

Intelligent Conversational Bot for Interactive Marketing

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Abstract— Interactivity of corporate website is important as marketing products through it become popular. Moreover, the usage of Artificial Intelligent application is growing. In order to improve it, a conversational bot will be developed. As a part of Artificial Intelligent application, it can respond to users' question and prolong the conversation with its intelligence. The conversational bot in this research is called as SamBot. It will be developed and integrated into Samsung IoT website as the corporate website. SamBot will have the knowledge of marketing domain. The knowledge base includes Samsung product promotions, product Frequently Asked Question, and general knowledge. In default, this bot will generate random answers if matching knowledge cannot be found. It will be enhanced to overcome this problem by improving its supervised learning capability. Normally, a machine learning is performed to increase the knowledge of a bot. Some functions will be added to filter random answers from whole conversation and store it into a database. With this enhancement, the machine learning will be performed more effectively.

Index Terms— Artificial Intelligence; Conversational Bot; Interactive Marketing; Machine Learning.

I. INTRODUCTION

Nowadays, companies tend to use their corporate websites to promote their products and sell directly from it. This method is not only used by companies but also sales persons. Marketing products through website is more efficient due to the growth of e-commerce websites like e-bay. Companies don't want to lose their grasp on the online market which several years ago ruled by e-commerce websites. Therefore, they put more effort on their corporate websites to compete with e-commerce websites. Marketing is becoming a leading power in competitive business environment. It requires responsiveness to customer's needs and desires. As a result, customers tend to expect a certain level of interaction on a company's corporate website, regardless of the nature of the company and its services [1]. In Web 2.0 era, interactivity is a requirement that all websites should fulfill. It changed the way users interact to a web page [2]. However, users' demand of interactivity still increasing. Therefore, some methods were proposed to give more interactive feel of the website such as live chat window, mini-games, and chatbot. The last method is what this research will look into. A chatbot or conversational bot is an implementation of Artificial Intelligence (AI) in a form of software or application which users can interact by having conversations [3]. As the bot can talk and influence people, it can help to attract more people, thus increase the advertisement power of the company [4]. It also has low maintenance cost and 24/7 service.

A corporate website usually contains rich information which spread across the links. In order to find a particular information, visitors need to explore the links by opening them one-by-one. It is inefficient, less interactive and time wasting. In order to overcome this problem, a conversational bot called SamBot is introduced in this research. The conversational bot will have all information regarding the company, including the products. Therefore, visitors can simply ask to the bot when they need such information through text or speech. By this way, the information needed can be retrieved efficiently in an interactive approach. Information of the website is stored in chatbot's knowledge base. The knowledge can be a domain-specific or a general knowledge. Knowledge of a domain-specific chatbot is usually built by a botmaster who gathers it from external resources by various methods. Huge amount of knowledge can be gathered and stored to the knowledge base. However, new information of a specific domain is always coming. Since no knowledge related to the new information is in the knowledge base, a chatbot will improperly respond to such input and generate random answer. The improper response might annoy users who interact with the bot which lead to unsuccessful improvement of interactivity. Therefore, this research proposed a way to maintain the knowledge of a chatbot to keep up with new information.

II. LITERATURE REVIEW

Conversational bot has been implemented widely and become popular. Other than ELIZA and ALICE, recent conversational bots also contribute in various domains such as education, social, politics, networking, entertainment, business, health, tourism, and marketing. In education domain [5], [6] the conversational bots have been developed to support education process in e-learning environment. They built bots to assist education process by monitoring the learning process or by replacing the teaching team in Massive Online Open Courses (MOOC) websites. The conversational bots are very assistive in e-learning environment since people from various country with different time zones are lined up in different time. Another popular domain which is as popular as education domain is marketing. In marketing domain [7], [8], conversational bot usually used as customer service who can answer Frequently Asked Question tirelessly. It also adds more interactivity to the website when customers are looking for information. Thus, this research will develop a conversational bot for marketing domain which is still under progress and the showcase can be accessed at <https://samsungiotacademy.com/product/>. Some other

researches emphasized the knowledge building of conversational bots and tried to enhance it. In 2007, [9] combined rational reasoning and associative reasoning brain in order to enhance the intuitiveness of conversational bots. Previous researches showed that knowledge enhancement is important in conversational bot development. Thus, in this research an approach of machine learning will be performed to enhance the knowledge of SamBot in order to maintain the knowledge updated. With the enhancement, a conversational bot can be more adaptive, intuitive and dynamic in responding users' input.

