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Supporting ubiquitous language learning with object and text detection technologies

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Abstract: Learning log is defined as a digital record of what learners have learned in their daily lives using ubiquitous technologies. By using the ubiquitous learning system named SCROLL(System for Capturing and Remining Of Learning Logs), learners can save what they have learned in their daily lives with photo, such as location (latitude and longitude), learning place, and date and time of creation as a learning log. Although learners have many opportunities to learn words and meanings of objects with taking a photo in their daily lives, SCROLL is not implemented functions for supporting language learning with object and text detection. Therefore, this paper proposes a ubiquitous learning system to support language learning with object and text detection technologies.

Keywords: ubiquitous learning, language learning, text and object detection

1. Introduction

In recent years, many researchers in language learning have constructed smart learning environments to support both in-class language learning and out-of-class language learning (Liu et al., 2019, Song et al., 2019 and Hasnine et al., 2019). To construct smart learning environments, it is often considered how recent technologies such as mobile and ubiquitous technologies can support language learning (Mouri et al., 2017; 2018). By using ubiquitous and mobile technologies, learners can actively save what they have learned as learning logs anytime and anywhere.

For example, Wong et al. (2014) reported a learning system called MyCLOUD (My Chinese UbiquitOUs learning Days), which allows students to learn the Chinese language in both in-school and out-of-school learning spaces. Uosaki et al. (2010) reported a learning system called SMALL System (Seamless Mobile-Assisted Language Learning support system) to support Japanese students who aimed to learn the English language in a formal and an informal setting.

In these learning systems, when learners learn objects in their daily lives, they often take photos regarding the objects and save them as learning logs. Learning words with photos is one of effective language learning methods. In the ubiquitous learning, when learners do not know meaning of the object, they often search it via internet or ask other learners or teachers. If providing the word regarding the object of the photo right after taking a photo, the efficiency of the learning can be enhanced. Therefore, this paper proposes ubiquitous learning system to support language learning with object and text detection technologies.

2. SCROLL

SCROLL project has started to support real-life language learning since 2011. SCROLL aims to aid users to simply capture, review and reflect their learning logs, reuse and share the knowledge. To simplify the process of capturing the learning experience in their daily lives, SCROLL provides a

well-defined form to illustrate a learning log. It adopts an approach to share contents with other users based on a LORE (Log-Organize-Recall-Evaluate) model proposed by Ogata et al. (2014). How the model supports each learning process is described below.

(1) Log: learners are likely to face some problems such as how to read, write and pronounce the object in their daily life. Then, they search the details of the object via internet or ask other learners and teachers about it. They can save what they have learned with photo, such as location (latitude and longitude), learning place, and date and time of creation as a learning log as shown in Figure 1.

(2) Organize: When a learner adds a new learning log, SCROLL compares it with his past learning logs and those of other users, categorize it and shows him related the learning logs. By sharing the learning logs as shown in Figure 2, past learning and current learning can be linked and their knowledge will be reorganized and reinforced.

(3) Recall: Learners are likely to forget what they have learned previously. It is necessary to support re-calling their past learning logs. During this learning process, the system support learners to recall what they have learned by using a quiz function (Li et al., 2013; Ogata et al., 2014). The quizzes are created automatically from uploaded learning logs. By answering the quizzes, the learner's knowledge will be enhanced.

(4) Evaluate: It is important to recognize what and how the learner has learned by analyzing the past ULLs, so that he or she can improve what and how to learn in the future. Mouri et al. (2014; 2015a; 2015b) developed an innovative visualization system that implemented Time-Map with network based graph theory to support this learning process. For example, when learners use the visualization system, they can reflect on what and how they have learned based on their past ULLs. It is expected that enhancing learning activities to share and reflect ULLs.

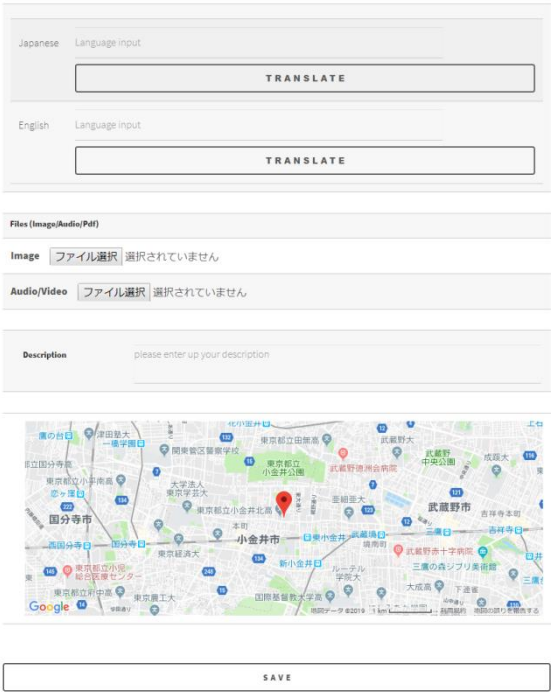

Figure 1. Interface for adding learning logs

Figure 2. Learning logs

3. Overview to support language learning with object and text detection.

As described section 2, learners often search the details of the objects via internet and ask other learners or teachers. To make learners' learning work efficiently, this section describes a method to support language learning with object detection and text detection. Figure 3 shows the overview.

