Proceedings of the 12th International Conference on Music Perception and Cognition and the 8th Triennial Conference of the European Society for the Cognitive Sciences of Music, July 23-28, 2012, Thessaloniki, Greece
Cambouropoulos E., Tsougras C., Mavromatis P., Pastiadis K. (Editors)

# Emotional Features of Musical Pieces for a Series of Survival-Horror Games

Ryo Yoneda,[*1] Kohta Matsumoto,[*2] Shinya Kanamori,[*3] Masashi Yamada[*4]

[*]*Graduate School of Engineering, Kanazawa Institute of Technology*

[1]*r_yoneda@venus.kanazawa-it.ac.jp,* [2]*kit6101396@venus.kanazawa-it.ac.jp,*

[3]*bu-bu-0224@jupiter.kanazawa-it.ac.jp,* [4]*m-yamada@neptune.kanazawa-it.ac.jp*

## ABSTRACT

In recent years, the hardware and software of video games has substantially developed. This led to rapid increase of the cost and time for creating high-quality contents for a video game. Therefore, once a game title sales successfully, producers tend to make that title into a series, because the content can easily recover the cost of development. However, it is rare for the original creators of a series to stay with it all the way through its life span, because game creators tend to switch companies frequently. In the present study, emotional features of musical pieces composed for Capcom's survival–horror title "Resident Evil," in which seven titles were released in the last 16 years, were rated using 24 semantic differential scales. The results showed that the emotional features of the musical pieces were constructed by "pleasantness" and "excitation" axes. On the two dimensional emotional plane, musical pieces were plotted for each title. The results of the distribution of the musical pieces were consistent for five titles. This implies that the musicians and sound engineers retained the original emotional features of musical peaces through at least five of the titles.

## INTRODUCTION

Since the very first video game "Odyssey" was constructed in 1972, the hardware and software of video games have substantially developed during these four decades. This led to a rapid increase of the cost, time and human resources for creating high-quality contents for a game title. Therefore, once a game title sales successfully, producers tend to make that title into a series, because the content can easily recover the cost of development. For example, Capcom Co., Ltd. released seven titles in the survival-horror game series, "Resident Evil" in the last 16 years. However, it is rare for the original creators of a series to stay with it all the way through its life span, because game creators tend to switch companies frequently. This was true for the music creators of the "Resident Evil" series, which retained none of the original members.

Tsukamoto, Yamada and Yoneda (2010) investigated the emotional features in game music, using 100 musical pieces. They revealed that the emotional features of the game music were illustrated by a two-dimensional plane which was spanned by "pleasantness" and "excitation" axes. Hevner (1936, 1937) plotted eight clusters of adjectives in a circle for measuring emotion in music. Russell (1980) showed that the emotion is illustrated by a circumplex model, which is spanned by "valence" and "arousal" dimensions. Russell's circumplex model showed a consistent configuration of adjectives with Hevner's clusters. The two-dimensional plane of game music, Tsukamoto *et al.* showed, was in principle consistent with Hevner's and Russell's models. And the "pleasantness" and "excitation" axes, as Tsukamoto *et al*. showed, corresponded to "valence" and "arousal" axes, respectively.

In the present study, emotional futures of musical pieces composed for "Resident Evil" series are determined, and the pieces are plotted on the emotional plane spanned by "pleasantness" and "excitation" axes for each title in the series. Then, the configurations for different titles are compared to reveal whether the emotional futures of the pieces for the original title are retained through the series or not.

## EXPERIMENT

Since the original title "Resident Evil" in 1996, Capcom released seven titles, not including spin-off titles, by 2011. These titles are listed in Table 1. Capcom released a box set of six CDs, which contained 270 musical pieces used in "Resident Evil", "Resident Evil 2", "Resident Evil 3: Nemesis", Resident Evil Code: Veronica", "Resident Evil 0" and "Resident Evil 4". It was difficult to rate emotional features for one piece, because it was too short. Then excluding this piece, 269 pieces were provided for the experiment. Capcom provided all of 86 musical pieces which were used for "Resident Evil 5" for the experiment. These 355 pieces, with 24 pieces of game music Tsukamoto *et al*. used, in total 379 pieces were used in the present experiment as stimuli.

