with relevant categories from a predefined set. Here we have predefined set of word categories to which mapping of input word can be done.Clustering: It is a type of unsupervised learning. [12]The task of clustering is to divide a set of objects into clusters that is parts of the similar set of objects, so that objects in the same cluster are similar to each other, and objects in different clusters are dissimilar to each other. Standford NLP Toolkit provides Flat Clustering in which it create clusters that are coherent internally, but clearly different from each other.Sentiment Analysis: Sentiment analysis is a process of analyzing the sentiments from the textual data.Standford CoreNLP provides Sentiment tool to analyze text as part of StanfordCoreNLP by adding "sentiment" to the list of annotators.Morphosyntactic Analysis: This process decomposes the word into small unit that is called as Morphemes. Morphemes may contain meaning or root of the word. StandfordNLP provides classes for Lemmatization and Stemming which carries the work for Morphological analysis.

B. Phase 2: Natural Language Generation

This is a process in which natural language is generated using some set of rules and using a knowledge base.
We are using SimpleNLG library to generate a text. Basically, a NLG system usually involves three processes:
Content determination: Deciding what information to mention in the text. Aggregation: It includes merging of similar sentences to improve readability and naturalness. Lexical choice: It does categorization of words according to related concepts. For example "deciding and referring" expression generator that is generating expressions that identify objects and regions. Realization: Creating the actual text, which should be valid according to the rules of syntax, morphology, and orthography. Orthography: It includes inserting the appropriate whitespace in sentences and paragraphs. Absorbing punctuation – e.g., generating the sentence "He lives in Washington D.C." instead of "He lives in Washington D.C.." that means the sentence ends with a single period instead of two periods. Pouring – This includes, inserting line breaks between words rather than putting word in the middle of a word ;in order to fit text into rows of 80 characters (or whatever length you choose).Formatting the lists such as: "apples, pears and oranges." Morphology: Handling inflected forms – that is, modifying/marking a word/lexeme to reflect grammatical information such as gender, tense, number or person.

V. LIMITATIONS

A. Design and Implementation Constraints

This chatter bot is not generic because different age groups and genders have varying sentiments, and thus sentiment analysis result may differ. This chatter bot will concentrate only on particular age group of girls (18 to 25 yrs.).
Sentiment Analysis domain is under development, hence sentiment analysis from tweets or any document provided by user may not be 100% accurate.

B. Assumptions and Dependencies

User have a twitter account.
User have posted a tweet on his timeline.

CONCLUSION

In the 21st century era, where automation is posing as driving force for technological development and world is becoming more competitive and fierce. In this competitive environment humans are losing their control as well as balance over feelings and emotions. Unlike older times, where human-human interaction [6]was convenient, the same is not seen in today's busy world. Not every individual suffering from stress or any emotional discomfort can seek for help. In such cases, chatter bot can prove fruitful to help individuals to feel positive and feel that they are

cared and are being positively mentored. Thus, we can conclude that motivating chatter bots like ELATE can help individuals to seek emotional support anywhere and anytime

REFERENCES

[1] A. TURING, "I.—COMPUTING MACHINERY AND INTELLIGENCE", *Mind*, vol., no. 236, pp. 433-460, 1950.
[2] J. Weizenbaum, "ELIZA---a computer program for the study of natural language communication between man and machine", Communications of the ACM, vol. 9, no. 1, pp. 36-45, 1966.
[3] K. Colby, Artificial paranoia; a computer simulation of paranoid processes. New York: Pergamon Press, 1975.
[4] B. AbuShawar and E. Atwell, "ALICE Chatbot: Trials and Outputs", *Computación y Sistemas*, vol. 19, no. 4, 2015.
[5] 'Mental health chatbots - The future of therapy?", *Himssinsights.eu*, 2018. [Online]. Available: http://www.himssinsights.eu/mental-health-chatbots-future-therapy. [Accessed: 16- Feb- 2018].
[6] A. Følstad and P. Brandtzæg, "Chatbots and the new world of HCI", *interactions*, vol. 24, no. 4, pp. 38-42, 2017.
[7] Z. Kedad, *Natural language processing and information systems*. Berlin: Springer-Verlag, 2007.
[8] "Chatbots Magazine", *Chatbots Magazine*, 2018. [Online]. Available: https://chatbotsmagazine.com/. [Accessed: 16- Feb- 2018].
[9] S. Qamar and P. Ahmad, "Emotion Detection from Text using Fuzzy Logic", *International Journal of Computer Applications*, vol. 121, no. 3, pp. 29-32, 2015.
[10] G. Wilcock, *Introduction to linguistic annotation and text analytics*. San Rafael, Calif.: Morgan & Claypool Publishers, 2009.
[11] K. Fitzpatrick, A. Darcy and M. Vierhile, "Delivering Cognitive Behavior Therapy to Young Adults With Symptoms of Depression and Anxiety Using a Fully Automated Conversational Agent (Woebot): A Randomized Controlled Trial", *JMIR Mental Health*, vol. 4, no. 2, p. e19, 2017.
[12] [12] A.Agrawal and A.An,"Unsupervised Emotion Detectionfrom Textusing Semantic and Syntactic Relations", IEEE computer society, pp. 346-353, 2012.