

# Piano Teaching of Music Education Major in Colleges

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**Abstract:** Music exists in almost all cultures, and emotional expression occupies a very special place in the nature of music. This article mainly studies piano teaching in music education majors in colleges and universities. In this paper, a rectangular window with a length of 1s, a sliding length of 0.5s per frame, and 50% overlap of the window length is used to divide each music file in the database into frames. The feature extraction and statistics are performed on the music signal in each frame respectively, and the local feature data set corresponding to the dynamic V and A annotations in the database can be obtained. When the pitch interval is 1, 2, and 3 notes respectively, the correct recognition rate of the 9 contours is very low, followed by 31%, 1.25%, 4.01%. The results show that cultural differences have a significant impact on the music perception of people with normal hearing.

**Keywords:** Multi-Sensor System, Normal Hearing, Cultural Differences, Music Perception, Correlation Analysis

## 1. Introduction

Music is an artistic experience and entertainment method that uses music as a performance medium and carrier, displayed in time, to express people's thoughts and emotions, and to reflect real life. The goal of piano teaching in normal universities is different from that of professional colleges, and it is no longer an education to train piano players. It is far from enough to simply teach students to play some piano works. It is the ultimate goal to actively cultivate students' learning ability and make every student's potential ability get its due play.

Music can change the state of awakening, evoke strong emotions, and restore attention and memory. In the music perception stage, the information collected by each organ is like every branch of a river, and each branch flows independently. Among them, the main receiving music information is vision and hearing. In addition, the rest of the organs are also collecting information and conveying it to the brain. Each type of information plays an independent and irreplaceable role and is transmitted to the brain. The brain produces such information. Independent and direct reaction, and feedback to form various feelings.

The emergence of multiple sensors has made people have a major breakthrough in the study of music perception. McDermott J H believes that the aesthetic response to homophony has biological roots and is therefore common in humans. In contrast, ethnomusicologists and composers believe that homophony is the creation of Western music culture. He reported on Tsimane's experiments and compared people in Bolivia and the United States with different levels of understanding of Western music. Participants rated the pleasure of the sound. Although his research has a certain pertinence, it is not accurate [1]. Girgin D uses metaphors to determine pre-service music teachers' understanding of instrument education. He collects data by asking participants to complete sentences. He uses content analysis methods to check the data. He analyzed the data through content analysis technology, including labeling, classification, category development, availability and reliability of supply, and data transmission to a computer. Although his research content is relatively detailed, it lacks a certain degree of innovation [2]. Toropova A V focuses on the differentiated perception of music, that is, identifying the emotional content of music through representatives of different ethnic cultures. His goal is to find typical patterns of individual differences in music perception. He tested the hypothesis that between Russian and Chinese students, there are differences in the perception of "local" and "foreign" music in terms of their emotional content. He assessed the segments they had listened to with twelve bipolar psychological test scales, reflecting the emotional and dynamic characteristics of music. He studied the phenomenon of "ethnic hearing" by classifying the evaluation results of emotional sound characteristics into Chinese and Russian. A total of 53 people participated: 27 Russian music students (M = 24.7) and

26 Chinese music students from Moscow University ( $M = 25.6$ ). Although his research process is relatively comprehensive, there are still big loopholes [3]. Chu W T believes that due to the emergence of hotel social media platforms, how to discover interesting attributes and use these discovered features in hotel-related applications has become an important issue. He extended large-scale hotel information collection to include heterogeneous hotel information to facilitate multi-modal and cross-cultural analysis. He found that travelers from different cultural regions (countries/regions) have different rating behaviors. He used these correlations to predict hotel ratings and verified that by considering visual information and cultural differences, prediction performance can be improved. Although his research method is relatively new, it lacks necessary data [4].

Music education major is a dual professional talent training mode, so both normal colleges and music colleges are required to cultivate students with both professional music knowledge and skills and education and teaching ability. Therefore, the local music colleges in the country have their own weights and appropriate coefficients for the setting of professional skills courses, teaching theory courses and basic public courses. This article discusses the cognition of the hierarchical structure of Chinese folk music from a cross-cultural perspective. This will provide a reference for the education of diverse music culture and provide help for better promoting the development of Chinese national music culture. Based on the conventional power spectrum analysis of EEG data under different speeds of music, this article further conducts EEG nonlinear analysis and deeply appreciates the feasibility and superiority of the combination of the two.

