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Malang, November 27, 2014

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Sekolah Tinggi Informatika dan Komputer Indonesia

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Editors & Reviewers:

Tri Y. Evelina, SE, MM Daniel
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GREETINGS

Head of Committee IC-Itechs

For all delegation participants and invited guest, welcome to International Conference on Information Technology and Security (IC-Itechs) 2014 in Malang, Indonesia.

This conference is part of the framework of ICT development and security system that became one of the activities in STIKI and STTAR. this forum resulted in some references on the application of ICT. This activity is related to the movement of ICT development for Indonesia.

IC-Itechs aims to be a forum for communication between researchers, activists, system developers, industrial players and all communications ICT Indonesia and abroad.

The forum is expected to continue to be held continuously and periodically, so we hope this conference give real contribution and direct impact for ICT development.

Finally, we would like to say thanks for all participant and event organizer who involved in the held of the IC-Itechs 2014. We hope all participant and keynote speakers got benefit from this conference.

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on Information Technology and Security

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Interviewer BOT Design to Help Student Learning English for Job Interview

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Abstract

To improve skills in English conversation when seeking job in employment interview session is a must to increase competitiveness among other employment seekers. Because of limited resources in our institutions that can help students learning and practice English for interview and achieve their dream work, we design a bot that has personality as an interviewer who asked the questions and then concludes the conversation and make summary of the interview result.

This bot interviewer design is using a modern chatter bot named ALICE, and to replicate human intelligent to machine we use AIML. Meanwhile Naive Bayes Algorithm is used to classify the interview result into areas of potentials, talents, and interests of student, and then made a summary in the end of the interview session using a modified phrase reinforcement algorithm where we change the term frequency – inverse document frequency algorithm with Booleanterm frequency using selected keywords. This interviewerbot help student to practice their listening, speaking, know how to answer interviewer questions, and also know their potentials, talents, and area of interests.

***Keywords**: chatter bot, alice, aiml, artficial intelligent, naive bayes, phrase reinforcement, Natural Language Processing*

1. INTRODUCTION

Capable to speak in foreign language, especially English in our country sometimes can be a plus for someone, especially they who seek for job. This ability will be formed if we have a good system to teach student to practice again and again. The lack of facility to support English environment will drastically influence the number of students who has capable to communicate in English.

We do have some places to practice and learn English inside institutions, but mostly they are independent groups which maintained by students. There is no specific place or system to help students developing and measure their ability to communicate when seeking job during interview session in English. We do have a program called PECT (Polytechnic English Computer Test), it is a program to test English skill, but this program also not specifically purposed to teach students to develop English for Job Interview while in University of Muhammadiyah Malang we have nothing to help student practice their English except in class. With this background, we design an interviewer BOT that hopefully can raise students capability to speak English and gain success on English interview session.

The growth of technology and human life style open a new door of possibility to create an online training for job interview in English using online chat with internet connection. The form of communication can also be a text chat or a voice chat. Students can send messages using text or voice to online interviewer, then the interviewer will replay the messages using

the same form, which is text or voice. This interview BOT will be a virtual interviewer that have an artificial intelligent which can serve for 24 hours a day and 7 days a week to train hundreds or even thousands of students in practicing their English for interview session whenever they want to train themself. An Artificial Intelligent will be created and implanted inside the machine so the machine will act like human who can do an interview training session with students. Natural Language Processing is one of many artificial intelligent that capable to give a machine an ability to virtually understand, and respond with language that used by human. Natural Language Processing needed to process inputs to produce outputs that easy for human to understand with as natural as possible language. One of the machine that created to do that is ELIZA that developed by Wallace and become a modern chatterbot named Artificial Linguistic Internet Computer Entity (ALICE). Artificial Intelligent Markup Language (AIML) is used to replicate human intelligent to machine in ALICE.

Artificial Intelligent inside ALICE will be used as Interviewer BOT to build basic knowledge to interact with human. ALICE system will then combined with Naïve Bayes Method to classify responses given by students into groups. After classification the given response will be processed to Phrase Reinforcement Algorithm process to get summarization for each classification groups. Interviewer BOT has some advantage in access speed to send and get information from database, it is because the form of information that sent to and received from students will be in plain text form. Result of interview can directly be see in the end of each interview session along with the review summarize just like the real human interviewer. This idea can save much time and resource to teach students English for Job interview.