III. PROPOSED ARCHITECTURE

This research proposed an architecture of conversational bot with its integration with the website. The system architecture in this research is focused on the website components as well as the conversational bot with enhancement on knowledge building using machine learning. The architecture contains several databases, programs, files and entities representing important elements in the system. The website is created in WordPress Platform for better compatibility with our Livebase plugin. Currently, WordPress was used by more than 27.5% of the top 10 million corporate websites as of February 2017 [10]. For the conversational bot itself, it is based on AIML language which will be processed in an AIML interpreter. AIML interpreter runs on PHP as programming language, Apache as web server and MySQL as database. AIML is suitable for SamBot because it can be integrated to a website which can be accessed by any platform such as PC, laptop and mobile devices. Thus, the main function of the bot to improve marketing aspect of a corporate website can be achieved. In order to fill the bot with knowledge, bot master needs to write some AIML files which contain product promotion, product FAQ, and Annotated ALICE AIML (AAA) files. Product promotion and product FAQ are domain-specific knowledge concerning Samsung's products. AAA files are award winner collection of general responses, emotions, and any other common knowledge which might be asked by the users. All of the files are stored in a database called AIML Knowledge Base. The AIML will refer to this database when a question is posed by a user. The user can access the bot through a chat box in the Samsung IoT's website. This website and the AIML are maintained in the cloud server.

The enhancement of the architecture is in the ability to collect random answer in a database which will be accessed by botmaster to update the knowledge of SamBot regarding the unanswered questions. Random answers are the response of questions which is performed when the bot is unable to get matched answer in knowledge base. These random answers are generated to prolong the conversation due to the lack of the bot's knowledge at the current time. By accessing the random answer database, a botmaster can easily know what the user wants and then update the knowledge related to the issue so that the user can get satisfying answer when accessing the bot again. Figure 1 illustrates the system architecture.

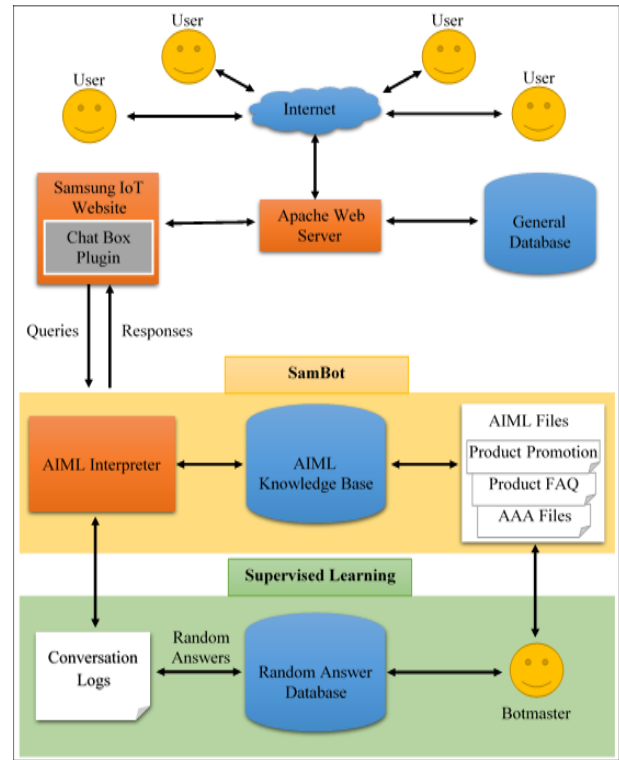


Figure 1: SamBot's architecture

A. Website and Conversational Bot Interface

Samsung IoT Academy website is one of important marketing media to support Samsung existence in the higher learning institute. Thus, integrating conversational bot is needed to achieve better outcome. This website contains latest features of Samsung products as well as their latest products. By developing our own Livebase Plugin, a smooth and interactive design is ensured. It has attractive transition among page section. Each section has its own content and function. It also has unique anchor tag to identify the section. This anchor tag is useful in integration with the bot's knowledge where the bot can change the section according to user input via text input or voice recognition.

