

Implementation of Voice User Interfaces to Enhance Users' Activities on Moodle

Toshihiro Kita

Research Center for Instructional Systems
Kumamoto University
Kumamoto, Japan
kita@rcis.kumamoto-u.ac.jp

Chikako Nagaoka

Research Center for Instructional Systems
Kumamoto University
Kumamoto, Japan
cnagaoka@kumamoto-u.ac.jp

Naoshi Hiraoka

Research Center for Instructional Systems
Kumamoto University
Kumamoto, Japan
naoshi@kumamoto-u.ac.jp

Martin Dougiamas

Moodle HQ
Perth, Australia
martin@moodle.org

Abstract—Voice user interfaces (VUIs) are effective and intuitive to improve user interaction with various types of information-technology-based systems. VUIs are increasingly becoming suitable for use in various practical applications, e.g., voice-operated smartphones or smart speakers such as Amazon Echo or Google Home. If VUIs, which enable hands-free and intuitive use, become available to a learning management system (LMS) such as Moodle, learning activities on the LMS can be made easier and help motivate the users. In addition, if it is possible to search LMS help documentation by speech via a VUI and listen to the search results, the work efficiency of LMS content creators may be improved. In this research, we have developed a voice app for learners to attempt quizzes on Moodle sites, and a voice app for users to search MoodleDocs (Moodle online documents).

Keywords—VUI, LMS, VLE, MoodleDocs, Smart Speakers, Voice Command, Hands Free Speaker

I. INTRODUCTION

Voice user interfaces (VUIs) allow people to use voice input to control computers and devices. VUIs have advantages over typing, such as faster input speed, hands-free use, and intuitive use [1]. Thanks to recent improvements in the accuracy of speech recognition and synthesis through machine learning approaches, VUIs are rapidly becoming suitable for various practical purposes in devices such as voice-operated smartphones and smart speakers like Amazon Echo or Google Home.

Moodle [2] is a popular Learning Management System (LMS) used around the world. Moodle offers various features to perform learning activities, such as Quizzes and Assignments. Making these features available through a VUI could enhance the functionality of Moodle. Of course, VUIs are essential for blind learners. Apps using VUIs have been developed for several LMSs such as Moodle, which show the submission due dates of assignments or the score of users in courses. However, there are no apps that can be used to perform the learning activity itself via a VUI with an LMS, as far as the authors have examined [3].

Additionally, even if an LMS itself is not equipped with a VUI, searching the help documentation of an LMS by voice commands will be useful when operating the LMS for creating teaching materials, leading to improved operability of the LMS.

II. DEVELOPMENT OF APPS FOR SMART SPEAKERS

In this research, two popular services for smart speakers are utilized for development: Amazon and Google. Tools and documentation for building the VUIs are found for “Amazon Alexa” [4] and for “Actions on Google” [5], which contain several examples and templates for developers to get started quickly with VUI development, including integration of the VUIs with external systems.

With Amazon Alexa, a cloud-based voice service, developers can build and publish Alexa Skills¹ that can be used with Alexa devices such as Amazon Echo smart speakers.

Actions on Google service, in contrast, are for building VUI applications for Google Assistant devices such as Google Home smart speakers.

In this paper, Alexa Skills that can be used with Alexa devices such as Amazon Echo smart speakers, and applications for Google Assistant devices such as Google Home smart speakers, are collectively referred to as “voice apps”.

Google’s Dialogflow [6] provides a voice app development environment based on “Actions on Google” service. An “intent” is a unit which defines how to respond when a user speaks. To define the response, a response string can be directly specified on Dialogflow. Alternatively, the user’s utterance data can be sent to an external service using “webhook” [7] (Fig.1) for processing in order to obtain a response.

The development environment called Alexa Developer Console [8] provided by Amazon Alexa has a structure similar to Dialogflow, but responses at an intent are not specified

¹VUI applications for Amazon products are called Skills.

