

# **A Virtual Violin Device for Personalized Emotional Music: 'Voice of the Heart'**

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## **Abstract**

The author of this article designed a virtual musical instrument device that can change the key according to the mood by studying the relationship between music and emotion. The author used a questionnaire survey to investigate users' understanding and interest in violins and virtual instruments, and found that users have a certain interest in music creation and virtual instruments. The author also found by designing experiments that the major and minor keys of music can affect the user's mood to a certain extent, and this range of influence can be reflected by the body temperature. Based on the above experiments, the author designed a virtual violin music device called "Voice of the Heart". This device can initially determine the user's mood based on the user's current body temperature, and use this to set the tonality of the strings. Even if users don't know how to create music, they can still play personalized music that suits their mood or calms them according to different states at each moment.

1. Introduction .....	4
2. Related work .....	6
2.1. Music and Mood .....	6
2.1.1. The effect of music on mood .....	6
2.1.2. The influence of musical tonality on mood .....	7
2.2. Relationship between body temperature and mood .....	8
3. Methodology .....	9
3.1. User needs research .....	9
3.1.1. Research purpose .....	9
3.1.2. Experimental population .....	10
3.1.3. Details .....	10
3.1.4. Data analysis .....	11
3.2. Experiment .....	13
3.2.1. Experimental purpose .....	13
3.2.2. Experimental population .....	13
3.2.3. Experimental fundamentals .....	14
3.2.4. Experimental materials .....	14
3.2.5. Experimental process .....	17
3.2.6. Experimental results and analysis .....	18
4. Project .....	19
4.1. Project introduction .....	19
4.2. Technical principle .....	19
4.3. Exterior design and sensing technology .....	20
4.4. User experience and results .....	20
4.5. Social significance .....	21
5. Critical self-reflection .....	21
6. Discussion .....	23
7. Conclusions & Future Work .....	24
8. Acknowledgement .....	25
9. Bibliography .....	26

# 1. Introduction

## A. The relationship between music and mood

Music is an ancient art. Through the organized form of music, music relies on sound wave vibration and unfolds in time to express people's thoughts and feelings and reflect social real life. Music has a close relationship with people's inner emotions. The original music originated from some indescribable primitive impulse of human beings. The passion of this primitive impulse has the basic attributes of various passions, but lacks specific emotional direction. It is just a strong experience of emotion. Labor created human beings, and labor also created music. Labor itself gives content to music, and the movements and sounds of labor give music rhythm and tone. In other words, these music integrate various emotions and emotional experiences of people during labor.

The study of the relationship between music and emotion has important theoretical significance. Music can induce many different emotions. For most people, the main motivation for listening to music is emotion induction. Music can not only induce unpleasant emotions, but also induce pleasant emotions, which is more advantageous than using static pictures to induce emotions. Cognitive neuroscience believes that human emotions arise from the intuitive processing of various internal and external stimuli, but the specific brain mechanism of the entire process of emotion induction is currently unclear. Therefore, using music to induce emotions provides a unique perspective on answering this question. The study of the relationship between music and emotion has important practical significance. At present, music has been widely used to improve physical health, reduce stress, distract or concentrate, etc.

## **B. Body temperature reflects mood**

A study by the School of Cognitive Brain Sciences at Aalto University invited 700 people from Finland, Sweden and Taiwan, showed them texts, stories, movies and facial expressions related to different emotions, and then measured the body temperature changes in different body parts. It was found that the temperature of specific parts of the body changes when people are in different moods, and these findings cut across ethnic and cultural boundaries.

## **C. Physical model of virtual musical instrument**

Virtual models of acoustic instruments have been available to the music industry for decades. These models are useful for studying the physical behavior of acoustic instruments, and they can also synthesize the sound output. Given a suitable interface, many models can be played by performers in real time. Use Arduino and sensors as physical devices to play music through practical operations.

## **D. Use music to affect people's mood**

By reading the user's skin temperature to initially judge the user's mood, and then reading different timbres based on different emotions, the music played by the user can change according to the user's mood at that time. For example, when the user's skin temperature is high and the user is prone to emotions such as tension and anger, the music melody read is more soothing and can soothe the user's emotions. At the same time, I set a specific music melody so that users who do not know music can easily perform their own emotional music.

## **2. Related work**

### **2.1. Music and Mood**

#### **2.1.1. The effect of music on mood**

Different music brings different emotions to people. For example, Beethoven's "Moonlight" is dark and sad, while Mozart's "Turkish March" is cheerful and relaxed. At the same time, different people have different feelings and experiences about the same music. Even the same person has vastly different feelings about the same music in different situations.

Music has many characteristics, including timbre, intervals, harmony, rhythm, dynamics, etc. Music affects people's emotions mainly through these characteristics.

