

Intelligent Chatbot for Trademark Infringement Queries

Sam C.C. Lin^{a,1}

^a*Department of Industrial Engineering and Engineering Management, National Tsing Hua University, Taiwan*

Abstract. In the generation of the advancement of technology. Especially, the rise of the artificial intelligence (AI). Additionally, chat platform such as Line, Facebook, Messenger has become an important part of life. Therefore, chatbot, which is a computer program that simulates human conversation, becomes a popular technology application. In the globalized society, how to become a competitive enterprise is an important issue. Brand equity such as trademark is a key performance index, it can enhance the value of the brand in the market. Trademark is the key point to enhance the brand image because the trademark registration does not only protect the existing trademark from infringement, but to gain its trademark market value. So, in this research, author combines the trademark with the intelligent chatbot to provide a platform of consultation service of trademark field, and uses Language Understanding Intelligent Service (LUIS) and Python programming to implement the result. The goal of this research is to reduce the possibility of trademark infringement in the future.

Keywords. Chatbot, Trademark infringement, Language Understanding Intelligent Service (LUIS)

1. Introduction

Online shopping has become the mainstream consumption patterns. Therefore, in order to achieve the purpose of marketing through trademark, suppliers use the two kinds of network services, search engine and online market, to fill the trademark in the network environment. According to the statistics of the Digital Marketing Association, in the first half of 2016, the number of advertisements in Taiwan increased to NT \$111 hundred million, surpassing the advertising volume of TV media, and the advertising of digital media has become the primary choice of enterprises (DMA, 2017). Additionally, in enterprise, in order to develop the trust, confidence or raise the global reputation in its products or service, the companies must be towards OBM. Therefore, businesses achieve this mostly through a distinctive trademark name and one or more trademarks. However, there are more and more trademark infringement behaviors in digital marketing, including advertising, pirated infringement website, counterfeit products, or keyword advertisements. Many illegal workers invaded other people's trademarks to attract users browse their site and sell goods to consumers. Whether a consumer buys a product or not will directly or indirectly affect the rights and interests of a trademark owner and infringe on its commercial value.

Thanks to the rapid development of artificial intelligence in recent years, especially in the aspect of human language communication. Chatbot is one of a computer program that simulates human conversation, or chat, through artificial intelligence and typically used in dialog systems for various practical purposes, including customer service or information acquisition. With the rise of chat platform such as Line, Facebook, Messenger, chat has become an important part of life. Therefore, if the system can combine the chat with the service, chatbot will be closer to the user, and can also help users who need assistance.

At present, most of the country's trademarks related websites are only a simple

consultation robot service provided by the Australian Bureau of intellectual property. However, the intellectual property related to knowledge is tedious and difficult to be searched by the people. Therefore, the research combines the knowledge of intellectual property and professional knowledge with chatbot to provide a platform of consultation service and offer a reliable bridge for the masses to discuss the problem of trademark field. Additionally, the research also combines the chatbot with artificial intelligence to construct the intelligent chatbot.

2. Literature review

This section introduces the important issues and technologies within the research, including the chatbot, trademark infringement, natural language processing. Additionally, this section also presents the semantic recognition platform which called Language Understanding Intelligent Service (LUIS) and the important concepts in LUIS.

2.1. Chatbot

Chatbot is a computer program that uses sound or text to interact with the user. It can simulate and interact with users through the compilation of Natural Language Processing, huge amounts of data and programs. According to the design and purpose of different robots, the aim of dialogue is usually used for web search, answer specific questions, and specific tasks such as setting up appointments.