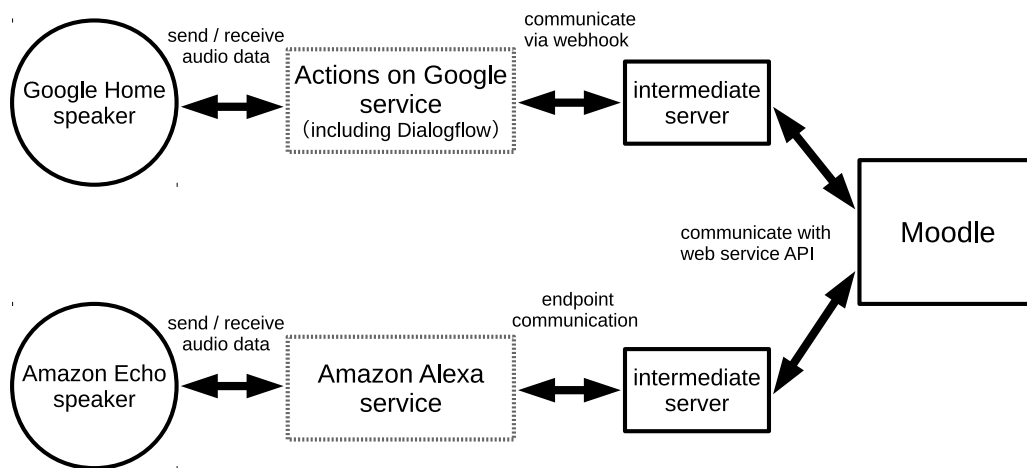


Fig. 1. Smart speakers connected to a Moodle site (Both Google Home and Amazon Echo are supported)

directly on the Alexa Developer Console. An external service (endpoint) must always be called to transmit a user's utterance data and to obtain the result that becomes the response at the intent (Fig. 1).

III. ATTEMPTING QUIZZES THROUGH A VUI

If oral quizzes on an LMS were to be available using a smart speaker placed at home, the learner could attempt the quiz questions more easily than with personal computers and smartphones, possibly triggering the user's willingness to learn. For example, before enrolling in a course or in the early stages of learning in the course, if a "trial quiz" (a quiz that can evaluate the skills to be learned and attract the attention of learners) is provided to learners through smart speakers, learners could quickly grasp what they will learn and what they will be able to do when they complete the course, stimulating their desire to learn.

The voice app developed in this research, which allows students to take quizzes² on Moodle using a VUI, is publicly available as a demonstration command [9]. Any users of Google Home or Google Assistant app can try the voice app by saying "OK Google, talk to Moodle quiz." For Amazon Echo, users can try the voice app by saying "Alexa, open Moodle quiz" after enabling the "Moodle quiz" Skill.

The publicly available version of our voice app works with a fixed user logged in to the demo Moodle course, but the development version uses a feature to link accounts [10]–[12], enabling a connection to any Moodle site and the ability to take quizzes on it by storing the access token for the Moodle site.

The connection between the voice app and Moodle is made possible using the Moodle web services API [13] as shown in Fig. 1. Users' history of quiz attempts is stored on the Moodle site as usual and can be reviewed by each user. To allow learners to attempt quizzes, the voice app uses the functions shown in Table I to communicate with Moodle via REST web

²Currently multiple choice questions are supported.

TABLE I
NAMES OF MOODLE WEB SERVICES FUNCTIONS USED BY THE VOICE APP

mod_quiz_get_quizzes_by_courses
mod_quiz_start_attempt
mod_quiz_get_attempt_summary
mod_quiz_save_attempt
mod_quiz_process_attempt
mod_quiz_get_attempt_review
mod_quiz_get_user_attempts

services. These functions are provided by a vanilla version of Moodle, thus users do not need to install any special Moodle plugins to use the voice app. One of the difficulties we faced in the voice app development was that the data returned by each web service function are intended for displaying purposes, and were not directly usable as the voice app response. To retrieve question texts, or question answers, the question data in HTML format, whose structure was not explicitly documented, needed to be analyzed.

Fig. 2 demonstrates the behavior of a Skill under development on Alexa Developer Console. The learner (right) is shown taking a quiz on Moodle. The score is mentioned and feedback is provided based on the learner's answers.

Currently the supported languages are English and Japanese. The user's language can be set in the smart speaker settings and the Moodle preferences settings. If a quiz needs to support multiple languages based on the users' language settings, quiz questions must be prepared using the format of the multi-language content filter [14].

