Development, Deployment and Evaluation of the Content Management System Generating CG Animations Automatically from Blog Entries

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Abstract

There is a wide variety of information on the Internet, and it is vital to organize and disseminate the information that people want to know based on this information. Expressing the data in a way that people can easily understand is an important task for the media. We have developed a system that automatically converts WordPress blog entries into CG animations. By incorporating the required functionality into a WordPress theme, users can choose this theme and build a blog where readers can watch CG animations instead of reading blog entries. CG animation is created by TVML (TV Program Making Language) technology that enables to create a TV program-like animation with CG characters with synthesized voices, image data display, sound playback, and superimposing, etc. In addition to contributing to the WordPress community, which is expected to be an auxiliary function of blog services in particular. It may also function as a production tool for creating various types of CG animation, not just blog support. In this research, we have developed a functioning software application working on a PC and an Android hand-held device to visualize the blog entries. the WordPress is specifically used for our purpose as the blog system in this research. We successfully showed this in several exhibitions and also conducted a web survey to evaluate the system. This paper describes the proposed system in detail and the evaluation test.

Keywords: Blog, CG animation, TV production tool

1 Introduction

There is a wide variety of information on the Internet, and it is vital to organize and disseminate the information that people want to know based on this information. With the development of the media, a large amount of data has been stored and it has come to be called big data. Expressing the data in a way that people can easily understand is an important task for the media.

As part of digital journalism, we are advancing research and development to create CG animations from blog entries [1] automatically. With this technology, users can watch the blog entry in a TV-news manner instead of reading it. This approach may have the potential to allow users to easily and comfortably understand the blog contents. And also this could be beneficial to visually impaired people. The web browser has a feature that automatically reads the text out loud for visually impaired people. In our system, the text is spoken like TV news with subtitles to help even for hearing impaired people understand the content. We think there is a need to develop this visual representation system of blog articles on the Internet that people with and without disabilities could see the same contents together.

In our system, it first fetches the HTML data of the blog entries from the Internet server, then processes it by using web scraping technique to extract necessary information (article title, text body, picture data, etc.) for the auto-generating CG animations. The information is then visualized by using TVML (TV program Making Language) technology [2] to output the TV-like CG animations with CG characters speaking with synthesized voices and other necessary visual effects such as subtitles, superimposing, image file displays, background music playback, etc.

We have developed a functioning software application working on a PC and an Android hand-held device to visualize the blog entries. This time the WordPress is specifically used for our purpose as the blog system. We successfully showed this in several exhibitions and also conducted a web survey to evaluate the system. This paper describes the system in detail and the evaluation test.
2 Related Work

Some attempts have been made to acquire text information such as websites already existing in large quantities on the Internet to make CG animation automatically.

2.1 Automatic Generation of TV Show Animations from Web Sites

The automatic generation of animation is one of the broad topics in the field of computer graphics. There are many types of expressions in animation, but the automatic generation of story animation is another challenge. Story animation requires a chronological storyline. It is still challenging to create a TV show like animation by the novice user because it requires knowledge of lighting, camera switching, and the studio set, etc. that are used in professional video production or a broadcasting station. To support the creation of it, the technology that enables to create a TV show like CG animation automatically from a text-based document has been developed [1, 2]. Nadamoto and Tanaka tried to convert web content into various types of story animation using TVML [3]. Nadamoto made a mechanism to define unique XML tags to the HTML of the Website and automatically convert the content of the site into a TV program produced by CG.

2.2 Generating News, Talk-show, Dialog Animations

In professional broadcasting stations, there are many examples of content produced by using CG announcers. An attempt was made to specialize in news programs [4] by limiting the target news websites and automatically convert them to news CG programs. As a relatively successful example, an attempt is made to automatically generate a CG talk-show program from an Internet forum [5]. Those two above use TVML as a visualizing tool however, Ullrich uses Multimodal Presentation Markup Languages 3D (MPML3D) [6, 7] that they developed to generate a dialog style animation with two characters by converting a dialog text into an MPML3D script. MPML3D has a similar concept to TVML. MPML3D focuses on how to control an agent’s interaction, and TVML focuses on how to mimic the current TV show format. Piwek et al. proposed a method for generating dialogues from monologal text using its rhetorical relations [7]. In their proposed system named T2D (Text2Dialogue), two virtual agents then speak the obtained dialogue text to make the output animation attractive.