## 2. Piano Teaching for Music Education Major

### 2.1 Piano Teaching

In piano learning, metacognition takes piano cognition as the cognitive object, and supervises and regulates the subject's own cognitive activities. The role of the teacher is to guide students to adjust their self-awareness, improve their cognition of piano learning, and to achieve the learning goals through active monitoring in the cognitive process. Students should realize that the cognition in these pianos can be improved through metacognitive monitoring strategies, including how to propose piano learning tasks, monitor the understanding process of piano playing, and evaluate the completed piano task process [5-6].

- (1) Determine the Gaussian center surround function required for each channel:

$$F_{k_i}(x, y) = Ke^{-\frac{(x^2+y^2)}{c^2}} \quad (1)$$

Among them,  $C$  represents the standard deviation of the Gaussian center wrap function.

- (2) Perform grayscale correction on the adjusted image of each channel, and correct the adjusted grayscale value of the image to 0~255 to obtain the output image of the MSR processing of 3 channels.

$$R_i(x, y) = \sum_{k=1}^K w_k \left\{ \log S_i(x, y) - \log [F_{k_i}(x, y) \times S_i(x, y)] \right\} \quad (2)$$

$$R_{0_i}(x, y) = \beta \times R_i(x, y) \quad (3)$$

$$R_{MSR_i}(x, y) = 255 \times R_{0_i}(x, y) \quad (4)$$

Among them,  $W_k$  represents the weight coefficient of the connection.

- (3) Adjust the color ratio of the output image processed by the MSR of 3 channels, and obtain the output image processed by the MSR of the 3 channel image:

$$R_{MSRCR_i}(x, y) = C_i(x, y) R_{MSR_i}(x, y) \quad (5)$$

$$C_i(x, y) = \beta \left\{ \log [\alpha I_i(x, y)] - \log \left[ \sum_{j=1}^K I_j(x, y) \right] \right\} \quad (6)$$

Among them,  $\alpha$  is the controlled nonlinear intensity.

The tracking gate filter  $S(k)$  is the covariance matrix of the vector, then the norm of the information vector  $v(k)$  can be expressed as:

$$g(k) = v^T(k)S^{-1}(k)v(k) \tag{7}$$

The Gaussian probability density is:

$$f(v(k)) = ((2\pi)^n |S(k)|)^{-1/2} \exp(-g(k)/2) \tag{8}$$

The major of music education is to cultivate teaching talents with multiple skills, piano performance and teaching will inevitably become one of the important courses. However, it is not possible to equate the piano performance major with piano teaching in music education, let alone the performance level as the only criterion for judging piano learning in music education. In addition to cultivating students to have a certain level of performance, the music education major should also allow students to master scientific piano performance theory, piano teaching methods, etc., to prepare for future music teaching work [7].

The multi-sensor task coordination structure is shown in Figure 1. The focus of piano teaching is not only the use of the dual piano teaching model in the classroom, but also the cultivation of students' piano skills and literacy teaching. Evaluation and teaching optimization are also indispensable and important parts. Through the mastery and evaluation of each student's piano skill level, timely change of teaching methods and methods, continue to amplify the teaching results of double piano teaching, further optimize teaching in accordance with existing problems, and improve each student's music aesthetic ability and moral and cultural accomplishment, so that piano teaching can achieve greater results [8-9].

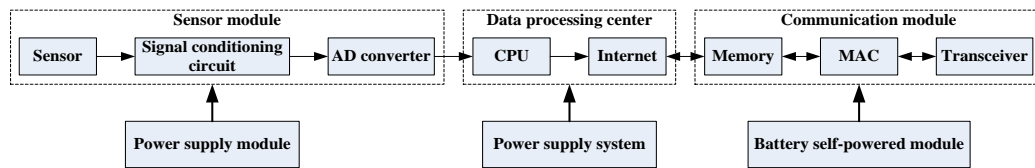


Figure 1: Multi-sensor task coordination structure

The sensor observation equation is:

$$z(t) = h(x_t) \tag{9}$$

The objective function is:

$$\min_x F(x) = \sum_{\langle i,j \rangle \in C} \underbrace{e(x_i, x_j, z_{ij})^T \Omega_{ij} e(x_i, x_j, z_{ij})}_{F_{ij}} = \sum_{\langle i,j \rangle \in C} \underbrace{e_{ij}^T \Omega_{ij} e_{ij}}_{F_{ij}} \tag{10}$$

$$x^* = \arg \min_x F(x) \tag{11}$$

In the formula,  $x$  is a collection of multiple state vectors.