IV. SEARCHING HELP DOCUMENTS BY VOICE COMMANDS

From the viewpoint of online teaching material creators, LMSs like Moodle have many features. When creating teaching materials, it is often necessary to search and browse documentation about the operation methods and functions, which is bothersome and can hinder the utilization of LMSs.

In this research, we developed a voice app with which users can search the help documentation of Moodle functions and

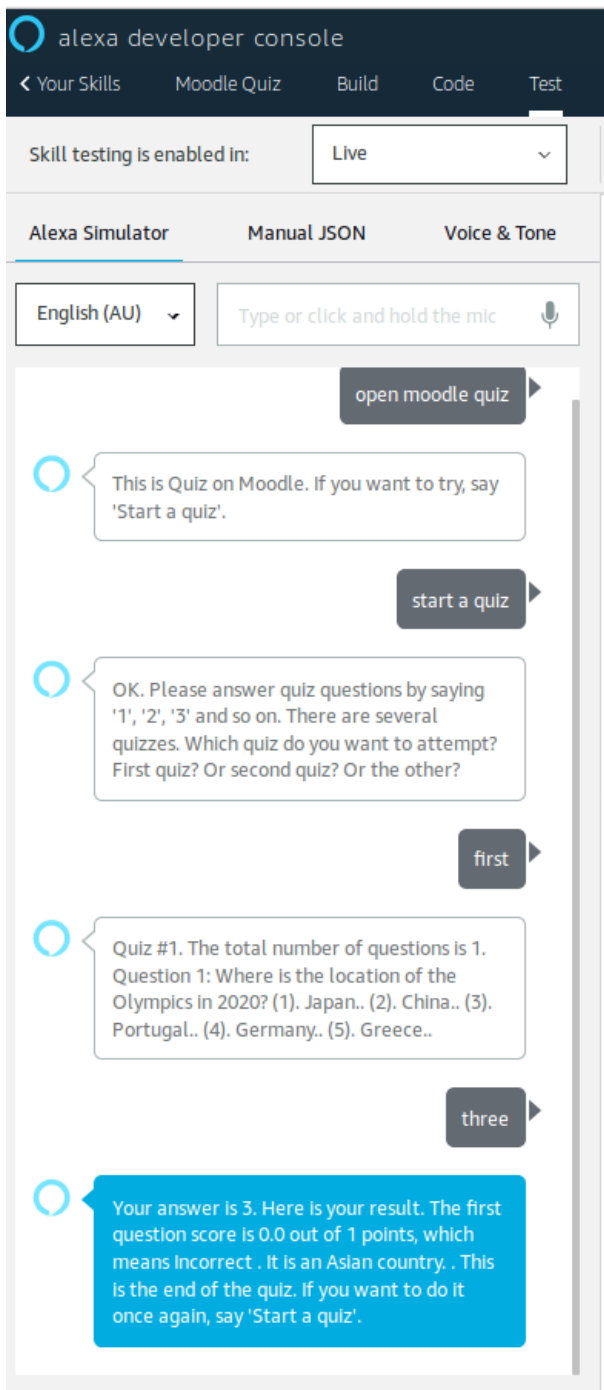


Fig. 2. Example of running Alexa skill "Moodle quiz"

can listen to the result using only voice commands. The voice app is designed to search Moodle help documentation created by translating English MoodleDocs [15] into Japanese³ using the Google Cloud Translation API (mistakes and deficiencies were corrected manually afterwards). MoodleDocs is one of the most popular Moodle online manuals, which is maintained

³Japanese users are the target users in this research. Other languages can also be supported by extending the system in a straightforward manner.