Based on that idea, we design the interviewer BOT in web base to maximize the term of use by anyone, anytime, and anywhere. We hope this design can give a good contribution to raise the ability of students in future when they have to answer questions in job interview session

2. RESEARCH METHOD

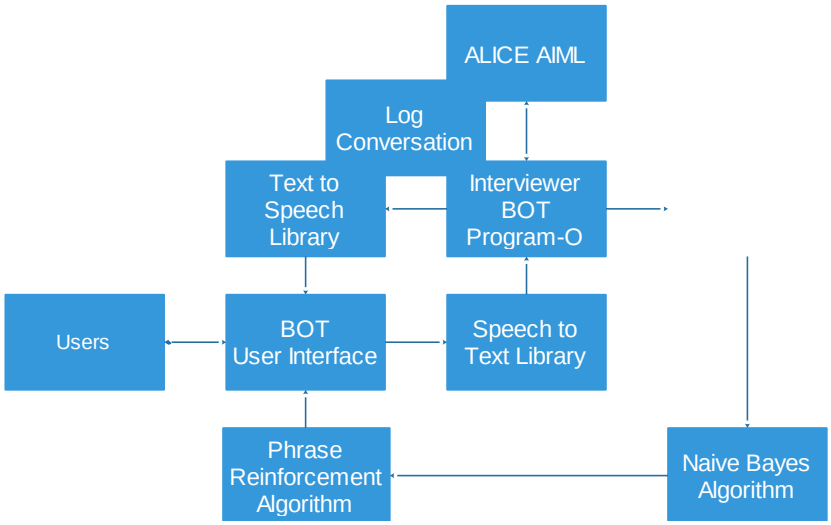


Figure 1 Job Interviewer BOT Design

Fig. 1 show the Interviewer BOT design and how to implementing the idea. The use of Naïve Bayes and Phrase Reinforcement Algorithms to make summarization is the value added to ALICE artificial intelligent besides ajob interviewer personality.

TEXT TO SPEECH

Text to speech used to virtually add speaking ability to the bot which will be used to turn text to speech to the selected text. The audio then played to replace text output from the bot. This supposed to make the bot more human like. To convert Text to speech we need a synthesis system like Festival Text to Speech Synthesis.Festival is a general framework to build speech synthesis systems. It offer full text to speech through APIs from shell level, command interpreter, C++ library, Java and Emacs. This Festival capable in several languages, currently English and Spanish.

ALICE BOT

Chatterbotis a computer program designed to stimulate intellectual conversation with one or more human beings both in audio or text form. At first, this bot is tested through the Turing Test, which is the secret of his identity as a machine that can fool the person who chat with it. If the user is not able to identify the bot as a computer program, the bot is categorized as an artificial intelligent. In 1950, Alan Turing published a famous article "Computing Machinery and Intelligent", which proposed the Turing Test as a criterion of intelligent. This criteria depend on the ability of computer programs to mimic humans in a real-time conversation written by humans as an appraiser, whether the computer program is well enough that people can't discriminate based on the content of the conversation and cannot be guessed that they are talking to real human or a computer program. Machine called ELIZA is one of famous bot that actually response like real human. The key operational method ELIZA involves the recognition of cue words of phrases in the input, and the output of the responses that have been prepared or programmed, which could continue the conversation in a way that seems meaningful.

After long history of development, in 2004, Wallace develop an AIML language that allows humans to incorporate knowledge into technology-based bot ALICE software that is distributed freely. Created by AIML free software community called ALICE bot in 1995 - 2000 which is the adoption of the XML language. This language is used by first ALICE bot as the basis for system implementation. Artificial Intelligence Markup Language describes a class of data objects called AIML as objects and separately describe the environment of a computer program that processes the AIML. AIML objects composed of units called topics and categories that contain parsed data sentence translation and unparsed of data, a not yet translated sentences. Parsed data consists of characters, the data characters, and elements of AIML.

NAÏVE BAYES ALGORITHM

Naïve Bayes Algorithm is one of many method to classify and predict using probability theory. This algorithm use probability theory introduced by an English scientist Thomas Bayes, by predict the future probability based on past experience. Two of researcher, one by Patel and Lin, and the other by Microsoft Research introducing Bayesian statistic method, but the most popular was the Naïve Bayes approach taken by Paul Graham. Naïve Bayes Algorithm is probability based method and the Bayesian theorem, which assuming that each of its variable is independence and assumes that the presence of a variable has nothing to do with the presence of other variables. Naïve Bayes model is a simplification of Bayesian Method and the one used in the machine learning as a method to get a hypothesis for taking decision. Here, in this study case, NaiveBayes algorithmis used to classify the results ofthe job interview conversation between the user and the Interviewer Bot. Thereare three categories of conversation is about interest, potential and talent. Eachcategoryhas thefollowing classification: interest (not

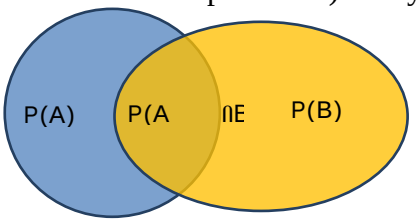
interested, lessinterested, interested, veryinterested), the potential (not skilled, less killed, skilled, highly skilled), and talents (visual, psychomotor).
The method of determining this algorithm can be doneas follows:

1. Calculating Opportunities and Bayes Theorem, take an example:
   a. There were of interest categories classified conversations conversations "very interested" towork.
   b. There are from conversations that contain the words listed in the category ofinterest ("expect", "will", "effort", "interest", "concern", "enthusiasm", "support", "provider").
   c. conversations that contain words listed in the category of interest pertained conversation"very interested".
   d. If there is interest categories conversation last performed by the user and Interviewer Bot, then what is the probability that conversation classified as conversation"very interested" and contains the words ("expect", "will", "effort", "interest", "concern" ,"enthusiasm", "support", "provider")?