The study of chatbots began in Turing's article on Mind in 1950 which called "Computing Machinery and Intelligence". This paper puts forward ("Can machines think?") and verifies the machine by allowing the machine to participate in a Imitation Game. Back in the 1960s, MIT professor Joseph Weizenbaum developed ELIZA, the first ever chatbot, that could "interact" with people like a psychotherapist would. He used a script that would recognize certain patterns and keywords, and generate a response accordingly by asking the patient how they felt about the issue at hand. Hugh G. Loebner in 1990 sets up artificial intelligence annual contest which called the Loebner prize. The establishment of the prize is to encourage the development of a computer program for dialogue with human beings and promote the development of Turing test and artificial intelligence. The most representative chatbot system is the Artificial Linguistic Internet Computer Entity (ALICE) system developed by Richard S. Wallace in 1995. Furthermore, ALICE has won the Loebner prize in 2000, 2001 and 2004. Currently, ALICE combines with AIML (Artificial Intelligence Markup Language) to apply in the development of the action device. Although ALICE uses a dialogue strategy of the heuristic template, it is still considered the one of best performance of chat robot system (Bradeško & Mladenčić, 2012). Most of the methods for chatbots are asking for key words and extracting the most matched keywords or the most similar word patterns from the database. Besides, the extent to the intelligence of the chatbot is determined by the size of database. The poor database do not provide enough ability for chatbot, but a powerful knowledge base may take several years to create (Al-Zubaide & Issa, 2011). Hence, most of the chatbots are confined to particular fields to perform specific functions such as information collection, instruction, and question answers.

Chatbots have two types of classification according to their purpose and the type of the model. According to the purpose of chatbot application, it can be divided into two categories, namely, goal-oriented dialog and non-goal-oriented dialog. These two types of systems actually have goals, but goal driven dialogue systems usually have well-defined performance measurement (Serban et al., 2015). The chatbots of the "Goal-Oriented Dialog"

usually have clear service goals or service objects, so input and output will be restricted to a specific range, and are set to have short conversations to get information from users to accomplish tasks. Additionally, “Goal-Oriented Dialog” system aims at efficiently completing tasks, including customer service, enquiry, weather query or ticket reservation, etc. The operation mode of the “Goal-Oriented Dialog” system is mainly based on the artificial logic rules and learning recognition models. Therefore, the system need to categorically classify users' intentions, so as to inquire the correct database to complete the response of the dialogue. The chatbots of the “Non-Goal-Oriented Dialog” is not developed for the purpose of service in a particular field. Due to the non-restricted topics and the emergence of a reasonable response are need a large amount of knowledge, the development of a “Non-Goal-Oriented Dialog” system become a difficult problem. This type of system includes pure chat programs and virtual character chat robots in computer games. For example, the well-known applications are chatterbot systems such as Eliza or Alice.

2.2. Trademark Infringement

According to the Trademark Law of Taiwan, the trademark is defined as any identifying mark, which is composed of characters, figures, marks, colors, three dimensional shapes, dynamic, hologram, voice and so on (TIPO, 2017). With the development of technology and transportation, the international business and trade are flourishing, and the mass produced goods can be quickly transmitted from the manufacturers, importers and exporters, retailers to the consumers. Therefore, the trademark on the product can be further derived from the quality, value and commercial reputation of the goods, and bring great economic benefits.

The original function of the trademark is to express the source and origin of the goods, which is convenient for consumers to find the goods they want to buy. The so-called "confusion of trademark" refers to the market as the two trademarks have the same or similar pattern, and use for the same or similar goods. When consumers buy goods, it is difficult for consumers to distinguish the goods that need to be purchased or the goods from different sources are mistaken for the same source. The sixteenth provisions of Trade-Related Aspects of Intellectual Property Rights say that the registered trademark owner should have exclusive right to prevent others to use the same or similar logo in the similar commodity or service. The court in trademark infringement cases, if the confusion of trademark will be constituted, this situation is usually the infringement will be established; conversely, if that is impossible to form the confusion of trademark or degree is fairly slight, the infringement won't be established.

2.3. Natural language processing

Natural Language Processing (NLP) is mainly to make the machine "understand" human language, and NLP is also an important branch of artificial intelligence. First, NLP can be divided into two types, one is from human to computer which let the computer transform human language into programs that can be processed. The other is feedback from computer to human which convert the results generated by computer into human understandable languages (Manning et al., 2014). This research uses Python programming language to do the word segmentation of words and sentences automatically, and remove data such as stopword. That is to say, computers must disassemble human sentences to understand meanings. Additionally, the research applies the word embedding which is an important core of language model and feature learning in NLP. The concept is the number

of words in all dimensions embedded from the original high dimensional vector space to a lower dimensional vector space. The language model based on neural networks that enables the machine to learn the distributed representation of words, and then reduce dimensional vector space (Nallapati et al., 2016). This research combines NLP technology with chatbot to achieve more intelligent applications.