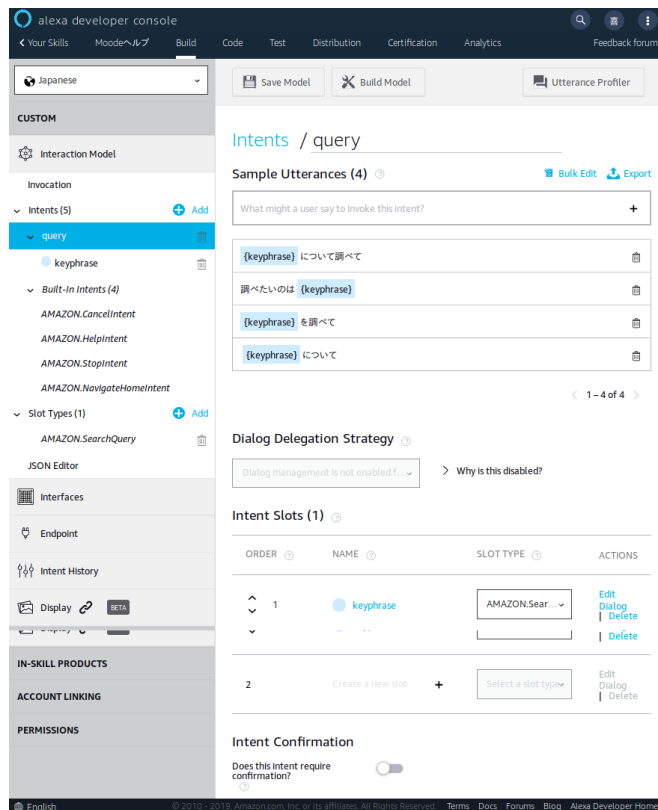


Fig. 3. Alexa Skill development on Developer Console

by Moodle HQ. It covers all the features of Moodle and is used by many as a basic manual to refer to when using Moodle.

Although there is already a Japanese version of Moodle-Docs, like many other versions in other languages than English, the Japanese version is not as rich as the English version and does not cover, in particular, the new features of the latest version of Moodle. For this reason, it was necessary to translate all the pages of English version of MoodleDocs using the machine translation service. The original English MoodleDocs is built on the MediaWiki system, but the archived files [16] retrieved from the system were used for this translation.

Voice apps are typically designed assuming that possible word candidates (personal names, date, city names, etc.) are used in a user's utterance to obtain a part of the user's utterance content as a parameter⁴. However, this voice app needed search terms for searching a large number of documents, meaning that any words or phrases must be obtainable.

Therefore, for the Alexa Skill, AMAZON.SearchQuery was used as the slot type (Fig. 3), and for the intent on Dialogflow, sys.any entity was used (Fig. 4).

Responses must be limited to the amount of information that is necessary and sufficient in order to accurately convey the search results by voice. In addition, a function capable of displaying images and text information in a visual format can also be implemented. From this standpoint, additional

⁴It is also called a slot.