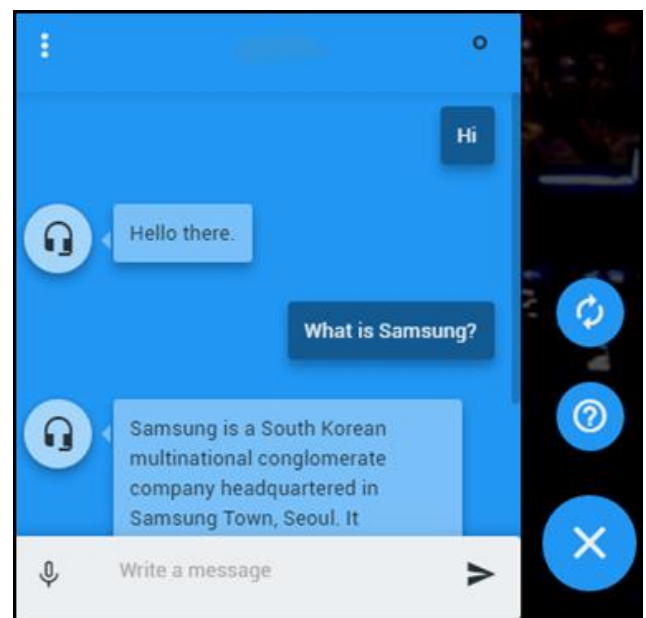


Figure 2: SamBot's interface in Livebase plugin with voice recognition

With conversational bot in it, user can reach important information at ease. SamBot has pop-up chat box as an

interface as shown in Figure 2. It is a plugin API provided by AIML which compatible with WordPress. It is located at the bottom right of the page for easy access and better visibility of the page. User can type a question in the text field or press microphone button to do it by voice. After receiving the input, SamBot will respond according to it. On the top left of the chat box, a button can be pressed to change the color of the chat box as user wanted to. The three button on the right side of the box are reset, help, and close button. Reset button is to clear the conversation history, help button is to show the instruction on how to use the bot, and the close button is to hide the chat box. The close (X) button will close the chat box and if user press again, it will open the chat box.

B. Speech Input

In the development, a speech input is included to help visually impaired users and produce better interactivity. Web Speech API is used for this speech input. Web Speech API is a JavaScript which allows a web application to have the ability of speech recognition and speech synthesis. With this function, SamBot can receive users' voice and recognize the words spoken thus it understands the question. SamBot can also respond by reading the text respond if the device's speaker is on. However, this feature is currently available only on Google Chrome and Apple Safari.

C. Knowledge Base

The knowledge of SamBot consists of Samsung products promotion, product FAQ, and general knowledge in Annotated ALICE AIML (AAA) files. It also contains the specifications of several latest specification of Samsung products including smartphones, tablets, and accessories. Product FAQ knowledge contains frequently asked questions related to particular Samsung product. AAA files contain general knowledge which might be asked by users. AAA files are basically ALICE bot's which was awarded as most human conversational bot. The AAA files are very important to prolong the conversation with users. All of these files are written in AIML files which can be opened and edited text editor such as Notepad++. SamBot can also retrieve information from users which is important for marketing aspect. SamBot can receive information without showing it as response by using `<think>` tag. By using `<set name>` tag, the bot can receive user information such as name, location, gender, etc. With this information, company can plan their future promotion better.

