Support System for Exercising Guitar Chord Performance

Mai Udagawa , Aiko Uemura and Tetsuro Kitahara [*]

Nihon University
udagawa@kthrlab.jp, {uemura, kitahara}@chs.nihon-u.ac.jp

The exercise of chord performance is essential for mastering guitar playing. There have been numerous studies on systems that support learning guitar playing. Yousician is the popular application that makes it easy to practice guitar playing [1]. There is a problem as to whether the beginners have confidence in the finger position by imitating the model example. So developed a musical performance support system using computer graphics (CG) [2]. Since these are not mentioned in the evaluation of the user's performance sound, Shimoo et al. investigated acoustic features suitable for automatic evaluation of guitar performance [3]. This is not a support system and only analysis of sound.
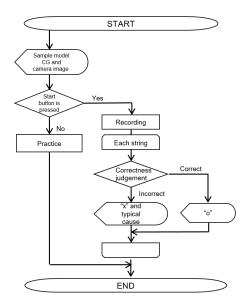
We propose a novel system that the position of the finger is shown as CG and evaluates the user's performance automatically. It is desirable to allow the user to play the guitar correctly by supporting considering both the example model and performance sound in the system. Fig.1 shows the processing flow. First, our method demonstrates how to press strings for C major chord with CG. Then, the user plays the chord for each string according to the instructions. Finally, the system presents judgment result for each string and the typical cases are shown in case of incorrect. Fig.2 is an example of displaying an error. The explanation includes the finger angle, the pressed position, the strength of the holding and whether the user plays a string which is not necessary. The following four patterns are displayed: "Let your fingers stand firmly." "You are weak in strength, let's press strongly." "Is the place to hold it correct?" or "Do you play the 6th string?" The demo video is referenced from the link [1].

We evaluated 100 acoustic signals by 10-fold cross-validation to evaluate the performance of automatic correctness judgment. Table 1 shows Percentage results of 10-fold cross-validation. The results show 90% for first to third strings and 85% for fourth and fifth strings.

We also evaluated our proposal system by three participants. First, they played the C major chord (first trial), then practiced for 15 minutes. After the practice, they played one stroke again. They repeated the exercise and stroke two times (the second and third trial). We record their sounds during the performances through all prosecution. Table 2 shows the performance correctness rate of each participants by automatic judgment. As a result, the experiment conducted for 15 minutes of practice time shows 40% of the correct performance. This result seems to be that the performer is accustomed to using this system.

[1] https://www.dropbox.com/sh/8h87zlhcasiiviu/AADEXQt8svql1W2JZ42NoMTXa?dl=0

Fig. 1. Processing flow.

Fig. 2. Result at the time of incorrect: It is specified that 4 CG images at the top of the screen are displayed only when x is displayed in judgment displayed on the left part.

Table 1. Percentage results of 10-fold cross-validation.

string	correct	wrong	average
1	90	90	90
2	86	96	91
3	98	86	92
4	92	80	86
5	88	82	85

Table 2. Correct percentage results of each participant.

participant	1st	2nd	3rd
A	0.0	0.0	20.0
B	20.0	20.0	60.0
C	0.0	20.0	40.0
average	6.7	13.3	40.0

References

1. Yousician: "Yousician", `https://yousician.com/`, 2010.
2. Aram So: "Guitar man: (an implementation of a rhythm game cooperative musical performance system with actual musical instruments)", *ACM SIG-GRAPH ASIA 2008 educators programme*, pp. 12, 2008.
3. N. Shimoo. *et. al*: "Investigating Acoustic Features for Automatic Assessment of Electric Guitar Performance", *SIG Technical Reports*, 2017-MUS-117, 3, pp.1-6, 2017 (in Japanese).