Music education is mainly to cultivate one-specialized and multi-energy teaching talents, and piano performance and teaching will inevitably become one of the important courses. However, the piano performance major should not be equated with the music education and piano teaching, let alone take the performance level as the only criterion to judge the piano learning in music education. In addition to cultivating students to have a fixed performance level, music education major should also let students master the scientific piano playing theory, piano teaching methods, etc., to prepare for the future music teaching work.

On the other hand, China's education has profound and ancient traditional Chinese virtues, pay attention to morality, filial piety first, the essence of education is firmly fixed in the background of moral education, domestic universities generally pay attention to moral education, moral word "German" first, with moral education as the key education direction, it has an indelible relationship with the tradition of the Chinese nation, this is also reflects a major feature of the Chinese social and cultural development. Inspired by such a traditional thought of stubborn education, music education, as a branch of education, reflects the value of non-music ontology in education essence and value

ontology. Value orientation focuses on political function value, and in fact, it ignores the moral cultivation, value and pursuit of music education itself with overgeneralization. The philosophical thought of "aesthetic core" highlights the study of music ontology, lets the people understand the ontology value of music education, has a philosophical appeal for music media, cannot completely deviate from the concept of music teaching, and turns to the value demand of education with emotion. In fact, the philosophical concept of "aesthetic core" highlights the philosophical demands for music ontology, understanding music from the perspective of education, has a correct positioning for music education, and the recognition of music culture. Ideologically, it is to highlight the influence of music curriculum on the people, enhance the value of music education itself, trace back to its root, and is always a pursuit of the value and status of music, a neglected discipline, and a philosophical appeal for music education itself.

## **2.2 Music Perception**

Modern electronic technology and digital audio signal processing technology make music production get rid of the embarrassment of repeatedly recording the audio until the player plays perfectly in order to improve the quality. The small mistakes in the performance can be made up by the later correction, which greatly improves the creative efficiency of music works. With the rapid development of technology, producers can operate more and more audio signals through software and hardware, and adjust more and more widely [10]. In the sense of music stage, it is through the various organs of the body to receive music information and music additional information. The same is true in the sense stage of music perception. Music perception is a series of psychological processes when people carry out music activities. Vision and hearing are the main organs to receive music. In addition, other organs of the body, for example, they are difficult to be detected by the body [11]. Melody contour expresses the relationship between the tones in the melody, which is manifested as "rising", "falling" and "flat" tones. It mainly investigates the subjects' ability to distinguish continuously changing tones, which is more objective and not affected by the corresponding memory ability and familiarity of the melody and its name [12].

Although there are differences to different degrees in the disciplines and educational philosophy of music education in colleges and universities to different degrees, and the ideas of curriculum setting tend to be diversified, the goal of music education major is reasonable, which are to cultivate excellent compound music talents for the society. However, today, when graduates face great employment pressure, it is urgent to research and innovate the curriculum structure that can meet the employment needs of today's society. Down-to-earth exploration and research on the curriculum of college music education plays a great role in improving the comprehensive quality and ability of students in universities, so as to improve the employment rate of graduates. To high school students have a great social practical value.

## **2.3 Cultural Differences**

Enterprises should actively encourage individuals who have lofty aspirations and seek the realm of moral beauty, so that the employees' pursuit of group, society and the overall value of the enterprise can be transformed into the driving force to promote the development of enterprises and social progress. Based on the above characteristics, it is a good attempt to use approximate entropy to analyze EEG data of subjects listening to different speed music States, because we expect to find a EEG characteristic parameter to reflect different EEG characteristics of different speed music states [13]. The contradiction between music education and examination oriented education, music discipline and further education discipline is the prominent problem of music discipline education. Some leaders put little investment in music education in order to complete the target of entering a higher school, and some even transferred music lessons to other subjects. Affected the normal development of music teaching, high school students in the best learning time can not get good music education [14].

