

Tutorbot: Teaching Chatbot

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Abstract— Chatbots have been around for years and have been used in many areas such as medicine or commerce. Our focus is on the development and current uses of chatbots in the field of education, where they can function as service assistants or as educational agents.

Chatbot functionalities have come a long way since the AI prototypes of the 20th century which relied on basic text-based outputs. Due to technological advancements, greater accessibility of tools for non-developers and the globalization of industries, the chatbot platform is now a ubiquitous staple on the World Wide Web. It also offers a more interactive user-friendly experience than ever before. Tutorbot is a chatbot-based micro-learning application that aims in educating students with their course. It simulates conversation with a human tutor through text and voice. Learning content is organized in such a way that it turns lessons into a series of messages that resemble a chat conversation. Therefore students stay engaged to the conversational style of the chatbot. It serves as educational agents with the aim of relieving the workload of human teachers in their subjects and offers accurate and immediate feedback to learners about their performance.

I. INTRODUCTION

A chatbot is a communication application that simulates human conversation via auditory or textual methods. It is also known as a conversational agent, an intelligent agent or a dialogue system. Conversation agents have received much attention in the field of education and have been deployed in different learning settings. Chatbots grant access to learning materials at any time and in any location and interact with students in a synchronous way. Experts in various educational fields have also backed the rising interest on chatbots in education. A 2014 meta-analysis of tutoring chatbots conducted by scholars in the Journal of Educational Psychology found that they were more effective than traditional computer-based instructions and garnered greater learning outcomes for students when paired with teacher instructions in full-sized classes. Another study conducted for the Patient Education and Consulting journal found that chatbots helped students change unhealthy diets and behavior just by virtue of

consistent conversations, which can attest to the power of crafting the right personality for your chatbot. Needless to say, education systems all over have recognized the need to invest in these innovative technological solutions in the classroom. However, this should not leave teachers feeling uneasy that AI will replace them. Chatbots serve to complement and supplement the work of teachers in education – they cannot substitute the nature of the teacher-student dynamic. Effective pedagogy in the classroom is not measured only by student engagement with the material, but also by creating meaning from the learned content which only interactions with the teacher can achieve.

II. THEORETICAL BASIS

A. Dialogflow

Dialogflow is a platform for natural language understanding that facilitates the design and integration of conversational user interfaces into mobile applications, web applications, devices, bots, interactive voice response systems, etc. By using Dialogflow, it can provide users with a new and interesting way to interact with the products they produce. Dialogflow can evaluate specific forms of consumer data, including text or audio samples (e.g. from mobile or voice recording). It can also respond to customers in a variety of ways, either by text or by synthetic speech.

B. Micro-learning

Micro-learning refers to a set of relatively small, focused learning units and learning activities that are usually completed in a short duration of 10 minutes that are accessible on multiple devices. According to Jomah et al. (2016), micro-learning is an effective strategy because of its learner-centered, easy-to-access, interactive, and well-designed features. The success of micro-learning is dependent on the interplay between various dimensions such as learning content, duration, curriculum level, form, process, modality, and learning type (Hug, 2006). The pedagogical design of chatbot-based micro-learning systems can adopt the theory of micro-learning proposed by Baumgartner (2013). The theory suggests that, in addition to organizing small content modules with a minimum time span, a recommended design involves content progressing

through three learning phases: the absorbing phase, the acquiring phase and the constructing phase. In the absorbing phase, basic knowledge is presented to students to enable them to absorb the required knowledge, which involves the learner completing some basic activities. In the acquiring phase, the design assumes that learning is an active process. Students interact with the chatbot to acquire and build knowledge through instant feedback, revision and reflection thus forming learning experiences. In the constructing phase, learners and the chatbot interact to create a solution together to resolve a checkpoint. The problem chosen should have only one clearly defined and straightforward solution so that it can be solved within the limited time bounded by the learning objective.

