

## Utilization of Base Model to create 3D Mobile Game Character

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**Abstract.** Along with development of mobile devices, mobile games contents which include a number of 3D Graphic Assets are actively being produced. Among 3D mobile games, ones in the RPG genre are characterized with numerous character contents in the gameplay. This study is to analyze the structure of character shapes appearing in 3D mobile games which include a large quantity of game characters and to propose how to apply Base Model and Base Texture in the process of Modeling and Texturing, the key elements in producing characters.

**Keywords:** 3D Mobile Game Character, Base Model, Large Quantity Character of Regular Shape

### 1 Introduction

As ICT (Information and Communications Technologies) environment has expanded and the number of smartphone users has increased, domestic market for mobile games has been steadily grown and the mobile game market is increasingly paid attention to which content is consumed the most by smartphone users [1].

With improvement of mobile devices' performance (such as three dimension acceleration chip), existing 2D casual mobile games have evolved to 3D mobile ones produced which are comparable to PC platform-based ones [2, 3]. Recently released 3D mobile games are characterized by a large quantity of characters in the gameplay structure [4]. Characters in 3D mobile games which include a number of characters are mainly in the form of Super Deformed (SD hereafter) and SD characters are used in casual style games and low-polygon is used, which provides development environment where diverse patterns of gameplay can be put into mobile games [5].

The number of personnel to develop a mobile game is mainly of 6 to 7 and it takes 7 to 8 and 2 to 3 months on average respectively in case of a large work game (large-scale game) and a small work game [6]. In spite of the short period of production compared to that of PC online games or video games, mobile ones should produce a large quantity of typical characters and game assets in a short period of time while maintaining the same quality. Thus, for the game assets drawn by different developers

to be consistent, detailed design on work process and various techniques for data optimization are required [7].

Among various games that have recently been raised as issues, this study is to analyze character structure (modeling & texturing) in 3D mobile games in which a large quantity of game characters appear and to propose Base Model and Base Texture for producing a number of typical game characters.

## 2 Analysis of Large Quantity 3D Mobile Game Character of Regular Shape

Around 'Seven Knights', 'Touch Monsters' and 'SD Gundam Battle Station', the mobile games which are recently released and rank high in the game chart with more than 200 SD characters within, this study examines and analyzes their character shapes [8]. These games are mainly in RPG genre and the big part of gameplay is fostering and collecting characters, which is directly associated with profit model as well. Compared to genres such as mobile arcade and puzzle, RPG seeks for long-term service. In addition to developing various play modes, it regards continuous update of new characters as an important factor. These 3 games subject to the case study also have developed and updated new characters consistently [9-11].

As a result of examining 1,259 characters in the 3 mobile games, they are classified into 2 major categories. Similar Shape (S\_Shape hereafter) is of characters with body structure of the same proportion but with different costumes and gear while Equivalent Shape (E\_Shape hereafter) is of the same character with differences in costume color or texture. In other words, regarding S\_Shape, changes of shape is properly added on each character for its characteristics on 3D Modeling, the common ground for character modeling while E\_Shape is to alter Texture which serves as a base and to express as suitable texture for each character's costume, weapon and accessory without changes on character shapes for it has the same modeling structure.

Table 1 shows the percentage of S\_Shape characters in Seven Knights and SD Gundam Battle Station. More than 50% of the entire characters are of S\_Shape. As shown in Figure 1, polygon structure of character's faces and the proportion of upper and lower body is similar in case of Seven Knights only with difference in structure of the gear worn they wear. In case of SD Gundam Battle Station, it is shown that characters are formed as 2 types of S\_Shape (Gundam Type : 55.3%, Zaku Type : 36.4%).

**Table 1.** The Proportion of S\_Shape in Seven Knights and Gundam Battle Station

Character classification	Seven Knights	SD Gundam Battle Station
S_Shape	193 (50.8%)	119 (55.3%)
		78 (36.4%)
Exceptional Shape	187 (49.2%)	18 (8.3%)
Total Number of Character	380 (100%)	215 (100%)



**Fig. 1.** S\_Shape Character in Seven Knights and SD Gundam battle Station

Table 2. shows the variation range and percentage of E\_Shape characters in Seven Knights and Touch Monsters.

In case of Seven Knights, it is more than 63.9% to make characters of 3 types using E\_Shape and as to Touch Monsters, it is 49.1% to produce characters in 6 or more types. As shown in Figure 2, it is specifically seen to make characters into different ones only by changing the texture on the same Shape and these characters are clearly distinguished by attributes such as level and ability on character system. E\_Shape is made into different characters only by changing texture color or detail on the same Base model and texture structure. Therefore, compared to S\_Shape which entails additional changes of character's Base model, E\_Shape can shorten the time period for production for its higher data reusability.

**Table 2.** The Proportion of E\_Shape in Seven Knights and Touch Monsters

Character classification	Seven Knights	Touch Monsters
E_Shape	2 type variation	12 (3.2%)
	3 type variation	243 (63.9%)
	4 type variation	24 (6.3%)
	5 type variation	35 (9.2%)
	6 type over variation	66 (17.4%)
Exceptional Shape	- (0%)	24 (3.6%)
Total Number of Character	380 (100%)	664 (100%)