When learners save learning logs with photos, the photo data is sent into cyber space. In the cyber space, our system categorizes whether the images include objects or texts. After categorizing the objects and texts images, the system detects the objects and the texts in the images based on google cloud vision api. After detecting them, the system adds annotations regarding the objects or texts. For

example, when a learner does not know an object (e.g. a folding fan) in his/her photo, he/she uploads the photo into cyber space using SCROLL. Our system detects the object as “a folding fan” and then translate it to the target language (e.g. Japanese: 扇子) that the learner is aiming to study.

In text detection, how does it support learners? For example, when a learner visits places such as temples, shrines and museums, he/she tend to read the sign in front of the artifacts. In most cases, the texts are written in the native language of the country. By using our system, texts shown in their uploaded photos can be detected, and our system translates them into their native language that the learner wants to study. These analysis results are shown in the learner’ web browser.

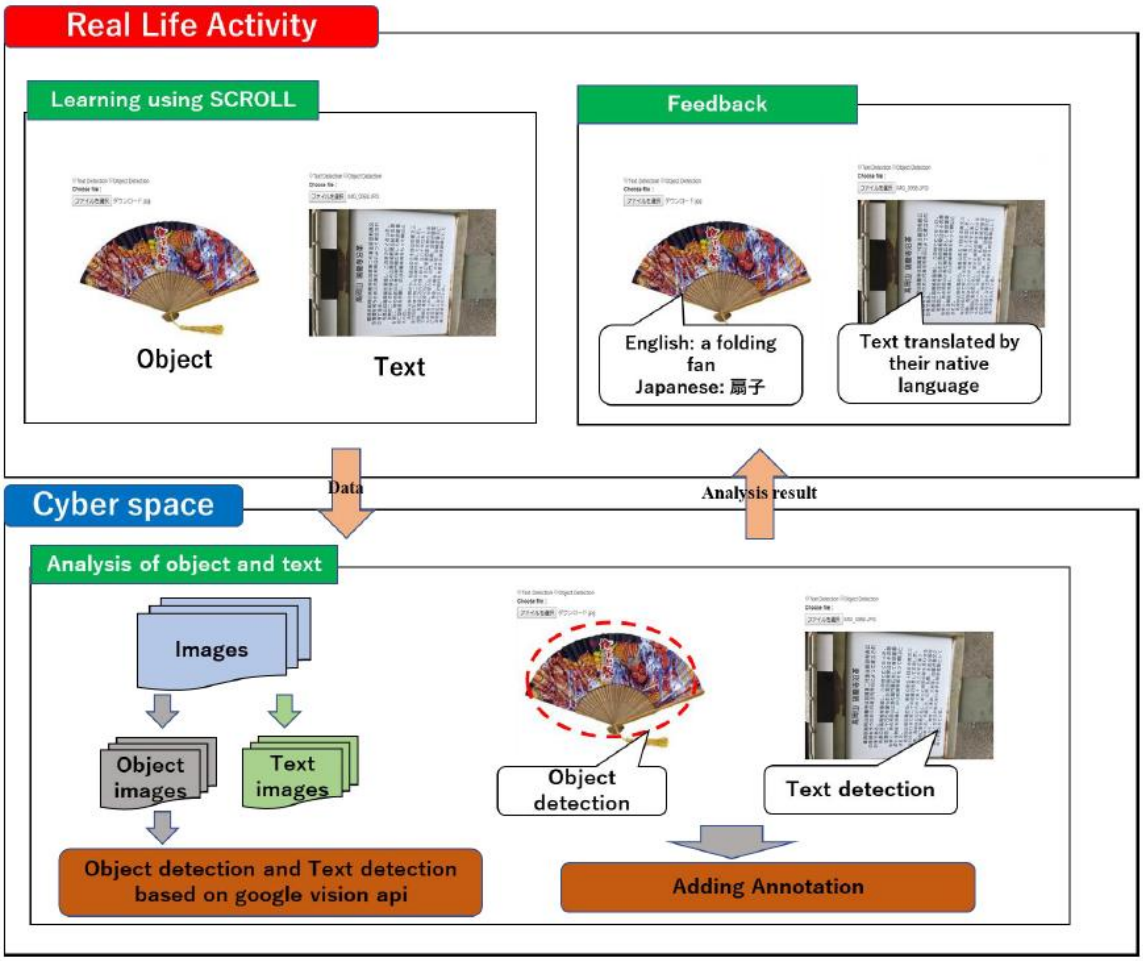

Figure 3. Overview for supporting ubiquitous language learning with object and text detection

4. Implementation

Figure 4 shows the interface for detecting objects and texts by uploading a photo. Firstly, the learner chooses the photo that he/she wants to detect objects and texts. Secondly, he/she chooses object detection or text detection icon.