2.3 Purpose of Our Development

Many attempts have been made as described above, but we have built an overall system for visualizing blog articles with CG animation, and actually deployed this on the Internet. For that purpose, we selected WordPress as the blog system, ensured the consistency of animation conversion (will be discussed in the next chapter), used TVML for animation, and made it possible to give visual variation to the production. Then, an evaluation experiment was conducted on this deployed system to investigate its usefulness.

3 Overview of the Method

Here, we describe our approach to automatically generate CG animation from blog entries.

3.1 System of Making Animations from Blog Entries

Figure 1 shows the configuration of the CG animation auto-generation system. The system applies a Web scraping technique to the HTML of the blog entry to extract the title, the main text, and the image URLs. It then generates a TVML script based on the obtained data and converts it into a TVML script. The TVML engine then playback the obtained TVML script to visualize it to get the TV-program-like CG animation with computer graphics and other techniques.

We have already developed the said system for general blog sites, but there are the following problems.

• We need to prepare a Web scraping method for each blog site.
• If the blog owner changes the CMS (Content Management System) unexpectedly, it will not work anymore.

This problem needs to be resolved in order for our system to be practical. The problem solving is described in the next section.

3.2 Examining Animation Making Method Using Blog Entries

There are three possible ways to solve the consistency problem mentioned in the previous section.

(1) To collaborate with the blog system operator to keep the consistency of automatic visualization.
(2) To provide an external plugin capable of converting the blog post to automatic visualization.
(3) To provide a fixed blog system that is designed for automatic visualization.

Each of these has its advantages and disadvantages, which are discussed below.

(1) Partnership with the blog operation company

Method (1) is to collaborate with the operator of the blog system in some way so that the automatic imaging algorithm is not affected when the blog system is updated. This is a reliable method, and it keeps the automation consistent, but of course,
you have to be correctly partnered with the operator company. Also, it is not easy to get them to make changes to their blog system in a stable partnership in the future.

(2) Plugin functionality
Method (2) is to allow users to change the HTML/TVML conversion plugin to adapt to the new blog site. Whenever the specification of the HTML structure of the blog changes, someone should create a new conversion plugin so that the user can replace it. It is not a perfect method, but it is practical as long as the plugin provider is active. This method has the potential to open up the new world for the general public so that anyone can create plugins and promote the automatic visualization of not only blogs but also news and information sites and other sites. But, obviously, if there is no developer or volunteer to update the plugins promptly, the automated application would easily become obsolete and not function.

(3) Utilized blogging system
The method in (3) is to design a fixed blog system that has the functionality of performing the HTML-to-TVML conversion. In order to make such a blog system, the system itself needs to be freely modifiable by us. This means it should not be a commercial blog system, however, there are many open-source blog systems available so that those can be used for our purpose.

After comparing the above three, we have decided to use the method (3) that we provide users a CMS capable of CG animation automatic conversion. This time we have picked up WordPress as the CMS which has the highest market share in the world. We create and supply a special theme of WordPress for CG animation generation. Adopting this method, it has the following benefits.

1) CG animation auto-generation is always guaranteed.
2) It leads to contribute to WordPress community
3) Embed special functions to the WordPress, such as, for example, an animation playback button on a blog entry to facilitate users.
4) The blog system could be used for other purposes, such as, for example, a user interface of CG animation generation.

4 Method of Auto-generating CG Animation by WordPress
In this chapter, we describe the details of the automatic video generation system with WordPress.