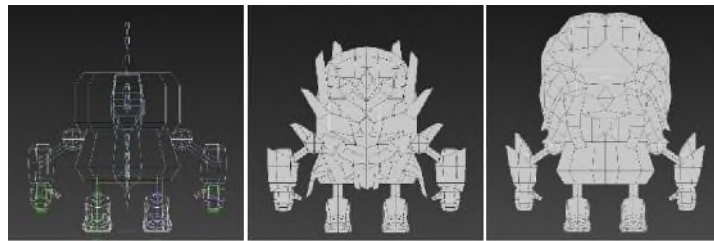


**Fig. 2.** E\_Shape Character in Seven Knights and Touch Monsters

### 3 Base Model and Texture

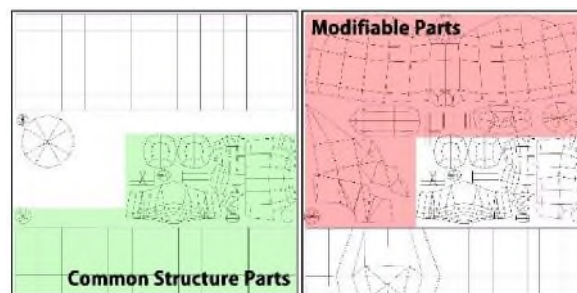
Examine the case studies and it enables application on the process of Modeling and Texturing of a large quantity of characters by making Base Model suitable for various character types (S\_Shape and E\_Shape). This study suggests how to actually make Base Model and Base Texture in the process of making a 3D character and to utilize the aspects for reusability. Base Model is made into a form which includes UV and Bone Setup as a shape before modifying character Mesh suitable for the concept and Base Texture is produced by organizing each Color's Layers based on UV Layout produced on the Base Model.

Upon making S\_Shape, its efficiency can be improved by dividing Body Structure of Mesh which composes a character into Base Parts which are Head, Body, Arm and Legs and repeating simple modifications on each Part suitable for changes on them. In this process, performing Bone Setup work required to character's animation beforehand and composing along with Modeling saves modification work which is to be necessary for discrepancy in character's size since each character's Bone Unit Set can be shared among developers. In addition, the working time can be greatly reduced for there is no need to repeat Rigging which is required upon finishing the work.



**Fig. 3.** The results using Base Model applied Bone Setup

Figure 3 is a S\_Shape type produced by performing Bone Setup on Base Model in advance and adding simple modifications on Polygon based on both character's concepts. In addition to the form of Head, Arm and Body parts are added to make different shapes of character.



**Fig.4.** Base UV applied UV layout

UV Layout can also be included in modeling process. Body Structure can be arranged as it is divided into Base Parts. By separately arranging Parts which are commonly used and modifiable ones as shown in Figure 4, the working time and confusion resulted from developers' arbitrary Layout production (size of each part and arrangement) can be reduced. UV Map unitedly arranged can also be produced as Base Texture.

The issue that can be raised upon making Texture is that great inhomogeneity can be incurred when Shadow and Highlight expression is differently applied to every character. Therefore, it is necessary to decide colors of Shadow and Highlight for Parts commonly used on the Base Texture and save and share them as Layer of PSD (Photoshop Document). Developers can give a sense of unity on various textures by changing Base Color only.



**Fig. 5.** PSD layer, Base Texture and Applied texture

As shown in Figure 5, 4 Layers of Base Color, Highlight, Shadow and Deep Shadow are organized to compose Base Texture. Character Texture can be produced without inhomogeneity by filling up colors to areas set on each Layer. In case of Base Texture, it is more effective to E\_Shape type. When UV Layout or Shape is not of significant difference, however, it can also be reused in case of S\_Shape type.

## 4 Conclusion

This study analyzes a large quantity of typical characters appearing in 3D Mobile RPG games and proposes how to use Base Model and Base Texture upon developing them. Reusability aspects are taken into account in making Layer so that Mesh structure, Bone setup and UV of Model which serve as the Base can be built and Texture can also be reused. If character developers research on concepts of characters in a game and build Base Model prior to this process, issues such as Unit size set up which can be incurred upon production or Skinning work on finishing phase can be more effectively settled and inhomogeneity of Texture, the most important factor in group work, can be removed.

Along with development of mobile devices, 3D mobile games will include a great deal of contents. Compared to other genres, mobile games of RPG genre in particular have a wider sort of characters and backgrounds to compose game contents. Applying the production method suggested by this study will effectively reduce the time period through optimization of working process.

## References

1. Jeon, J.: Impact of social networks on the social network game property characteristics: in the Mobile Game. Journal of the Research Institute for Global Management of Technology for Catching Up (GMOT). Vol.4,pp.131-157 (2014)
2. Jeong, K.: Future Direction of Mobile Game Market according to the Advance of Mobile Device Capability. In: Journal of Digital contents Society. Vol.11, No.4, pp.495-501 (2010)
3. Chehimi, F., Paul C., Reuben E.: Evolution of 3D mobile games development. Personal and Ubiquitous Computing Vol.12, No.1, pp.19-25 (2008)
4. Chou, J. C., Hung, C., Hung, Y.: Design factors of mobile game for increasing gamer's flow experience. Management of Innovation and Technology (ICMIT), 2014 IEEE International Conference on. pp.137-139 IEEE Press (2014)
5. Shen, L. T., Luo, S. J., Huang, C. K., Chen, B. Y.: SD Models: Super-Deformed Character Models. Computer Graphics Forum. Vol.31, No.7, pp.2067--2075 Blackwell Publishing Ltd Press (2012)
6. Yu, S.: Mobile Game Market and Development Trend. Journal of Korea Information Processing Society. Vol.9, No.3, pp.42-48 (2002)
7. Ko, B., Kim, S.: The Study about The Manufacturing Environment and Developing Process of Mobile 3D Game. Journal of the Korea Contents Association Vol.1, No.1, pp.23-30 (2005)
8. <https://play.google.com/store/apps/category/GAME/collection/topgrossing>
9. <http://www.netmarble.net/mobile/sknights>
10. <http://www.netmarble.net/mobile/monster>
11. <http://www.patigames.com/games/21>