2.4. LUIS

LUIS is released by Microsoft for the development of natural language understanding module, providing developers with the ability to create and maintain high quality natural language understanding models and directly connect to applications which related intelligent fields. LUIS not only can design domain specific language models according to users' individual needs, but also provide some prebuilt models. The training mode of LUIS is to use the training of a large number of human sentences to improve the accuracy of the meaning of the sentence. After completing the steps of model design, training and publishing, LUIS program will receive the input statement and determine the intention of the statement (Microsoft LUIS, 2017). The following section will introduce important concepts in LUIS.

2.4.1. Important concepts in LUIS

(1) Utterance

The expression statement is that the application needs to understand the text input from the user. Utterance may be a sentence, or a fragment of a sentence.

(2) Intent

Intent is the purpose or goal that the user wants to express. Additionally, intent represents the action that the user wants to execute, so the user can define the operation corresponding to the intent.

(3) Entity

Entity represents the detailed information in the statement, which is the key to the accuracy of the entire semantic understanding.

The following description is the development process of LUIS. First, we need to clearly define the users' intentions and entities that need to be understood, and annotating the initial data, including input (natural language instruction) and output (intention and entity). After training the data will get the semantic understanding model, and then do the necessary tests for the model. Develop and improve the understanding model through iterative computing, making the system closer to human understanding (Microsoft Research Asia, 2017).

3. Methodology

First, the research collects and defines some relevant questions based on the theory of knowledge ontology, and the questions is the basis for the chatbot. In the second part, the research uses LUIS platform to create the database for the defined problem. The function of LUIS is to train the data so that the chatbot can correctly distinguish the user's input and make a corresponding answer. Besides, the research will design the dialogue process based on the defined problems. In the next section utilizes Python to build and test the program of the chatbot. According to the dialogue process, the research uses NLP technology to achieve he results of problems. When the preliminary construction of the chatbot is completed, the system will continue to test and train the dialogue process and combine with artificial intelligence technology in order to make the chatbot more intelligent and sound (As shown in Figure 1).

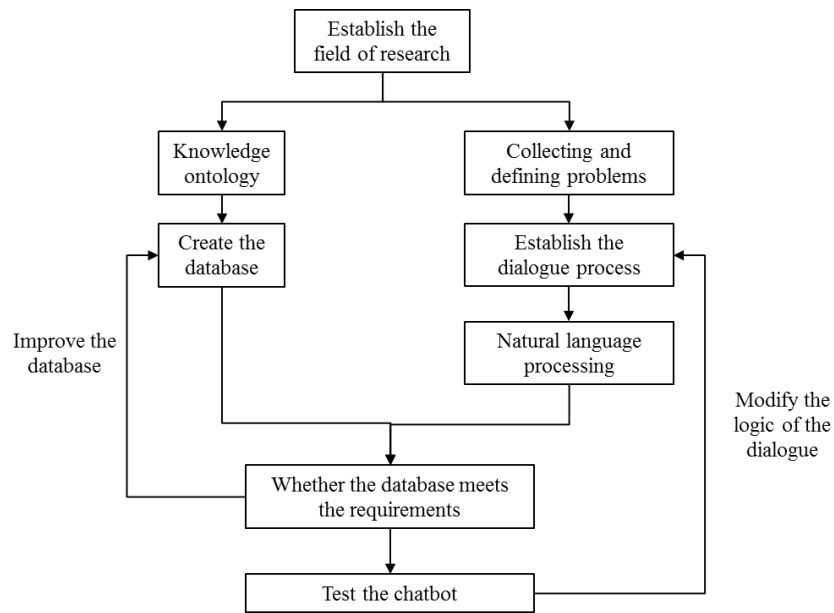


Figure 1. The construction method of chatbot

3.1 The dialogue system of task-oriented answering chatbot

The research is mainly construct the task-oriented answering chatbot, and the main purpose is to answer the issues related to the trademark and reduce the occurrence of trademark infringement. This dialogue system of answering chatbot is based on text dialogues. Moreover, the standard architecture of the answering chatbot begins with user input, and the process mainly includes natural language understanding, dialogue management and generation of answers (As shown in Figure 2).