4.1 WordPress Theme and Web Scraping
In general, CMS has “themes” that package the appearance design and functions of the blog so that users can choose and apply them for their blogs. In WordPress this theme has its source code and specifications open to the general public, and you can create and publish your own theme. This means we can create a special theme for automatic visualization, then users will be able to automatically visualize their blogs by selecting this theme for the targeted blogs.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;article&gt;</code></td>
<td>Multiple articles, with each article enclosed in an <code>&lt;article&gt;</code> tag</td>
</tr>
<tr>
<td><code>&lt;h2&gt;</code></td>
<td>Extract the entire text with the dive-tag, and then extract the text and images for each paragraph with the following p-tags, a-tags and img-tags.</td>
</tr>
<tr>
<td><code>&lt;div</code> class=“entry-content”“&gt;`</td>
<td>If the extracted text contains HTML tags, delete them. It also detects punctuation and reading in a paragraph and divides the text into appropriate lengths.</td>
</tr>
<tr>
<td><code>&lt;p&gt;</code></td>
<td>If it is combined with an img tag, it is an image. Get the URL of the value of the href attribute.</td>
</tr>
</tbody>
</table>

In our development, we used an official theme named “Twenty Fifteen” provided by the WordPress community. The theme is written in PHP, and you can see and modify the source code in the administration screen. In this study, we read the PHP source for the theme “Twenty Fifteen” and found that certain tags were used to indicate the title, text body, and images, so we used them as they were and did not modify the PHP source itself. Table 1 shows a set of tags for web scraping of “Twenty Fifteen.”

4.2 TGPlayer
We have developed an application named “TGPlayer” working on a Windows PC or an Android device with Unity Game

Figure 2 Screenshot of TGPlayer
Engine. TGPlayer implements the full functions performed by web scraping, TVML script generator, and TVML engine (see Figure 1) described in section 3.1. The web scraping module works in a way described in the previous section and the TVML script generator generates a TVML script from the title, text, and image URLs extracted from the web scraping. This module determines the show format of the TVML program video. Specifically, this module specifies the opening title, studio set, what to use for the CG characters, camera angle, superimpose design and display location, how to display the images, and so on. And finally the TVML script is played back by the TVML engine to generate the final TV-like CG animation.

When the application is launched, it reads the initialization file, accesses the URL of the blog, retrieves the article and shows the CG animation. In addition, a real-time digital clock is displayed at the upper left corner of the screen to give the impression of a broadcast television program. Figure 2 shows a screenshot of the output of TGPlayer.

5 Blog Entry system for TGPlayer
This section describes how to deploy and operate the WordPress blog with TGPlayer.

5.1 Deployment of WordPress Blog
We have installed WordPress version 4.8 on an experimental rental server. The following two blog sites for English and Japanese are set up.


WordPress supports multiple languages, so you can easily switch between Japanese and English in the blog settings. By using the same WordPress theme for both sites, you can make the conditions exactly the same. As mentioned in Section 4.1, we use the official theme “Twenty-fifteen”.

Creating a blog post is the same as the normal WordPress method. This time, we have registered multiple users as “Editor” privileges so that multiple blog authors can update their blog posts. The authors with editor privilege can freely post, edit, and change articles, but they cannot change the blog structure itself, such as changing the theme or updating WordPress or the theme version. These can only be done by a user with “Administrator” privilege. This way the authors can freely update their blogs without affecting the functionality of automatic animation production.

5.2 Creating a Blog Post
When writing an article in WordPress, first enter the title and then the body of the article. You can insert the image into the text if you want. When the blog is visualized, it switches from a studio shot to a full image shot at the position where the image was inserted, as shown in Figure 3. In that state, the text in the paragraph after the image is read aloud. Then, at the beginning of the next paragraph, the full image shot returns to the studio shot, and the CG character reads the paragraph in front of the camera. The authors will write the blog manuscript with the above mechanism in mind. If the sentence in a paragraph is too long, the system will automatically break it into shorter sentences using punctuation and commas.

5.3 Automatic Visualization with TGPlayer
Those who watch the blog with CG animation use a PC or Android smartphone or tablet. In advance, download and install the application from the download section of the blog site. When you start TGPlayer, the screen shown in Figure 2 opens. You can switch between Japanese and English blogs with the send button at the bottom. Alternatively, if you register three or more blogs, you can switch between them one by one. Below the playback screen, the blog posts registered on the site are listed in order from the latest one. Each button on the list display a thumbnail

Figure 3 Displaying an image in blog

Figure 4 A blog post and visualized animation
image and the title of the article, which a user can select and click to start playing back. When the article finishes playing, it automatically moves to the next article playback and loops.