   By using a simple form of Bayes' theorema can then be calculated:

   If P(A)= Opportunity conversations that are "very interested".

   P(B)= Opportunity conversations that contain the words listed in the category of interest("expect", "will", "effort", "interest", "concern", "enthusiasm", "support", "provider") ->keyword.



$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(B|A)P(A)}{P(B)}$, so that :

$P(\text{very interested}|\text{keyword}) = \frac{P(\text{very interested }|\text{keyword }) * P(\text{very interested })}{P(\text{keyword })}$

$= \frac{\frac{5}{10} * \frac{10}{30}}{\frac{18}{30}} = \frac{1/6}{3/5} = \frac{5}{18} = 0.27$

NaïveBayesApproach

With the results of previous calculations, for Naïve Bayes approach can be added to the problem as follows:

a. There were conversations that contain the word ("learn", "MOTIVATE", "improve") -> keywordB.
b. conversations are categorized as conversation al interest categories "very interested".
c. What is the chance of a conversation conducted by the user which contains a list of words ("expect", "will", "effort", "interest", "concern", "enthusiasm", "support", "provider") and("learn" ,"MOTIVATE", "improve")? ->keywordA

Above problems become more complex, and cannot be solved using a simple form of Bayes' theorem. So it takes a formula as below:

P(very interested|keywordA,keywordB) =

$$\frac{P(very\ interested\ |keywordA\ \ \Omega keywordB\ )*P(keywordA\ |very\ interested\ )*P(very\ interested\ )}{P(keywordA\ |keywordB\ )*P(keywordB\ )}$$

To simplify the assumptions, it can be considered that the incidence of emergence keyword Aword lists are not relying solely on the appearance of a list of words ina conversation keyword B. So the above formula can be simplified to:

P(very interested|keywordA,keywordB) =

$$\frac{P(keywordA\ |very\ interested\ )*P(keywordB\ |very\ interested\ )*P(very\ interested\ )}{P(keywordA\ )*P(keywordB\ )}$$

$$= \frac{\frac{5}{10}*\frac{5}{10}*\frac{10}{30}}{\frac{18}{30}*\frac{6}{30}} = \frac{250/3000}{108/900} = \frac{0.083}{0.12} = 0.694$$

The value of this opportunity ist he possibility that the responses given by the user conversation during a job interview with Interviewer Bot contain words listed on keyword A and keyword Band classified conversations "very interested" to work. The above calculation is done to classify a category of interest include conversations conversation "very interested" to take the opportunity of the words contained in the conversation. Naïve Bayes approach is done by making the assumption that the incident on the group list of words does not depend fully on the rise to the list of other words. This is done to simplify the process of calculating odds.

VI. PHRASE REINFORCEMENT ALGORITHM

Phrase Reinforcement Algorithm is an algorithm used to construct a summary of a sentences set in a document. This algorithm checks the beginning of a sentence that starts with a conversation. This is the beginning of a sentence is usually a trending topic, but it can also be a non-trending topic. Given the initial sentence, this algorithm will read the log of each conversation that contains conversation sentence. After the conversation log is taken, the conversation filtering algorithm used to eliminate spam or other data sources that are not relevant. Filtering is an essential step in order to stay focused on the phrase reinforcement algorithm most relevant content. This step will use naïve Bayes Classifier that trained before with the spam contents. Next, non-English and duplicate conversation will be deleted because we are going to be focused on making an English summary and preventing any user in the conversation dominating the topic. Finally, to obtain a set of relevant conversation, after isolating the longest sentence of any sentence that contain a topic conversation, phrase reinforcement algorithm will be used to these phrases to form the input and then produce a summary of the conversation.

VII. SPEECH RECOGNITION

In computer science, speech recognition mean translating words spoken into text. The system analyze the voice and find a match for words inside. This system need to be trained to get an accurate translation. One of the most used speech recognition system is google speech api, the api can be used on web based service or mobile service.

DISCUSSION AND CONCLUTION

ALICE with an interviewer personality artificial intelligent combined with Naïve Bayes and Phrase Reinforcement Algorithms may hopefully help students to learn english for interview and give experiece about what questions will be asked in job interview session. We still in the process of developing the bot personality and we accepting any sugestion and help

we can get to boost the reasearch and both web and mobile service are on prototypes state. For the web prototype can be viewed on http://ivbot.azurewebsites.net while the mobile one still in development process but already have ability both text to speech and speech to text.

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