C. Chatbot based Micro-learning

The chatbot micro-learning system is designed with motivational dimensions to support self-learning. First, it contains different forms of media such as text, images, and videos to captivate interest and enjoyment during interactions. Second, the content is made simple and precise to allow quick absorption to minimize any unnecessary pressure and stress. Third, knowledge checkpoints with affective and positive feedback are included to support self-evaluation, knowledge construction and competence motivation. Fourth, it allows repeated practice and free-text queries to easily target a specific concept to encourage

learner-content interaction and strengthen the application's perceived value. Lastly, the chatbot provides learning choices with optional links to content-specific videos and voluntary self-evaluation to support choice motivation. In sum, the chatbot-based learning design in this study ensures its motivational and educational objectives are met with a verifiable conversational functionality, educational goals, and pedagogical roles that strengthen students' ability to learn autonomously at a self-directed learning pace.

D. Conversation Design

Conversation Design is a language-based design in human conversation (similar to how object design on pen and paper is a language-based design). The more interfaces an ordinary human interaction has to teach fewer users how to use it. This is a fusion of many disciplines of design including voice user interface design, interaction design, visual design, motion design, audio design, and UX writing. Conversation Design's role as an architect is to map what users can do in space while taking into account user needs and technological constraints. In detailed design specifications, they organize conversations, decide the flow and underlying logic which reflect complete user experience. They are collaborators with stakeholders and developers who can turn to develop and bringing to life experience.

III. METHODOLOGY

A. Creating a User-Led Chatbot

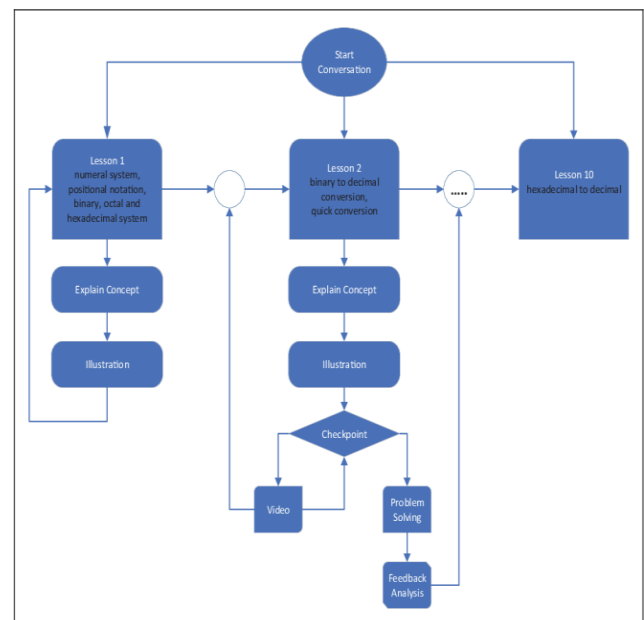
In addressing the diversity and optimizing issues, User-led conversational chatbot was designed to serve as an FAQ or a dictionary type chatbot where users can ask a question, and the chatbot will give out a

definition. This type of chatbot is widely used in the field of finance and technology sector. Chatbots like Siri, Cortana, Bixby, and Google assistants are just some of the few chatbots that are common to us. However, unlike these commercial chatbots, the ones that are being built for this course are explicitly designed to do a handful of tasks such as defining words that are specific in each the module.

The goal of these chatbots is to encourage the students to think and ask questions during the learning process. By embedding these chatbots, students can quickly raise their question that they may have as they go through the learning process. Moreover, it can give more personalized experience in learning the content.

Chatbot Micro-learning system

The above figure shows an example for chatbot learning flow created using the content and curriculum from the

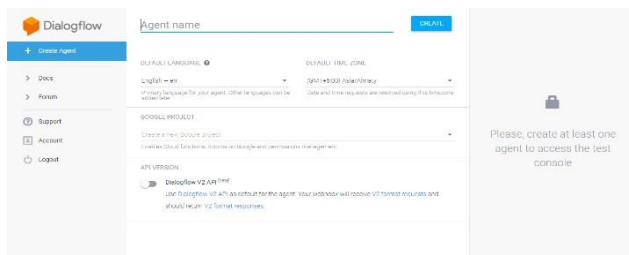


"Conversion of Numerical Systems". The chatbot-based learning system in the current study contains 10 micro-learning lessons. These lessons closely adhere to the micro-learning theory suggested by Baumgartner. Apart from Lesson 1 which contains only the absorbing phase without a knowledge checkpoint exercise and video, Lessons 2 to 10 contain all the three phases of learning operationalized by knowledge presentations, illustrations, checkpoint exercises and video options. Each module can be completed within eight to ten minutes with the nine videos averaging three minutes each. Figure illustrates a typical learning flow of the chatbot micro-learning system.