1) Product Promotion

Products promotion knowledge makes SamBot can persuade users with latest promotion available. AIML has the ability to run JavaScript. This JavaScript will be used to load a specific part of the website as requested which will improve the interactivity of the website. A short conversation discussing this knowledge and its AIML code are illustrated in a scenario as shown in Figure 3.

2) Product FAQ

Users tend to ask about product specifications on a corporate website. Thus, this knowledge is included to enrich SamBot. Product specification is important since users need to know more about the product and may influence their decision on buying a product. The products included in this knowledge will be smartphones, tablets, wearables, and accessories. By the time this research is being done, the latest

smartphone released is Samsung Galaxy S7 and S7 Edge. Newer products which have not released yet can be a topic to perform the machine learning.

```
<aiml version="1.0">
<category>
<pattern>SAMSUNG</pattern>
  <template> Samsung is a South Korean
multinational conglomerate company
headquartered in Samsung Town, Seoul.
  </template>
</category>
<category>
<pattern>SAMSUNG GALAXY S7</pattern>
  <template><script language="JavaScript">
window.location.href =
'https://samsungiotacademy.com/product/#g
alaxy7'; </script>Here is our latest
product on Samsung Galaxy S7 and S7
Edge.</template>
  </category>
</aiml>
```

Example responses:

```
User : Hi
Bot : Hi there. Welcome to Samsung IoT
Showcase website.
User : What is Samsung exactly?
Bot : Samsung is a South Korean multinational
conglomerate company headquartered in
Samsung Town, Seoul. We just launched
our new products, Samsung Galaxy S7 and
S7 Edge. Do you want to know more?
User : Certainly
Bot : Here is our latest product on Samsung
Galaxy S7 and S7 Edge. (The page redirect
to Samsung Galaxy S7 section)
```

Figure 3: Samsung promotion scenario

3) Annotated ALICE AIML (AAA) Files

Another important knowledge is contained in the AAA files. The AAA files is collection of human interest topic. The AAA files is a free copy of ALICE bot brain with some revision by ALICE Foundation to accommodate current issues. With this knowledge, users will be attracted with the bot and keep interacting with it. The knowledge includes astrology, emotion, sports, geography, and etc. which have not released yet can be a topic to perform the machine learning.

4) AIML Interpreter

AIML Interpreter is very important in this architecture. AIML Interpreter is the core of SamBot which interprets AIML files, accepts text and voice inputs, responds queries, performs pattern matching on queries and databases, and produces conversation logs. Since it is written in PHP language, integrating it to a website is easier thereby AIML Interpreter is chosen. The pattern matching algorithm performs depth-first search and returns the first matching response to answer a question. AIML Interpreter used MySQL database to store the bot's knowledge and information including conversation logs. This AIML Interpreter will be enhanced so that it will be able to classify random answers and store it to a database. With the enhancement, botmaster will easily fill new knowledge by answering questions which was answered with random answers before.

5) Random Answer

Random answer is basically a response of question which the bot cannot understand [5]. It is generated in order to keep the conversation alive. However, the answer shows the lack of knowledge related to the question. The questions usually contain either new issues or unrelated topic. For unrelated topic questions, botmaster may skip answering the questions while for questions of new issues, answering is compulsory. For example, Samsung Galaxy Note 8 is taken as topic example which is not in the knowledge. SamBot will show that it has nothing related to Samsung Galaxy Note 8 yet it still responds. Clearly, the responses are not satisfying and may lead customers feel annoyed. This issue can be handled by botmaster by reading the conversation logs. In real conversation, the dialogue can have more questions which make the log take longer time to read. The number of users interacting also rises a problem for botmaster to read the log. Thus, an improvement of random answer identification will be performed in the AIML Interpreter. The improvement also includes a function to store the identified random answers along with the questions into a database. A table will be made to accommodate the records as illustrated in Table 1.