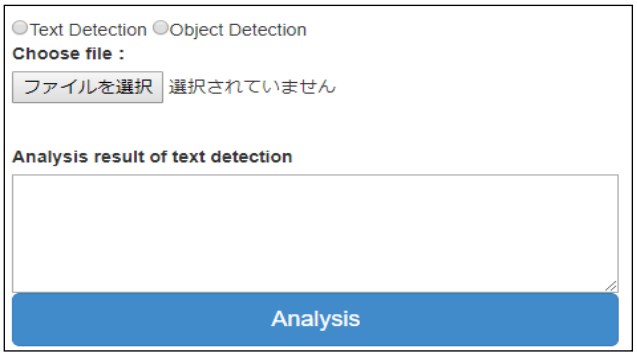

Figure 4. interface for detecting objects and texts by uploading a photo

Figure 5 shows the result of the text detection. This photo is a sign in front of an artifact in a temple. By translating it to their native language, the learner can read and learn the meanings of the artifact. Figure 6 shows the result of the object detection. This photo includes a snake and frog. The table in Figure 7 are displayed in score order based on google vision api calculation. The result shows “serpent”, ”snake” and “Reptile” such as related to the objects “snake” and “frog”. Based on these results, the learner learns the words of the objects in the photo.

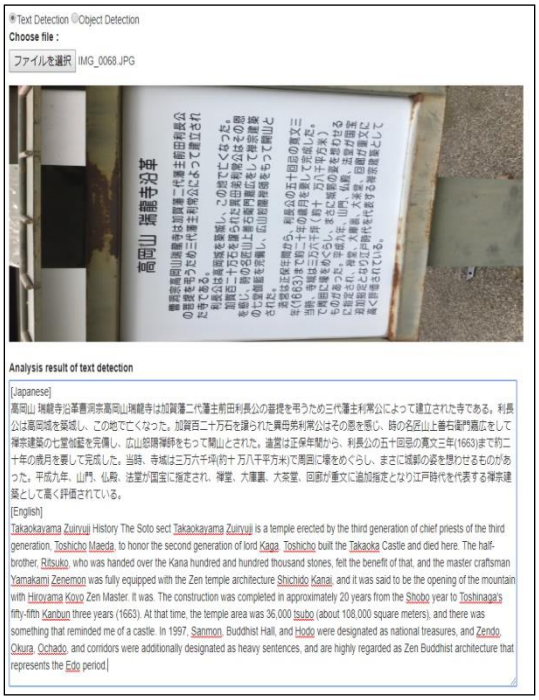

Figure 5. Result of text detetction

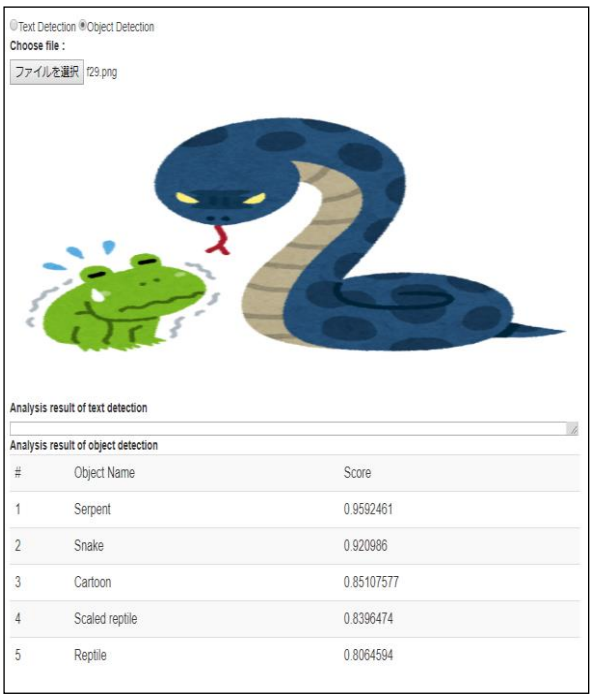

Figure 6. Result of object detection

5. Conclusion and future work

This paper described a ubiquitous learning system to support language learning with object and text detection technologies. To detect objects and texts in photos, this study used google cloud vision api. By this, our system enabled learners to provide the results of text and object detection.

However, it is yet to be evaluated whether these analysis results are effective for language learning and the efficiency of learning can be enhanced. In future work, we will consider to evaluate them.

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