B. Making an agent

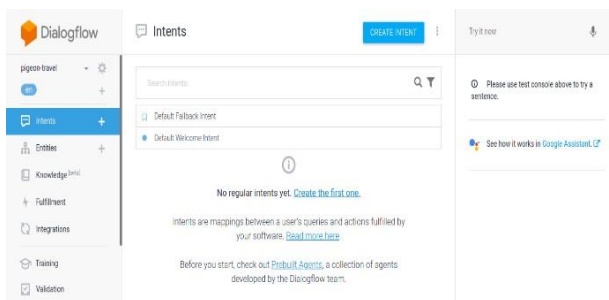
The first step that must be done before creating a chatbot in Dialogflow is to create an agent first. Agent is a natural language understanding module that will later train and understand human language, so the conversation becomes more natural.

C. Making an intent



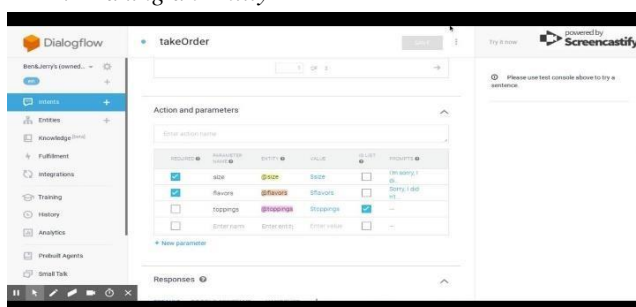
The figure shows the making intent of a console dialogflow agent. In intent, there is a collection of several questions from users that contain the same topic. If the user sends a question, the agent will match the question that entered the data with the intents. Then, the agent will send the correct answer. If a question is sent that does not match or does not match the intent that was made, then the agent will send an answer from the fallback intent.

D. Intent Parameter



The figure shows the intent parameters in a console dialogflow agent. Inside there are parameters, entities, and values. These parameters must be checked in the required section. For example, if the user enters input data that does not contain dates or numbers as shown in the image (according to entities that have been checked), then this system will ask again the time of departure according to the conversation topic. Meanwhile, Entity is a tool to identify and extract data spoken by users, such as time, date, place, weather, etc. In addition, Entity can also be customized according to the conversation topics needed in the entities menu.

E. Making an Entity



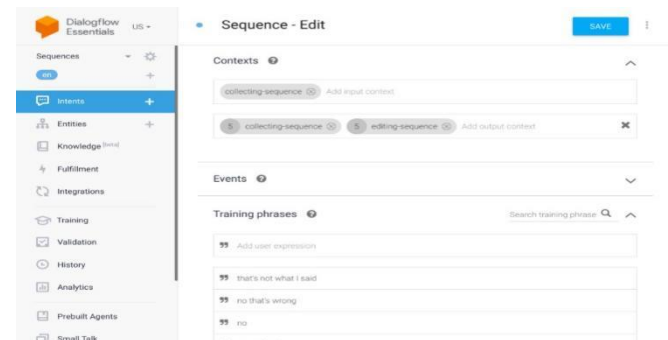
The figure shows the creation of an entity in an agent Dialogflow. The creation of this entity aims to identify and extract data spoken by the user. The entities menu functions to create your own entities that do not yet exist in system entities. In system entities, there is already automatic data extraction in the form of time, date, place, weather, country, etc.