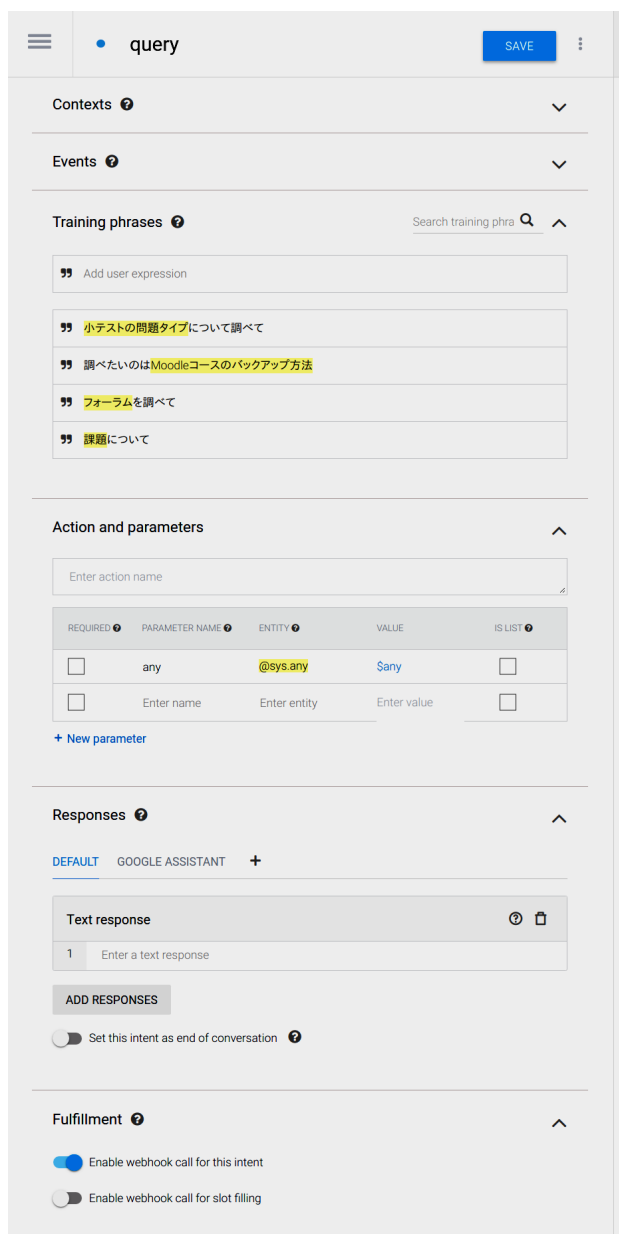


Fig. 4. Agent (voice app) development on Dialogflow

improvements could be made to produce an even more user-friendly voice app.

V. CONCLUSIONS

In this research, we developed functions to take quizzes on a Moodle site and to search LMS manual documentation via a VUI in order to enhance user activities.

Although there are currently few examples of LMSs equipped with VUIs, it is considered worthwhile to practically explore the use value of VUIs as a new channel that strengthens the interaction between LMSs and the users. Implementing a VUI as a user interface requires consideration of how to capitalize on the advantages while being aware of the limitations and drawbacks of a VUI.

Our future plan includes extending the voice app to be able to notify learners and teachers of important activities (such as due or overdue assignments) to support their learning and teaching on Moodle. One possible method is to add web service API support to the Timeline block [17] and a notification feature to the voice app. In addition, more intelligent and proactive support for users can be implemented by importing insight results of Moodle Analytics engine [18].

The authors have joined another research project on implementing a safety education system based on Moodle that is aimed at preventing serious accidents. The VUIs we are developing are expected to play an important role in achieving these aims.

REFERENCES

- [1] Pearl, C. : *Designing Voice User Interfaces*. O'Reilly Media. (2016).
- [2] Moodle.org: Moodle - Open-source learning platform, <https://moodle.org/> (2019).
- [3] Kita,T., Nagaoka,C., Hiraoka,N., Suzuki,K., and Dougiamas, M., : A Discussion on Effective Implementation and Prototyping of Voice User Interfaces for Learning Activities on Moodle, CSEDU 2018, <https://doi.org/10.5220/0006782603980404> (2018)
- [4] Amazon.com: Amazon Alexa, <https://developer.amazon.com/alexa> (2019).
- [5] Google Developers: Actions on Google, <https://developers.google.com/actions/> (2019).
- [6] Dialogflow, <https://dialogflow.com/docs> (2019).
- [7] Create fulfillment using webhook, <https://dialogflow.com/docs/tutorial-build-an-agent/create-fulfillment-using-webhook> (2019).
- [8] Alexa Developer Console, <https://developer.amazon.com/alexa/console/ask> (2019).
- [9] Kita : Moodle Quiz (Actions on Google, Alexa Skill) <https://tkita.net/ai/moodlequizvui.html> (2019)
- [10] Understand Account Linking, <https://developer.amazon.com/docs/account-linking/understand-account-linking.html> (2019)
- [11] Account linking, <https://developers.google.com/actions/identity/> (2019).
- [12] An Alexa Skill for the MMBBS, <https://github.com/jtuttas/alexa> (2019).
- [13] Web services API - MoodleDocs, https://docs.moodle.org/dev/Web_services_API (2019).
- [14] Multi-language content filter - MoodleDocs, https://docs.moodle.org/37/en/Multi-language_content_filter (2019)
- [15] MoodleDocs, <https://docs.moodle.org/> (2019).
- [16] Wimski: Download offline Moodle Docs packages, <https://wimski.org/docs/> (2019).
- [17] Timeline block - MoodleDocs, https://docs.moodle.org/37/en/Timeline_block (2019)
- [18] Analytics - MoodleDocs, <https://docs.moodle.org/37/en/Analytics> (2019)