A Support System for Designing Camera Blocking of Battle Scenes in Robot Anime

Abstract

Japanese robot animation has a long history and many masterpieces have been produced. Robots in the anime have important roles for showing deep storytelling and unique drama. A “battle scene” which visualize a combat against one or more opponents is one of the most important factors of modern robot anime. In this paper, we propose a support system for designing a camera blocking of a battle scene in the robot anime. We have extracted 2531 shots in battle scenes in 10 existing robot animation works and classified them by 17 items such as robot’s action, camera movement and shot size. The users can browse classified scenes and their detailed information on camera work and camera blocking stored in our library system, and use desired one as a reference when they draw their original battle scene. Experimental results show that our system is useful for the user without production experience, and facilitates drawing a camera blocking of the battle scene.

Keywords: CG / Robot Animation / Battle scene design / Camera work and Composition

1. Introduction

Robot (mecha) anime which features robot in battle is one of the most popular genres in Japanese anime. The series of manned robot started in 1970s and many masterpieces gained great popularity around the world. In these robot anime, “battle scene” which usually features a fight against opponent robots is an important factor affecting the popularity of that anime. A battle scene is composed by large number of shots with complicated camera switching for producing the powerful actions of robots. Therefore, elaborate design based on the intentions of the director is necessary to build these scenes.

Previous research about camerawork and lighting technique do not focus in camera blocking. Investigation about camera blocking is required for the battle scene which contains a lot of shots and special film transition such as wipe used to show a robot and its pilot at the same time.

The purpose of this study is to provide a support system for battle scene design. We extracted every battle scene and shot in 10 famous robot animation works. Then extracted scenes and shots are classified based on the scene situation, the robot action, the information on camera work and composition. Finally, we build a system combined with a battle scenes library containing camera blocking that enables easy retrieval of the user desired scene by robot action.

2. Related Work

Kanematsu et al.\cite{1} has analyzed existing 3D computer graphic animation works and proposed a retrieval system combined with a digital library of typical camera work and composition for the unit of shot. The shot stored in the library are tagged by the direction of camera movement, technical terms in cinematography such as pan and...
3.2 Classification of Scene Information

We created records consisting of the following 17 items for each extracted scene. Previous research on lighting technique\cite{4} shows that using the keywords which describe the situation instead of technical terms in cinematography is helpful when the user searches the information on directing. We achieve search without technical terms by classifying the battle area, battle scale and the situation of the battle. Table 1 shows a record of the battle scene shown in Figure 1.

(1) Scene number
(2) Title
(3) Episode
(4) Scene length
(5) Amount of shots in this scene
(6) Battle area; the area where the battle takes place. We categorize areas into the ground, the air, the space and the indoors according to the robot anime which was chosen in this research. Furthermore, the battle area may change during one scene. For example, the battle area can be changed from the air to the ground. In this case, we recorded it as “Exchange” within the details.
(7) Amount of machines
(8) Main machines
(9) Behavior of main machines
(10)Purpose of main machines
(11)Sub machines
(12)Behavior of sub machines
(13)Purpose of sub machines

However, shot-by-shot analysis is not enough when considering the battle scene because one action may be composed of a sequence of shots. For example, the action of “shooting an opponent” can be divided into four shots; “holding a gun”, “pulling the trigger”, “a bullet is fired”, and “the bullet hits the opponent”. Therefore, we made not only shot-by-shot analysis but scene-by-scene analysis. The information on camera blocking can be obtained from the result of scene-by-scene analysis.

3. Analysis of Existing Works

We analyzed 10 existing robot anime features manned robot with high sales such as “Mobile Suit Gundam SEED”, “Neon Genesis Evangelion” and “Fafner in the Azure: Exodus” to extract common directing techniques necessary to design the camera blocking of the battle scene. First, we extracted 73 battles scenes and made records of scene information. Then, we analyzed 2531 shots extracted from battle scenes to obtain information on camera work. Both pieces of information are organized and put into our battle scene library.