F. Making an Context



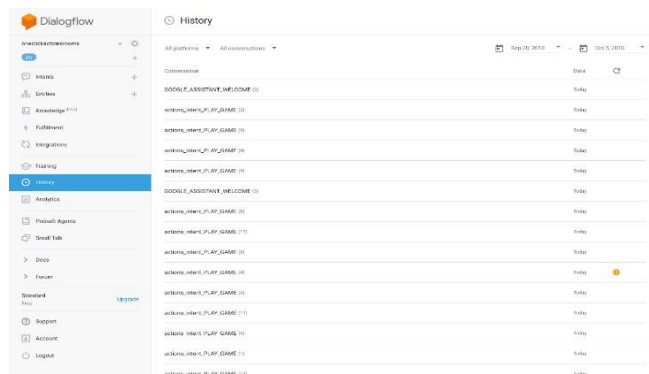
The figure shows the context in a console Dialogflow agent. Context is a tool used to regulate conversation flow so that conversations become structured and ordered. In this section, the developer determines his own name in the contexts section. There are 2 types of context, namely: input context and output context.

G. Test Console



After compiling the conversation flow through context, it is then simulated through the test console located on the side of the dialog flow console. The aim is to ensure that the conversations in the chatbot are structured.

H. Conversation History



The figure shows that after the chatbot is tested on the user, the conversation will be recorded while the user interacts. On the console dialog flow history menu, there is a history of data conversations between users and agents such as date, time, platform type, number of interactions, to display conversations that are not in accordance with the intent that has been made. Then, the analysis will be carried out with a precision, recall, and accuracy approach. So we get the accuracy or suitability of the agent in answering the response from the user.

A. Chatbot and Dataset

Provided with the current landscape of this technology, developing a chatbot is resource-intensive. Those who wish to develop a chatbot for a particular course would require at least a few semesters of data and a tremendous amount of time to clean and organize it. Hence, it is strongly advised to pick a course with at least a few hundred students. Using it in a large class will not only increase the impact of the chatbot but also make the data collection process faster. The clean and organized dataset is still the backbone of creating educational chatbots.

B. Need to Improve the Dataset for Educational Chatbot

We also think that there is a need for educators to continue to push for the limits of this tool in education. This will steer awareness and curiosity among the members of the teaching community. Moreover, by doing so, we will be improving the quality of the data set for which can be beneficial for the wider community.

IV. CONCLUSION

This initiative, though there is still much work to do, shows that there is a gap in the teaching and learning landscape that chatbot can fill. However, the current natural language processing is still in its early stage, using a chatbot in the field of education is promising. In particular, these chatbots can address some of the logistical and diversity issues that a classroom might have. These issues, from simple Q&A and quick information to scenario-based question, can be addressed by a chatbot if appropriately designed.

V. REFERENCES

- [1] J. Yin, T.-T. Goh et B. Yang, *Conversation Technology With Micro-Learning: The Impact of Chatbot-Based Learning on Students' Learning Motivation and Performance*, 2020.
- [2] A. F. Muhammad et D. Susanto, «Developing English Conversation Chatbot Using Dialogflow,» chez *2020 International Electronics Symposium (IES)*, 2020.
- [3] L.-K. Lee, Y.-C. Fung, Y.-W. Pun, K.-K. Wong et M. T.-Y. Yu, «Using a Multiplatform Chatbot as an Online Tutor in a University Course,» chez *2020 International Symposium on Educational Technology (ISET)*, 2020.
- [4] J. Sadhasivam, M. Ametwala, A. Mazumdar et A. Bhataiya4, «Implementation of Chatbot That Teach,» vol. XII, n° 13, 2020.
- [5] J. Q. Pérez, T. Daradoumis et J. M. M. Puig, Rediscovering the use of chatbots in education: A systematic literature review, vol. 28, 2020.
- [6] X. Sánchez-Díaz, G. Ayala-Bastidas, P. Fonseca-Ortiz et L. Garrido, «A Knowledge-Based Methodology for Building a Conversational Chatbot as an Intelligent Tutor,» chez *Lecture Notes in Computer Science book series*, 2019.