Piano group class is a cooperative, open form of teaching. Students are taught in groups, etc. The teaching form is taught for multiple people at the same time. While saving teaching time and teaching resources, the communication and learning between students are strengthened. In teaching the piano playing- some basic knowledge, basic methods, to solve the piano teaching middle school students one-some general questions. Questions and confusion, the advantages of group teaching are obvious. The second class can focus on teaching knowledge and solving students' problems. Through group teaching, students can learn from each other and complement each other, and let each student know their own learning progress in comparison, so as to improve students' learning efficiency. Under

the general premise of the contemporary society, in order to cultivate high-quality and comprehensive talents, the curriculum has a very important position, and has a great impact on the cultivation of talents. The curriculum of music education plays an important role in helping the cultivation of student educational goals and student employment. At the same time, with research, history as a mirror, after the history of music education curriculum summary, analysis, with more space of academy of music education analysis of existing courses, hope to get some kind of experience, think academy of music education to a better future has a certain reference.

### **3. Effect Experiment of Piano Teaching**

#### **3.1 Experimental Environment**

The experimental system of visual music perception designed in this paper is developed on the 64 bit operating system of windows 10 version. The computer is configured with inter i7 processor, 8GB memory and independent graphics card (4GB memory). The upper computer is a notebook computer installed with Ubuntu 16.04 LTS and ROS kinetic, which has intel i5-7300HQ processor and 16GB RAM. Robots and laptops communicate over Wi-Fi [15-16].

#### **3.2 Data Collection**

The data used in this experiment comes from live recorded band ensemble. The music includes 5 single musical instruments: trumpet, trombone, soprano saxophone, alto saxophone and bass saxophone. The total duration of the performance is 230 seconds and contains a total of 1767 notes. The recording environment is a concert hall, where all musicians are on the same stage and play together. The performances of the musicians are recorded to separate tracks through the microphones in front of them. Sound insulation boards are placed between some musicians, but they cannot completely isolate the crosstalk between the instruments [17-18].

#### **3.3 Data Preprocessing**

In this paper, a rectangular window with a length of 1s, a sliding length of 0.5s per frame, and 50% window length overlap is used to divide each music file in the database into frames [19]. The feature extraction and statistics are performed on the music signal in each frame respectively, and the local feature data set corresponding to the dynamic V and A annotations in the database can be obtained. Further statistical processing of 60 frames of data for each file can obtain the global feature data set corresponding to the static V and A annotations of the entire music file [20].

#### **3.4 Analysis of Music Features**

The acoustic features based on the time-frequency domain analysis of audio signals are the basis of audio signal analysis and processing, and the musical theory features between the acoustic features and high-level content attributes are the link between the two. In this paper, the use of features at different levels of abstraction can refine complex problems into several lower complexity sub-problems, which helps eliminate unnecessary interference factors when solving sub-problems, and makes full use of prior knowledge to build more detailed mathematical models. In order to reduce the complexity of the solution algorithm and improve the accuracy of the solution [21].

#### **3.5 Behavioral Testing**

Before the EEG test, each subject needs to complete the music experience questionnaire and the music behavior test, including the pitch minimum discernibility threshold test, the pitch direction test and the melody contour recognition test, and the reference tone fundamental frequency is C4 (262Hz). In the formal experiment, all subjects listened to two kinds of music, and each melody had two endings, that is, music that conformed to the syntactic rules and that violated the syntactic rules [22]. Tell the subjects that the task is to listen to each melody carefully and judge whether each melody meets expectations. Participants make their own judgments by pressing the keys. The F key means that it meets expectations, the J key means that it does not meet expectations. The order of Block presentation is balanced among the participants. During the experiment, the subjects were allowed to rest three times to ensure that the subjects were performing the experiment in a relaxed state. Each block was

about 15 minutes, and the entire experiment lasted about an hour [23].

### 3.6 Statistical Analysis

After scoring, the database was established by SPSS16.0 software, and the data was input and analyzed. For the general information of the experimental group and the control group, such as gender, age, years of education, family residence and family economic situation, independent sample t-test and four grid chi square test were used. Stepwise regression was used to test the predictive effect of the score of neuropsychological test on the score of mbea [24].