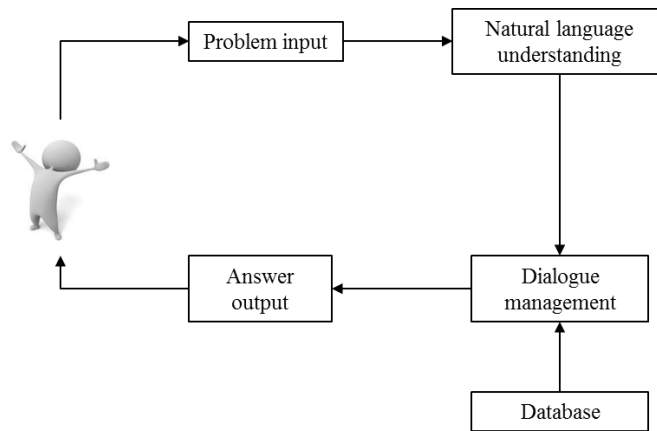


Figure 2. The architecture of answering chatbot

3.1.1 Natural language understanding

Natural language understanding is an important part of man-machine conversation system, which aims to automatically detect and confirm the intention of the user and meet the requirements of the intention. The natural language understanding of this research uses

LUIS as a construction tool. Input the defined intent and the key words in the system's interface, and then add the corresponding utterances to each intention and train the data so that the chatbot can learn the meaning of each utterances.

3.1.2 Dialogue management

The core of the chatbot system is dialogue management, which is responsible for the overall workflow. The establishment of dialogue process architecture is based on user input, so knowing the input of the user in advance is a very important part of the dialogue design. The basis of intelligent dialogue management is to extract the user's input, and convert the user's input into machine - processing form. After defining the process of the response of the dialogue system, the natural language generation system must output the discourse. The research takes advantage of Python programming language to implement the process of answering chatbot system.

4. Case study

In this study, chatbot is applied in the domain of trademark. The goal is to solve the related problems in the field of trademark, and hope that the final result can effectively reduce the occurrence of trademark infringement. First, the research collects and defines the questions. Therefore, this study preliminarily defines 4 trademark issues includes “Search for a trademark website”, “Inquire about the process of trademark registration”, “Query the name of trademark” and “Inquire the verdict of the similar trademark”. Second, according to the defined question, the research will create the dialogue flow and train the utterances in LUIS platform. For example, the study trains the utterances such as “I want to apply for a trademark in China, how to apply?” and “I would like to ask how to register Taiwan's trademark?” for question “inquire about the process of trademark registration”. Moreover, this study sets the entity to let LUIS learn the understanding of the natural language like “Taiwan” belongs to the entity of “Country”. The following figure 3 is an example for utterances training in LUIS platform.