Fifteen students from the Kanazawa Institute of Technology, ranging from 21 to 24 years old, participated in the experiment as listeners. The listeners listened to each of the 379 pieces and then rated the emotional features of them. In one trial, a listener was presented a piece through STAX Lambda-pro headphones. The listener was not allowed to rate while a piece of music was presented. After the piece was finished, the listener rated the emotional features of it using the 24 seven-step bipolar scales listed in Table 2, *e.g.*, "very cheerful", "fairly cheerful", "slightly cheerful", …, "very gloomy". The order of the scales was determined in a random order for each combination of piece and listener. The play time of the pieces ranged from one to eight minutes. The order of the pieces was determined in a random order for each listener. The whole experiment was divided into nineteen sessions. Each session included twenty pieces. A 10-minute rest period divided the sessions. The listening level was varied with pieces ($L_{Aeq}$ = 63 - 82 dB). Each listener participated four to five sessions a day and finished the whole experiment in a week.

## RESULTS AND DISCUSSION

Numbers -3 to 3 were given for each of the seven categories on the SD scales. The mean value was calculated from the listeners' responses for each combination of scale and stimulus. Then factor analysis was performed for these mean scores with the principal factor method and varimax rotation. The results showed that the two-dimensional space accounted for 80 % of data variance. Table 2 shows the resulting factor loadings for the 24 SD scales. The two dimensions were labeled "excitation"

and "pleasantness" respectively, after the scales showing high loadings on the dimensions. These dimensions are consistent with the dimensions Tsukamoto *et al.* showed. Moreover, the "pleasantness" and "excitation" axes corresponds well to the two dimensions in Russell's and Hevner's models.

The pieces were plotted on the "excitation – pleasantness" plane. Each panel in Fig. 1 shows the distribution of musical pieces on the plane for each title. Figure 1 shows that the distributions are consistent except for three titles: "Resident Evil 0", "Resident Evil Code: Veronica" and "Resident Evil 5". For four titles, "Resident Evil", "Resident Evil 2", "Resident Evil 3: Nemesis" and "Resident Evil 4", the pieces are divided into two clusters. In one cluster, pieces are distributed around an "unpleasant" position. These pieces were used in the scenes when battling with creatures or zombies. In the other cluster, the pieces distributed around a "pleasant and calm" position. These pieces were used in the "saving data", or "relaxed state" scenes after the battles. In the case of "Resident Evil 5", a small cluster exists around a "pleasant and exciting" position, other than the two clusters. "Resident Evil 5" included many mini games and the pieces in this cluster were composed for these mini games. Therefore, excluding mini games, the distribution of "Resident Evil 5" is, in principle, consistent with "Resident Evil", "Resident Evil 2", "Resident Evil 3: Nemesis" and "Resident Evil 4".

In the case of "Resident Evil 0", two clusters fused into one cluster, and in the case of "Resident Evil Code: Veronica", it had a lot of "pleasant and calm" pieces in comparison with the other titles. These results were discussed with a sound engineer at Capcom. He revealed that "Resident Evil 0" and "Resident Evil Code: Veronica" were deliberately constructed a different way from the other titles in the "Resident Evil" series.

These characteristics described above are summarized in Fig. 2. The results described above showed that the musicians and sound engineers retained the original emotional features of musical peaces through at least five of the titles.

In the next step the correlation between tempo and emotional features is investigated. It is well known that the degree of excitation in music deeply correlates with tempo, *i.e.*, a fast tempo results in an excite emotion and, *vice versa*. Therefore, tempo of each piece was measured in BPM (beats per minute), then using the tempo as a dependent variable with factor scores on the "excitation" and "pleasantness" dimensions as independent variables, a multiple-regression analysis was performed. The resulting coefficient of determination was smaller than 0.5. This implies that the emotional feature for video-game music cannot be simply explained only by the "tempo" parameter.

## CONCLUSIONS

In the present study, it is shown that the emotional features of the musical pieces used in "Resident Evil" series were constructed by a plane which was spanned by "excitation" and "pleasantness" axes. On the two dimensional emotional plane, musical pieces were plotted for each title. The results of the distribution of the musical pieces were consistent for five titles. This implies that the musicians and sound engineers retained the original emotional features of musical peaces through at least five of the titles.