## 4. Evaluation of Experimental Effects

### 4.1 Musical Ability Evaluation

Table 1 shows the comparison of distance statistics of different key music. The statistical maximum (small) value indicates the maximum (small) value of the distance in the top 80% of the music pairs if the distance between the music samples in the set is rearranged in ascending (descending) order. It can be seen from the table that the average distance of the intra-class harmony centroid and the average distance of the pitch distribution of the homophonic music are 0.2917 and 0.1402, respectively, which are much lower than the inter-class distance of uncorrelated tonal music (0.5637 and 0.3681); they are mutually related. The distance between major and minor music pieces is relatively small (0.3344 and 0.1860); the distinguishability between major and major music pieces is also better (the two types of distance are 0.5160 and 0.2715 respectively).

Table 1: Comparison of distance statistics of different key music

		Harmony centroid distance	Pitch distribution distance	Timbre distance
Music of the same tonality	Average value	0.2917	0.1402	0.8568
	Statistical minimum	0.0193	0.0004	0.2597
	Statistical maximum	0.4419	0.2177	1.243
Music in major minor	Average value	0.3344	0.1860	0.7717
	Statistical minimum	0.0675	0.0330	0.3288
	Statistical maximum	0.5224	0.4777	1.0662

The results of reliability analysis are shown in Table 2. According to the reliability analysis, except the Cronbach's  $\alpha$  value of song itself and artistic conception perception is 0.656, the Cronbach's  $\alpha$  value of cultural cognition is 0.793 and the Cronbach's  $\alpha$  value of audience satisfaction is 0.771, the Cronbach's  $\alpha$  value of other measurement items is greater than 0.8, which indicates that the scale has good reliability and stability. Although the sub scale of the song itself and the construction of artistic conception perception has the value of 0.501 and 0.506, it is within the acceptable range. In music experience, the situationality of embodied cognition can be seen as a new cognition in a certain group or a certain group in a certain music environment. Then, the production of this cognition is based on the long-term cognition of music in the past. Under a certain music situation, it is influenced by some factors in music, resulting in a new cognition of music and even other things.

Table 2: Reliability analysis results

Variable	Total correlation coefficient	Cronbach's $\alpha$ of structural variables
Cultural Cognition 1	0.716	0.793
Cultural Cognition 2	0.773	
Cultural Cognition 3	0.704	
Cultural Cognition 5	0.772	

The error rate and standard deviation of the normal hearing group are shown in Figure 2. The main effect of the object appearing on the target is not significant,  $F(1,22)=2.067$ ,  $p=0.165$ ; the main effect of SOA is not significant,  $F(3,66)=1.740$ ,  $p=0.167$ ; the interaction between the object appearing on the target and SOA The effect is not significant,  $F(3,66)=1.231$ ,  $p=0.306$ . Therefore, it is believed that

object-based inhibition of return does have a different mechanism from space-based inhibition of return. The existence of object-based inhibition of return is not universal, but only exists in detection tasks. The results show that regardless of the correctness of the participants' judgments of syntactic rules, they may not have an impact on the participants' EEG data. However, the Chinese participants showed a positive correlation when judging Chinese music, which may be due to has long been in the environment of Chinese music culture. The subject's musical ability is related to the judgment of the stability level and the judgment of the syntactic rules. However, the subject's judgment of the stability level and the syntactic rules is not entirely dependent on the participant's musical ability, which may also be It is related to the subjects' listening experience and familiarity with music.

