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A Discussion on Web-based Learning Contents with the AR technology and its Authoring Tools to Improve Students' Skills in Exercise Courses

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Abstract: In recent years, use of Web based instruction manuals by using Web browser have been made in Exercise Courses such as practical subjects and exercises. So far, we developed new e-Learning contents for learners by using the AR(Augmented Reality) technology that can instruct to actual equipment and we conducted the evaluation experiment. Results of evaluation experiment was indicated that content is useful for Exercise Courses. However, there is a problem that it is not easy for teacher to create contents when consider using contents in real classes. To solve these problems, we developed authoring tool using the Action- Script3.0 and conducted the evaluation experiment. We developed a new authoring tool using JavaScript and HTML5. Moreover, we improve GUI of authoring tool by using jQuery. In addition, we expand the function by using WebRTC and Google Drive for ease of use.

Keywords: learning contents, exercise courses, AR technology, authoring tool

1. Introduction

In the engineering education field, laboratory courses such as practical subjects and exercises are very important lessons for confirming theories studied. In these courses, use of Web based instruction manuals(Takayama, 2008) by using Web browser have been made in recent years. The Web based instruction manual is containing rich illustration to describe about experiments work. However, there is a problem that it is not easy for some students to associate that web based instruction manuals and real environment(Toguchi, 2010). To solve this problem, we have developed new e-Learning content by using the AR technology(Toguchi, 2010) that can superimpose instructions on actual equipment so far. To use in real classes, teacher need to create new e-Learning content by using the AR technology by describing XML. However, to create the contents going to describe each type of information in XML tags was big burden(Toguchi, 2011). Because teacher must be specified one by one the coordinates of the object to be superimposed and have programming knowledge. Moreover we worked on the development of Authoring tool that can create contents in text input and simple mouse operation in order to easily create contents even unnecessary to write in XML(Toguchi, 2012).

At first, development of authoring tool using the Action Script was developed. Moreover the evaluation experiment of authoring tool is also implemented, content creation can be easily even people that do not have programming knowledge was confirmed. Then the operation has been suggested in real classes by results of the evaluation experiment. Demanded more convenience, and worked on the development of authoring tool able to create content with only a Web browser without relying on plugins such as Flash Player by using JavaScript and HTML5. Moreover, we review GUI of authoring tool by using jQuery. In addition, we improved the function of authoring tool by using WebRTC and Google Drive for ease of use.

In this paper, we report improvement of authoring tool using JavaScript and HTML5 that newly worked on the development.

2. The authoring tool using JavaScript and HTML5

We thought content could be created in a Web browser by performing developed using JavaScript. That it is possible to expand the range of use. We newly worked on the development of authoring tool(Kobayashi, 2013) using JavaScript and HTML5(W3C, 2004). Moreover, it was developed by use of jQuery(Resig, J. 2006). It is a lightweight JavaScript library focused on DOM(Document Object Model) manipulation and change. By using jQuery, can implement the complicated processing by less description. In addition jQuery is a cross-browser, can be used without worrying about the differences between browsers.

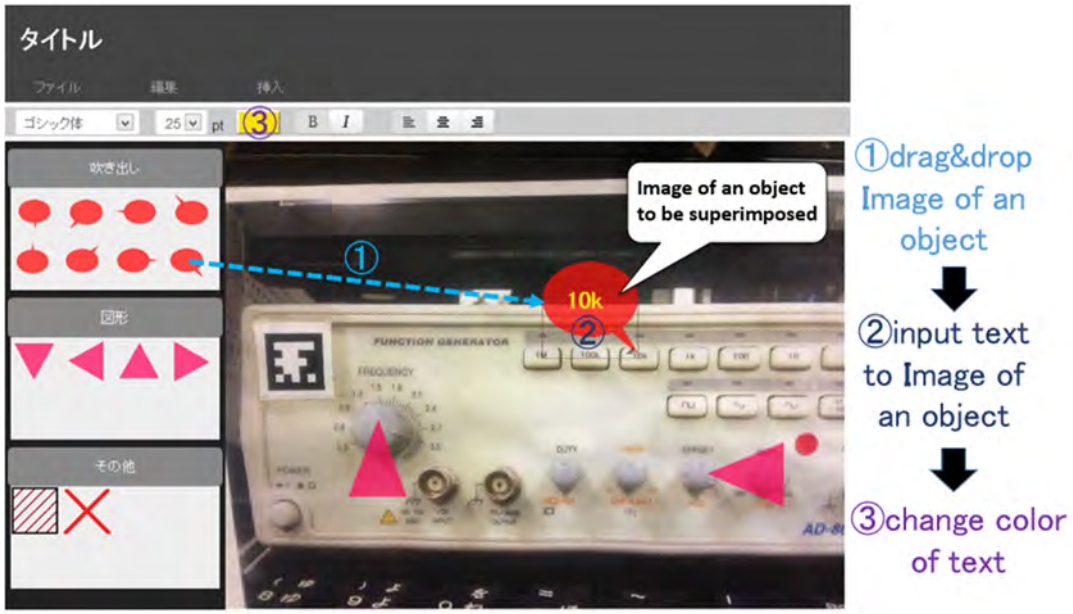

Figure 1. Example of editing a learning content.

In addition, improved this authoring tool by using WebRTC(Web Real Time Communication) (W3C, n.d.). It is one of a framework for the Web application that allows real-time communication on the Web browser. We could be easily used because API such as getUserMedia and PeerConnection has already been prepared. In this way we has been working so far in order to easier to use. Basic functions are the same as authoring tool using Action Script. However, we newly improved the three main functions and tried at the improvement of convenience. Figure 1 is showing edited a learning content actually by placing an object to be superimposed on image of the real environment.

First, ”image read and display function ” was improved the ability of read and display function of the real environment by using WebRTC. Moreover, we improved superposition of instruction tag to allow the real environment of remote location. Next,“ object placement and edit function ”was added newly a format bar to authoring tool using JavaScript and HTML5. Therefore, improved to free formatting from the format bar into the object. In the format

```
<data>
  <annotation step="1">
    <icon>Annotation/images/7.png</icon>
    <content>
      <text size="25"
color="#f6e61e">10k</text>
      <media type="null">null</media>
    </content>
    <position>
      <x>111.6</x>
      <y>13.3</y>
      <z>0</z>
    </position>
    <size>
      <width>100</width>
      <height>100</height>
    </size>
  </annotation>
      .
      .
```

bar can be set font-size, font-color, bold, italic and input text start position. In the format bar, can set font-size, font-color, and bold, italic and text-align. Therefore, it has become possible to Figure 2. Figure 1 of XML file created.
edit the object freely than authoring tool using Action Script. Finally, "Content output function" was improved to be able to save the Cloud storage using Google Drive(Google, 2012). It is a cloud storage service provided free of charge up to 5GB by Google. By saving in Google Drive, it can access the files from environment connected to the Internet. In addition, it was becomes possible to share and edit jointly. Figure 2 is showing output XML file from Figure 1.

3. Conclusions

In this paper, we reported authoring tool using JavaScript and HTML5. We expanded the function of this authoring tool by using a variety of techniques. At first, we improved GUI of this authoring tool by using jQuery. User can be used regardless of the type of Web browser in the device of user because jQuery is a cross-browser. Second, we developed to allow reading the real environment of remote location by using WebRTC. Third, user was able to save the Cloud storage by using Google Drive. User can access the files from environment connected to the Internet and becomes possible to share and edit jointly. For these expand of functions, this authoring tool became easier to use.

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