3.1 Extraction of Battle Scene

Based on Kaneko’s rule for scene transition\cite{3}, we defined the battle scenes as scenes contains robot’s attacking action. Switching of scenes occurs by jumping in time and shifting focus between characters.

With the above conditions, we have extracted the battle scenes and made records of the scene information. Figure 1 shows an example of a battle scene. The scene contains the information on battle areas, such as the ground or the air, the battle scale which indicates the magnitude of battle, battle situation, behavioral patterns of robots and characters, fighting abilities of robots and characters, and stories for showing what happened in this battle scene.

Figure 1. An example of a battle scene ©XEBECzwei, FAFNER EXODUS PROJECT, MBS

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3.4 Classification of Shot Information

In this research, we focused on actions and poses of the characters, location of a battle scene in the shot and composition of shot with camera work. These three elements are important for the shots constituting battle scene. Therefore, we created records consisting of the following 17 items for each extracted shot. Some items are classified into categories as the classification for scenes, so that the user can search using the keywords describes the situation to obtain a set of directing information.

(1) Shot number
(2) Title
(3) Shot length
(4) Amount of robots
(5) Main object; a robot or a character the camera is focusing on. We also defined his/her role in the story as the following six roles based on Kaneko’s definition of character roles[5].
(a) Protagonist
(b) Protagonist’s robot
(c) Antagonist
(d) Antagonist’s robot
(e) Cooperator
(f) Cooperator’s robot
(6) Action of main object; the action which robot or character are carrying out in a shot, classified into the following 11 actions.
(a) Standing
(b) Move
(c) Attack
(d) Transform
(e) Hutten
(f) Evade

3.3 Shot Extraction from Battle Scene

In this paper, a shot is defined as a short sequence from the beginning of camera rotation path to the end of it. We divided the battle scene into a set of shots by using movie editing software (Figure 2).

Table 1. An example of a battle scene record

| Item                     | Details                                      |
|--------------------------|----------------------------------------------|
| Scene number             | SC-FFN-2                                     |
| Title                    | Fafner in the Azure: Exodus                  |
| Episode                  | episode 9                                   |
| Scene length             | 35.94s                                      |
| Amount of shots          | 16                                           |
| Battle area              | Exchange → from the air to the ground        |
| Amount of machines       | More than 5                                 |
| Main machines            | Fafner Mk.Sein                              |
| Behavior of main machine | Battle                                      |
| Purpose of main machines | Beat enemy                                  |
| Sub machines             | Fafner Mk.VIII, Fetum                       |
| Behavior of sub machines | Battle                                      |
| Purpose of sub machine   | Invade the base                             |
| End of the scene         | Enemy was beaten down                       |
| Battle scale             | Grand battle                                |
| Situation                | Reversal                                    |
| Story                    | Hero machine intervened in the battle area as reinforcements, and wiped out the enemy at once. |

Figure 2. Extraction process of shots
(g) Defend
(h) Return
(i) Confirming the information
(j) Communicate/Corresponding
(k) Rescue

(7) Action details of main object; specific action such as shooting and close combat.

(8) Pose of main object

(9) Sub object; robots or characters appearing in the shot but out of focus.

(10) Action of sub object

(11) Action details of sub object

(12) Pose of sub object

(13) Stage of the shot; the following five areas to which “cockpit” was added to four areas defined in the scene information.

(a) Ground
(b) Air
(c) Space
(d) Indoor
(e) Cockpit

(14) Camera’s motion path; camera movements classified into the following 8 types defined by Kanematsu et al. [9].

(a) Approaching; when the camera is approaching to the objects from the initial position.
(b) Back-type; when the camera is going back to the objects from the initial position.
(c) Panning; when the camera is going side by side with moving objects.
(d) Semicircle; when the camera is circling around objects.
(e) Revolving; when the camera is going around to objects and returns to the initial position at last.
(f) Rising; when the camera is moving from bottom side of objects to their upside.
(g) Dropping; when the camera is moving from upside of objects to bottom side.
(h) Fix; when the camera is not moving.