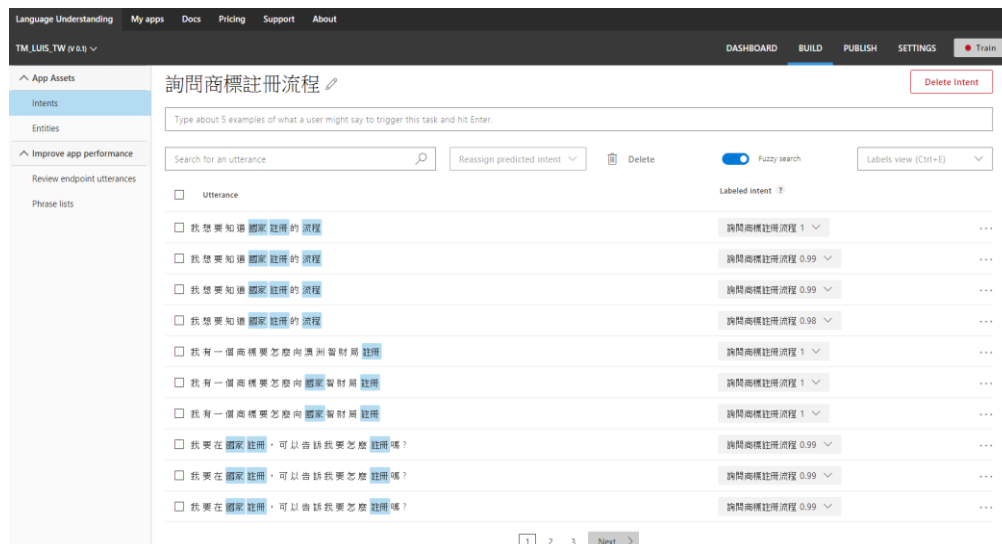


Figure 3. Example for utterances training in LUIS platform.

Third, when the training utterances is finished, this study will design the answer of the dialogue process. In addition, this study combines the Python programming language with LUIS to make the chatbot produce answers. The following figure from 4 to 7 are the dialogue process of a chatbot based on a trademark field. When the user asks a question,

the system will do the detection according to the LUIS defined entity and then use the python to implement the chatbot's answer.

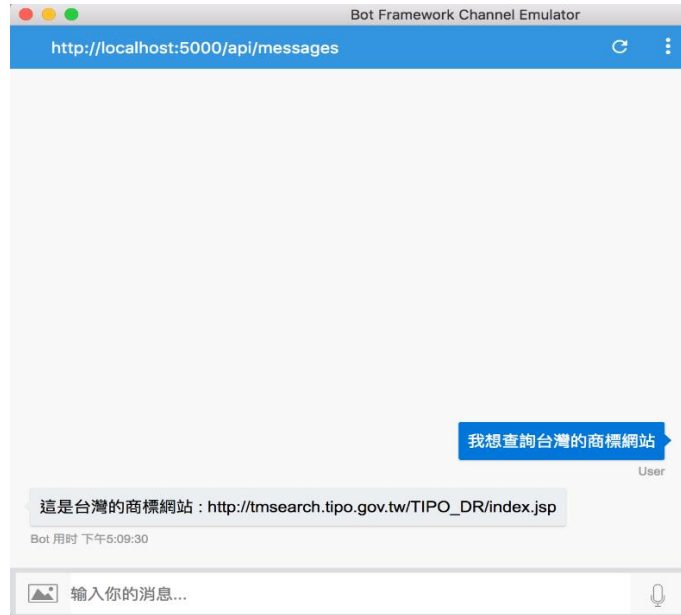


Figure 4. Example of chatbot for question “Search for a trademark website”

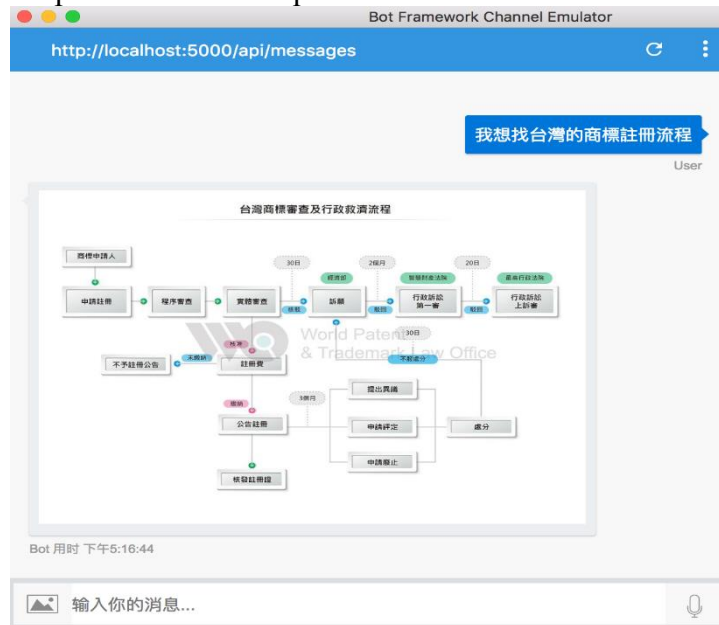


Figure 5. Example of chatbot for question “Inquire about the process of trademark registration”