## REFERENCES

Tsukamoto, M., Yamada, M., & Yoneda, R. (2010). A Dimensional Study on the Emotion of Musical Pieces Composed for Video Games, *Proceedings of the 20th International Commission for Acoustics* (pp. 1-3). Australia: Sydney Convention Centre.

Hevner, K. (1935). Expression in music: A discussion of experimental studies and theories, *Psychological Reviews, 42*, 186-204

Hevner, K. (1937). The affective value of pitch and tempo in music, *American Journal of Psychology, 49*, 621-630

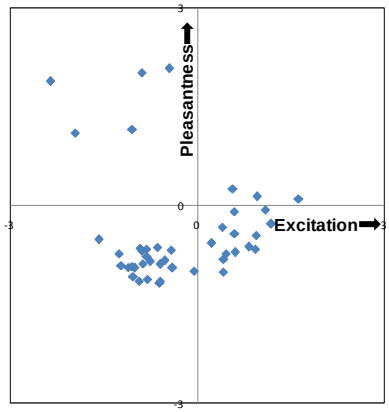
J. A. Russell, "A circumplex model of affect," Jour-nal of Personality and Social Psychology, 39, 1161-1178 (1980).

**Table 1 Number of pieces for each title used as stimuli.**

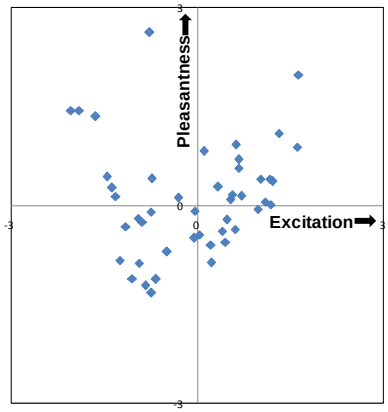
| Title | Number of pices |
|---|---|
| Resident Evil | 44 |
| Resident Evil 2 | 35 |
| Resident Evil 3: Nemesis | 42 |
| Resident Evil Code: Veronica | 46 |
| Resident Evil 0 | 70 |
| Resident Evil 4 | 32 |
| Resident Evil 5 | 86 |

**Table 2 Semantic differential (SD) scales and factor loadings of them.**

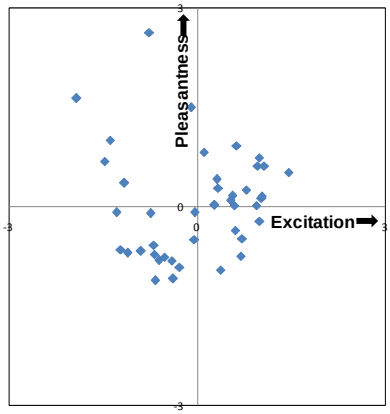
| SD scale | | | Factor | |
|---|---|---|---|---|
| | | | Excitation | Pleasantness |
| Gloomy | - | Cheerful | 0.489 | 0.701 |
| Calm | - | Agitated | 0.910 | 0.041 |
| Feeble | - | Majestic | 0.839 | -0.001 |
| Powerless | - | Powerful | 0.942 | -0.135 |
| Neat | - | Mixed | 0.757 | -0.432 |
| Soft | - | Hard | 0.837 | -0.186 |
| Restless | - | Tranquil | -0.917 | 0.084 |
| Dull | - | Delightful | 0.449 | 0.837 |
| Unimpressive | - | Impressive | 0.474 | 0.592 |
| Relaxed | - | Tense | 0.638 | -0.693 |
| Cold | - | Warm | 0.253 | 0.806 |
| Tight | - | Loose | -0.867 | -0.035 |
| Light | - | Heavy | 0.488 | -0.748 |
| Dirty | - | Clean | -0.287 | 0.832 |
| Fuzzy | - | Brilliant | 0.061 | 0.921 |
| Varied | - | Monotonous | -0.497 | -0.172 |
| Bright | - | Dark | -0.229 | -0.931 |
| Unexcited | - | Excited | 0.960 | 0.104 |
| Slowly | - | Speedy | 0.879 | 0.205 |
| Uncute | - | Cute | -0.337 | 0.892 |
| Strong | - | Weak | -0.945 | 0.050 |
| Humble | - | Showy | 0.897 | 0.351 |
| Unpleasant | - | Pleasant | 0.070 | 0.949 |
| Sordid | - | Fresh | -0.392 | 0.847 |
| Contribution Rate | | | 0.446 | 0.354 |