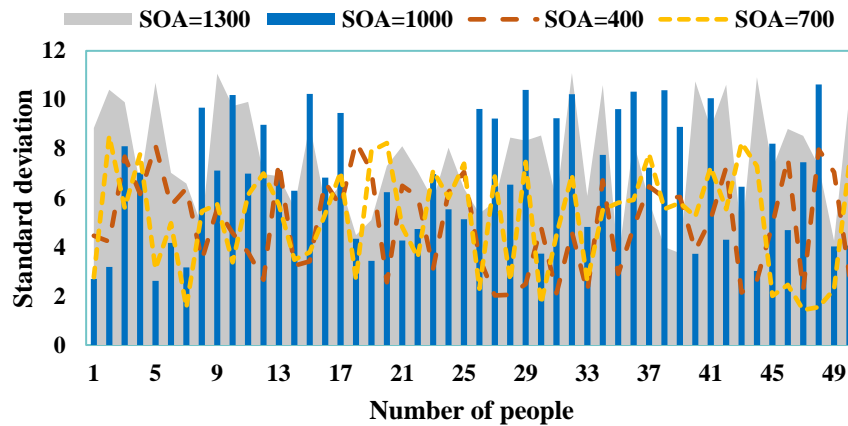


Figure 2: Error rate and standard deviation of the normal hearing group

#### 4.2 Analysis of Cultural Differences

The statistical results of melody contour recognition are shown in Figure 3. When the pitch interval is 1, 2, and 3 notes respectively, the correct recognition rate of the 9 types of contours is very low, followed by 31%, 1.25%, and 4.01%; and the probability of recognition as flat is the largest, followed by 90.1% , 88.56% and 87.21%, the pitch interval has little effect on the recognition of melody. The experimental results show that after the phase of the music signal is missing, the outline of the original melody can hardly be heard, which has a great influence on the melody, and most of the melody is recognized as flat. In terms of the ability to describe cultural styles of different characteristics, timbre characteristics show the best distinguishing ability, and the overall accuracy of 84.06% can be achieved by using timbre characteristics SVM alone.

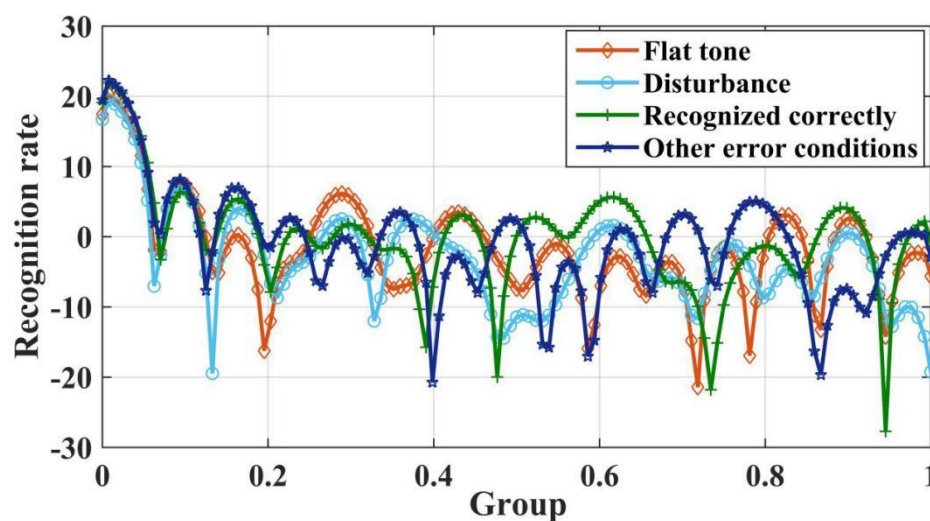


Figure 3: Statistics results of melody contour recognition

The statistical results of the melody contour recognition when the window length changes are shown in Figure 4. When there is no phase feature, when the window length is 1ms or 2ms, the contour of the melody can be roughly recognized accurately (up to 90% or more); when the window length is

3ms, its correct recognition rate drops rapidly, and as the window length continues Increase, the correct recognition rate gradually decreases. It shows that the window length is an important factor for melody recognition. When the phase feature is zero, the melody can be identified by shortening the window length to within 2ms.