(15) Camera angle; the camera angle of the main object.

We defined the following three camera angles according to Sijil [6].

(a) High angle; when the camera has been set on the upside of the main object and look down at the main object.
(b) Medium angle; when the camera has been set on the eye level of the main object.
(c) When the camera has been set under the upside of the main object and look up at the main object. We recorded it as “Low angle”.

(16) Shot size; the size of main object in a shot. In this research, the shot size was classified by the following 8 categories described in video production handbook [7].

(a) Long Shot
(b) Full shot
(c) Knee Shot
(d) West Shot
(e) Bust Shot
(f) Up Shot
(g) Close-Up
(h) Detail

(17) Story of the shot

3.5 Classification Result

Figure 3 shows an example of a shot and Table 2 shows a corresponding record. We found some trends about how to describe robots’ action within a shot from the number of shots included in a category. Here we show typical situations and corresponding shots of shooting action and close combat action.

As illustrated in Figure 4, robots are shooting with diffusion-type weapons or throwing-type weapons such as missiles and javelins. We compared 231 shots of shooting action, and found 183 shots are where the camera or the object itself is backed for a feeling of increasing the weapon’s size as a trend of projectile shooting action.

Figure 3. An image of a shot © Sunrise, MBS, Project Valvrave
result, we found that there were 139 shots that show the size of the robots’ parts or weapons are increased during the shot and there are 112 shots used west shot for showing subjects shot size. So, we found there is a trend that the size of the robots’ parts or weapons is usually increased and the west shot are usually used in the close combat.

4. Retrieval System with Digital Library

We propose a retrieval system with battle scene library in which the user can search for reference information required to design camera blocking of battle scenes. Users can search both scene information and shot information by the categories which were recorded in Chapter 3. These pieces of information were saved as a XML file, and can also be read through our search interface implemented using JavaScript.

Our system has two interface for scene information and shot information. Figure 8 shows a search interface for battle scene. The user can search for scene information by using the keywords of categories, and can also obtain the details from search result as shown in Figure 9.

As illustrated in Figure 10, the interface of the shot information is the same as the one for the scene informa-
Step 1: We briefly explained the participants how to use our camera blocking library in the form of a lecture.

Step 2: We presented one original story about fighting robots, and let them think about the scene structure.

Step 3: The participants design a camera blocking of given story by using our system. We counted the number of shots that were designed and how long it took for them to complete the camera blocking. A short questionnaire asked participants to rate our system.

5.2 Experimental Results

Table 3 shows the time required to complete the camera blocking and Figure 12 shows an example of camera blocking designed by a participant.

The inquiries show that each of the evaluators replied “useful” as the evaluation of our system. We also re-
ceived some comments about the system such as “It is interesting to search the information about the robot animation’s battle scenes and I can make a storyboard simply by understanding the process of the battle with this system.” and “It is useful to amateurs who without the experience of the robot animation, I’m really expect the evolutionary system which can be used in the production.”.

Table 3. Results of the experiment

| Tester | Time     | Amount of shot |
|--------|----------|----------------|
| 1      | 37m09s   | 19             |
| 2      | 33m21s   | 17             |
| 3      | 39m57s   | 21             |
| 4      | 33m49s   | 23             |

5.3 Discussions

These results and evaluations suggested that our proposed system can help the users create scene structure and shot design more efficiently although they are no experience about robot anime production.

6. Conclusions

The purpose of this study was to create a support system for designing battle scene structures. We therefore classified and analyzed scene characteristics as well as shot information in order to find the trends about camera blocking, camera work and composition in the robot anime production. We also made a library for classifying the behavioral patterns of robots and characters to be able to create a supporting system that can help to create battle scenes by using this information. Experimental results suggest our system makes user without an experience of battle scene production to design the camera blocking of a given story.

Additional user experiments by participants with different skills are required to improve our system from a broader perspective. Further studies for the 3D robot anime may extend the library and enables a wide range of the shot simulation.

Reference

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