In this way, the user can “watch” the blog entry instead of reading it. Figure 4 shows a blog post on the web browser and the visualized animation of the post. And you can see various examples of playback animations in Figure 5.

6 Experiment and Evaluation
This section describes how to evaluate an automated blog viewing system using WordPress blog with TGPlayer.

6.1 Experiment Setup
In order to use the content of the blog as close to the real world as possible for the evaluation of the system, we decided to experiment with the articles of the blog that are already in operation. As a target, we used the blog of the Faculty of Media Studies, Tokyo University of Technology (TUT blog: http://blog.media.teu.ac.jp/). This blog uses Cocolog (operated by NIFTY Corporation), not WordPress, so we cannot just apply our system to this blog. Therefore, we moved the articles of TUT blog to the built WordPress blog semi-automatically to conduct the experiment.

In our previous research [8], we have developed a method to shorten sentences of blog articles with different lengths to a certain length used in a TV news program using natural language processing. It automatically generates a summary of a blog article and keeps it to a certain number of characters. This time, we used this method to create the experimental WordPress article by the following steps.

1) The target blog posts are compressed to 200 characters by automatic summarization method.
2) Image URLs are extracted automatically using HTML tags.
3) Manually enter the obtained 200-character summary and the images into the WordPress blog to make an article. For the English version of the blog, we used a Japanese blog article translated by machine translation.

We have selected 25 articles from the one-year posts from September 2019 to put them in the WordPress blog. This input took about an hour. The Japanese text was translated automatically, and we did the same process for the English blog.

6.2 Evaluation
Usefulness of Our System:
In the experiment of creating CG news programs generated from the university’s public relations blog, we found that the operation was smooth, and the automatic visualization with TGPlayer worked without any problems. By using WordPress, automatic CG animation generation is always guaranteed. We also noticed that this blog’s automated visualization system could be used in reverse as a user interface to generate any required CG animations. When the system was demonstrated at multiple international conferences, many visitors were impressed by the novelty of the idea of “watching a blog as a TV program,” and the great potential was highly evaluated.

Evaluation Test and its Results:
Using the blog visualization system constructed this time and the content of the article on the university public relations blog explained in Section 6.1, an evaluation experiment was conducted by a Web survey. In order to carry out this survey, 5 articles were selected from the 25 articles mentioned in Section 6.1. The participants were given five blog articles on the Web browser and a 6-minute video of the visualized five articles made by capturing the TGPlayer. Google Forms with 5-step Likert-scale was used.
Q1. Do you think CG news can be used instead of reading blogs?

For the survey, in addition, we divided the participants into two groups according to whether the blog article presentation or the CG video presentation came first, and having the same number of people perform it to minimize the influence caused by the order. There are three survey questions:

Q1. Do you think CG news can be used instead of reading blogs?
Q2. How effective is CG news in understanding the content of blog posts?
Q3. How appropriate would it be if CG news could replace blog?

Also, at the end, a free text box is setup to ask them to enter comments with the text of “Please write down why you chose to answer and what you noticed.”

Fifty-five participants answered the survey. The results of the subjective evaluation for the three questions are shown in Figures 6, 7, and 8. A score of 5 means “very good” and a score of 1 means “very bad.” Figure 6 shows the results of the reaction to the difference between reading an article and seeing and hearing it in a video format. As the figure shows, it is divided into two parts, “it is better to read” and “it is better to watch the video,” and the shape has less center. Figure 7 shows a straightforward distribution with an average score of 3.57, showing that participants responded that CG news was a little bit easier to understand than blog posts. Figure 8 shows the results of replacing CG news with a blog post, showing the same trends as Q1. It is divided into good and bad reactions in terms of the replacement with CG news.