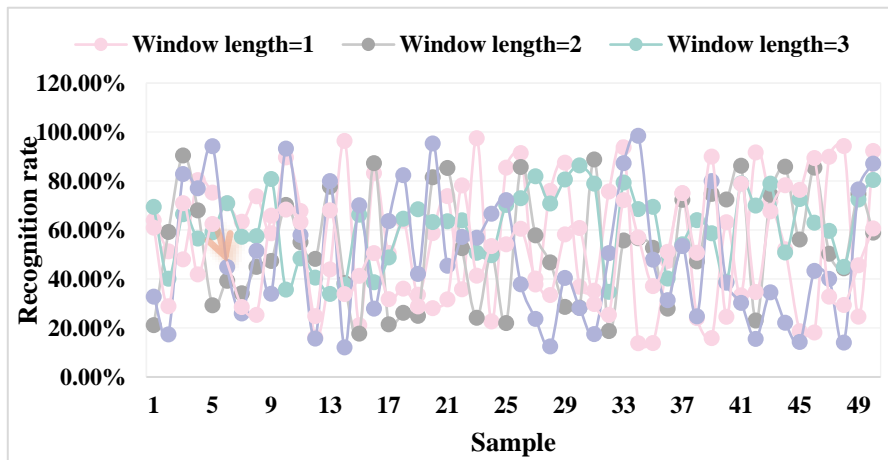


Figure 4: Statistics results of melody contour recognition when the window length changes

### 4.3 Comparison of Music Perception

The Laplacian current density is shown in Figure 5. For fast sequences, the standard target sound is about 30ms before the opening point, and the left and right temporoparietal joint areas are significantly activated; after the opening point, the activation of these two areas continues to be about 90ms after the opening point. The early target sound at the opening point causes a significant increase in the activation of the left temporal and parietal area; then the activation of the left prefrontal and right temporal and right posterior parietal areas is enhanced. In the case of pedestrian non-gait interference and sensor's own measurement drift, the improved Kalman filter processing is compared with no filter and Kalman filter processing, the positioning results are closer to the real path, the positioning accuracy is improved, and the system position error is 2 meters. The probability value within the range reaches 84% after being processed by the improved filtering algorithm. The experimental results show that the use of improved Kalman filter for acceleration data preprocessing can effectively filter out signal interference and improve the positioning accuracy of the system.

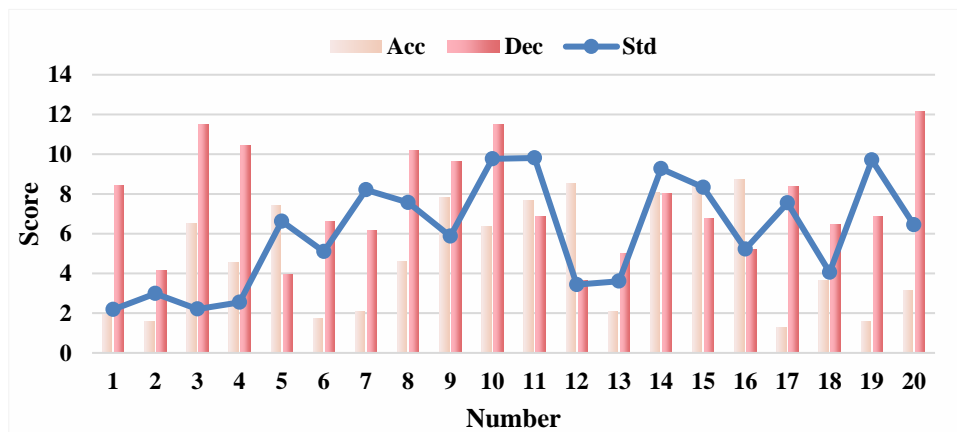


Figure 5: Laplacian current density

## 5. Conclusions

Under the influence of music colleges and professional piano teaching content, the piano teaching of music education majors has also received more reference and promotion. Piano teaching should have its own unique teaching ideas. In recent years, the educational background of piano teachers has generally improved, and the teaching equipment has been continuously increased; students from



various schools have recruited students from all provinces in the country; the comprehensive ability of students in piano performance, accompaniment, scientific research and teaching has been improved to varying degrees.

The automatic analysis of music content has important theoretical significance and practical value no matter in the initial stage of creation of the work, or in the later stage of commercial distribution and promotion. After automatic analysis, further editing intelligence and music teaching automation will help improve the efficiency and quality of music production, and reduce the labor cost of music education.

In music perception, the body organs receive music, the brain processes music, and dominates the body's response to music. This process is interlinked, and the body's bearing role is inseparable from the beginning to the end. Objective music information is transmitted from the body to the brain, and the brain produces a reflection of the information, but the reflection here is no longer objective, but through the "channel" of the body, with subjective factors of physical experience. This has to extend the body to the specific environment, including both the natural environment and the human environment.

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