Table 1
Random Answer Table

Conv. ID	Date	Time	Question	Random Answer
#1	8/9/16	4:32 PM	Do you have the specification of Galaxy Note 8?	No, I don't have the specification, but I do have a great Botmaster
#2	8/10/16	9:11 AM	Do you know Galaxy Note 8?	I know very little about it. What kind of it do you like?
#2	8/10/16	9:12 AM	The specification	Is that a fact

6) Conversation Logs Based Machine Learning

This research will try to improve SamBot by utilizing its conversation logs. The conversation logs contain users' dialogue with the bot and by default is sorted by users' name. By utilizing the logs, botmaster will be able to know what the user expect from the bot. Thus, botmaster can add more knowledge to the bot based on the new issue. However, this will take time since bot master need to read whole conversation of each user. An improvement will be done in AIML Interpreter to make it able to filter random answers in a conversation log and store them in database. With this function, botmaster only need to answer the questions without reading the whole conversation one-by-one. Botmaster can just simply read the questions which led to random answers in the database then fill new knowledge as answer via AIML interface.

IV. CONCLUSION AND FUTURE WORKS

Based on the proposed architecture, a showcase of the conversational bot has been developed and integrated to a corporate website. This bot will act as a media for visitors to find information related to the website in interactive way. Knowledge building will be performed to fulfil the marketing requirement related to Samsung products and general knowledge. Thus SamBot will be able to respond to wide variety of questions in Samsung products as well as general knowledge. With the improvement made on the architecture, new issue related to Samsung product can be handled properly. When the development of the improvement on supervised learning has been done, the botmaster will be able to sort and answer the unanswered question from the filtered conversation logs. With the new knowledge, SamBot will be able to respond properly to new issues currently happen.

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REFERENCES

- [1] R. Zollet, "Interactivity of Corporate Websites: An Integrative Review of the Literature," *IEEE Transactions on Professional Communication*, vol. 57, no. 1, pp. 2–16, 2014.
- [2] P. Anderson, M. Hepworth, B. Kelly, and R. Metcalfe, "What is Web 2.0? Ideas, technologies and implications for education," *JISC Technol. Stand. Watch*, vol. 60, no. 1, p. 64, 2007.
- [3] S. Russell and P. Norvig, *Artificial intelligence—a modern approach*, Prentice Hall. Series in Artificial Intelligence, Englewood Cliffs, NJ., 3rd ed. Englewood Cliffs, New Jersey: Prentice Hall, 2010.
- [4] O.S Goh, C.C Fung, A. Depickere, K.W Wong, "An analysis of Man-machine Interaction in Instant Messenger", *Advances in Communication Systems and Electrical Engineering*, 197-210, 2008.
- [5] O.S Goh, A. Depickere, C.C Fung, K.W Wong, "A Multilevel Natural Language Query Approach Conversational Agent Systems", *International Journal of Computer Science* 33 (1), 7-13, 2007
- [6] F. A. Mikic, J. C. Burguillo, M. Llamas, D. A. Rodríguez, and E. Rodríguez, "CHARLIE: An AIML-based chatterbot which works as an interface among INES and humans," in 20th EAEEIE Annual Conference, EAEEIE 2009 - Formal Proceedings, 2009.
- [7] C. Chakrabarti and G. F. Luger, "Artificial conversations for customer service chatter bots: Architecture, algorithms, and evaluation metrics," *Expert Syst. Appl.*, vol. 42, no. 20, pp. 6878–6897, 2015.
- [8] N. T. Weerawarna, H. M. H. R. B. Haththella, A. R. G. K. B. R. Ambadeniya, L. H. S. S. Chandrasiri, M. S. L. Bandara, and S. S. Thelijjagoda, "CyberMate: Artificial Intelligent business help desk assistant with instance messaging services," in 2011 6th International Conference on Industrial and Information Systems, ICIS 2011 - Conference Proceedings, 2011, pp. 420–424.
- [9] G. Pilato, A. Augello, G. Vassallo, and S. Gaglio, "Sub-symbolic semantic layer in Cyc for intuitive chat-bots," in ICSC 2007 International Conference on Semantic Computing, 2007, pp. 121–128.
- [10] Usage Statistics and Market Share of Content Management Systems for Websites". W3Techs. February 2017. Retrieved February 22, 2017.