Based on the above results, the degree of completion of CG news is generally considered to be good based on the result of Q2, but there are disagreements as to whether it is better to read the blog or to see and hear it in the video. This probably indicates that there are strong advantages and disadvantages for each. It is also possible that there are differences depending on the individual nature of the subject and its environment. The above consideration can be known more concretely from the comments given by them. This will be introduced in the next paragraph.

Comments from participants:
The comments obtained were categorized into CG news and blogs. Furthermore, each of them was classified into those that described its advantages and the time required to understand the contents. Furthermore, regarding CG news, there were the comments on the quality of CG, so it was classified as a different category. The following is a list of typical comments according to the above classification.

(1) Comments on CG News
a) Advantage
   - News is easy to understand because they read it out loud.
   - Video has an impact on people.
   - CG news techniques are easier to understand because you can adjust the images’ timing for the viewer to see as you describe them.

b) About time for understanding
   - CG News felt like a long restraint.
   - CG News is constrained in the time it takes to listen.
   - Video takes more time to read the information instead of getting an accessible overview.

c) About CG movie
   - I’m concerned about text-to-speech errors.
   - An announcer’s lip-syncing and other animation quality is low.
   - Difficult to hear with the synthetic voice of CG news.

(2) Comments on Blog post
a) Advantage
   - A blog post allows to understand the content of the article faster than CG news.
   - Easy to actively gather information
   - Blogs are better in terms of “seeing what’s interesting”.


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6.3 Discussion
This sub-section discusses the results, referring to the survey result and the free comments shown in Section 6.2.

Figure 7 of the result of Q2 shows a clean distribution, and the mean value of 3.57 is mostly reliable, indicating that CG news appears to be effective a little above the norm. Thus, the next question is whether this CG news can replace the blogs.

This was asked in Q1. And two peaks are observed in the result shown in Figure 6, indicating that it is not possible to determine whether the participants thought that it could be replaced or not. Looking at the comments from participants, there are two opinions: one is that CG news is easy to understand because they read it out loud with necessary images, and the other is that reading the blog text is easier and convenient to understand the content. One of the reasons for this result may be that Q1 contains two criteria, those are “watching CG news” and “reading blogs”. This might be the problem in formulating Q1 including the expression “reading blogs”.

However, Q3, which directly asked whether CG news could be a substitute for blogs, also has two peaks shown in Figure 8. As a result, we can say that Q1 and Q3 are asking the similar question. In addition, CG news and blogs have their own advantages and disadvantages and those are complementing each other. Thus, it is not possible to decide which is better than the other.

In conclusion, we found that CG news generated from blogs has the advantages and disadvantages depending on the person or situation. This means that by reducing those disadvantages, we would be able to improve the automatic generation of CG news.

7 Conclusion
We have proposed and developed a system that allows users to view blog posts like TV news programs. WordPress is used to construct this special blog site and a user who wants to view the articles uses TGPlayer which is an application that we developed working on a user’s PC or Android device. When blog users use this system, a specified blog theme needs to be used for the visualization. This makes it possible to view blog posts in animation with a CG character spoken by synthesized voice with subtitles, image file display, playback of music, etc. This paper describes the details of this system and the evaluation experiments conducted on general users. From the above, the following results are obtained.

1. A blog system for automatic CG animation conversion was designed and actually demonstrated by using real blog articles.
2. Usefulness of viewing with CG animation was confirmed. However, there were some opinions in our experiment that it was easier to read the blog than CG animation. This suggests that it should be operated in consideration of the use case.
3. Contributed to the community as a new way to use WordPress.

Future issues and prospects are as follows.
1. Instead of using the theme “Twenty Fifteen” as it is, we should modify the PHP source code and insert some unique identification tags for more advanced automatic visualization, then create the new theme which is exclusively used for automatic visualization.
2. We currently use a standalone TGPlayer, however, the CG animation playback should have been made within the blog web page for user’s convenience.
3. For users who want to create CG animations, we can provide special WordPress themes prepared in advance for the use in creating news programs, language education programs, debate show programs, etc., and develop them as an animation production tool.

References