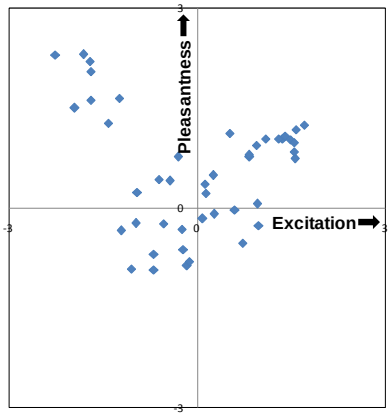

(a) Resident Evil



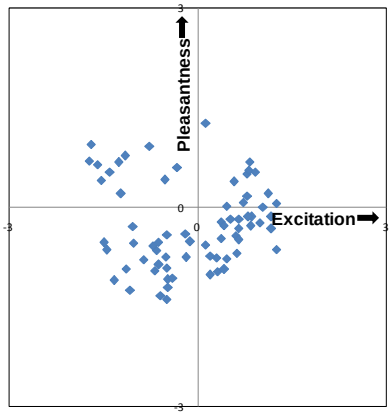

(b) Resident Evil 2



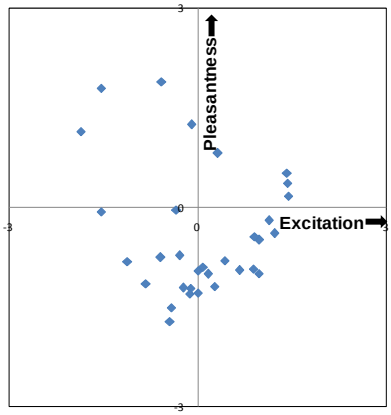

(c) Resident Evil 3: Nemesis



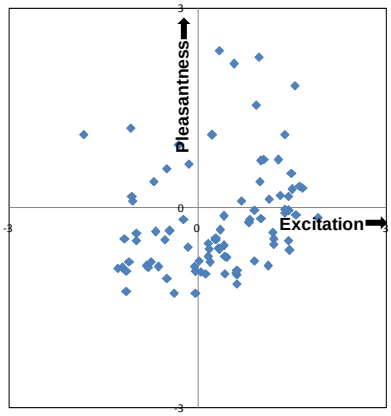

(d) Resident Evil Code: Veronica




(e) Resident Evil 0




(f) Resident Evil 4




(g) RESIDENT EVIL 5

**Figure 1 Distribution of musical pieces on the emotional plane for each title in "Resident Evil" series.**

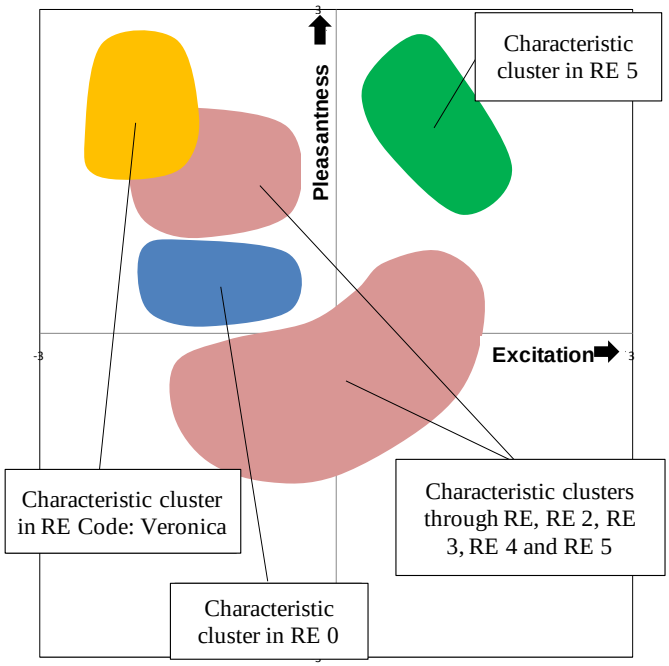



**Figure 2 Characteristic clusters appeared in each title in "Resident Evil" series.**