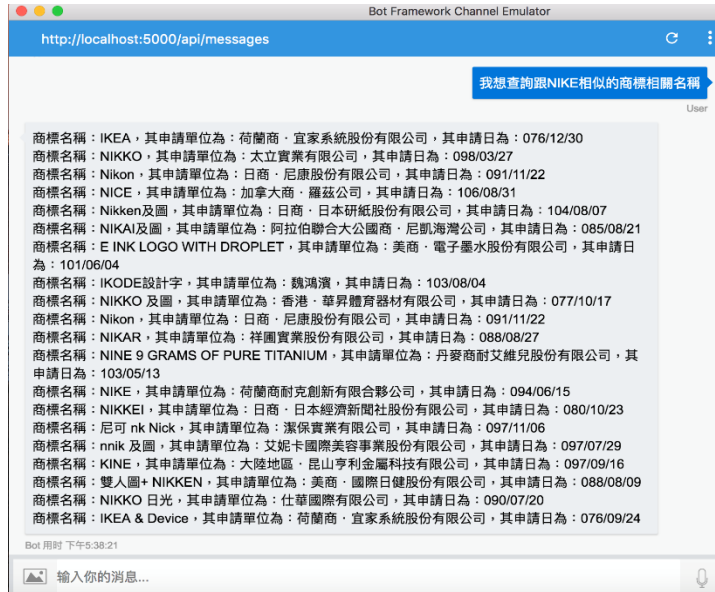


Figure 6. Example of chatbot for question “Inquire the verdict of the trademark”

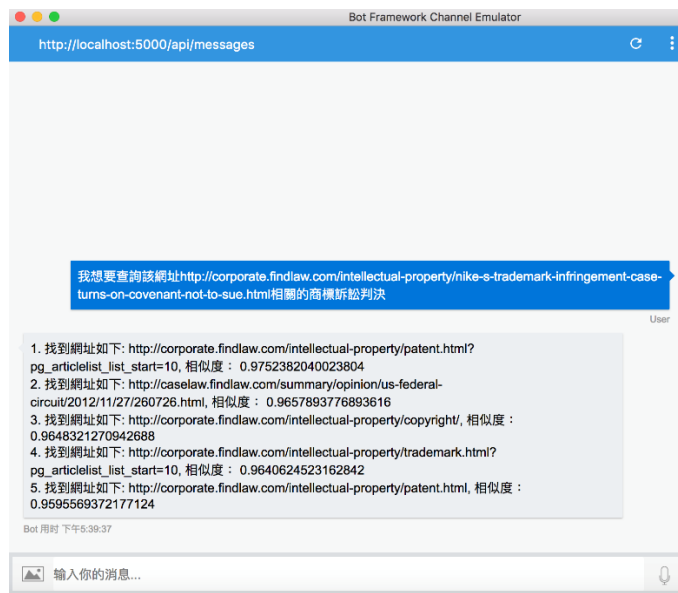


Figure 7. Example of chatbot for question “Query the name of similar trademark”

5. Conclusion

With the rise of chat platform such as Line, Facebook, Messenger, chat has become an important part of life, and the progress of artificial intelligent technology. Therefore, chatbot has evolved into a popular application. Additionally, in enterprise, in order to develop the trust, confidence or raise the global reputation in its products or service, trademark registration is an effective method. Therefore, this research applies the chatbot to the trademark field. Furthermore, the study uses LUIS as an action of natural language understanding, and utilizes the Python programming language to implement the response of the chatbot. Finally, chatbot in this study will provide a platform of consultation service of trademark field, and the ultimate aim is to effectively reduce the possibility of trademark infringement.

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