In music structure, tonality is a very important part. When music progresses, its direction relative to the tonic of a key determines the listener's feelings of tension (deviating from the tonic) and relaxation (moving toward the tonic). Based on the understanding of the specific structural characteristics of music, listeners will have certain expectations about its transferability. The realization and violation of such expectations will also affect emotions. This may be the most important factor in music-induced emotions. Pitch, dissonance, sound intensity, and beat all affect emotional arousal, while tonality (major or minor) mainly affects emotional valence.

Different types of music have different beats or rhythms. The rhythm of music has two characteristics: speed and strength. Generally speaking, calm and sad music have a slower rhythm, and exciting and joyful music have a faster rhythm. At the same time, calm and happy music have a weaker sense of rhythm, while sad and exciting music have a stronger sense of rhythm. Therefore, the rhythmic characteristics of music play an important role in the expression of its emotions. Research shows that music of different

speeds gives people different emotional experiences. For example, Beethoven's "Für Alice" has two versions: a brisk and smooth pure piano solo and a slow and long piano version with accompaniment. Many people have different subjective descriptions after listening to these two pieces of music. It is generally reflected that the former gives people a steady, rolling, and endless feeling, while the latter is sad and desolate.

People's appreciation of music is not only affected by the characteristics of the music, but also by many subjective and objective factors, such as mood, environment and past experience. Therefore, when people appreciate music, they not only judge the emotions expressed by the music from simple timbre and rhythm. The influence of music on emotions also has a more complex brain mechanism.

Music has strong cultural characteristics, and music in different cultural backgrounds has different forms and characteristics. Although the appreciation of music is universal to a certain extent, certain groups of people will still be influenced by specific music paradigms in their cultural backgrounds. Influence. A study on music-induced epilepsy showed that patients' epilepsy can only be induced by music from their own country, but not by music from other countries.

### **2.1.2. The influence of musical tonality on mood**

Tonal rules are an important element in expressing emotions in Western music. Multiple studies using European people as subjects have found that generally European groups can recognize and understand the emotional connotations conveyed by tonal rules, and on this basis, evoke more consistent emotions.

Emotional response. Mode type is usually related to emotional color. Music in a major key is bright and open in auditory effect, and can easily evoke positive emotional experiences

such as joy and lyricism (warmth). Music in a minor key sounds winding and winding, and can easily evoke negative emotions such as sadness, fear, anger, etc. Sexual emotional experience (Huron & Davis, 2012; Juslin & Lindström, 2010; Straehley & Loebach, 2014).

Harmonic function is usually related to emotional arousal. A series of studies by Krumhansl et al. found that harmonic intervals with a low stable level are more likely to arouse "dissonance", "surprise" and "alertness" than harmonic intervals with a high stable level. and other related "tense" experiences, activating emotional upsurges; and compared with harmonious intervals with a low stable level, harmonic intervals with a high level of stability are more likely to evoke a "relaxation" experience related to "harmony" and bring about emotional calm. The alternate use of "unstable" and "stable" creates a contrast between "tension" and "relaxation", forming the unique emotional tension of music and giving the listener a special aesthetic feeling (Krumhansl, 1996; Koelsch, Kilches, Steinbeis, & Schelinski, 2008; Lerdahl & Krumhansl, 2007; Lehne, Rohrmeier, & Koelsch, 2013).

## **2.2. Relationship between body temperature and mood**

According to the British "Daily Mail" report, a scientific research team from Finland conducted an experiment on the impact of emotions on physiological changes on 700 volunteers.

700 volunteers were arranged to watch multiple movies of different types and themes in the exact same room temperature environment. At the same time, the infrared scanning equipment in the room also started working to record the body temperature changes of various parts of these people's bodies in real time. The results show that emotions do indeed cause completely different expressions of human body temperature.



It is not difficult to see from the experimental results that in a happy and joyful mood, the whole body shows a red and yellow color representing warmth, and it almost runs from the brain to the feet, which coincides with the warmth that people feel throughout the body when they are happy.

In the mood of love, the body temperature will also rise rapidly. The difference is that the affected area is mainly concentrated in the upper body. In this case, people often feel a strange pleasure in their hearts.

Under the emotions of sadness, fear, and disappointment, the human body will appear blue-black, which represents coldness. For example, when you are depressed, the chest and throat of the human body are almost black, and people often feel difficulty breathing. Under the depressed mood, the human body can hardly detect any heat radiation. "Despair" is the best way to describe people at this time.

### **3. Methodology**

#### **3.1. User needs research**

##### **3.1.1. Research purpose**

This is a user needs survey: how much users know about music. Through this experiment, I aimed to gain insight into the participants' level of musical understanding of the cello and violin and their level of interest in the two instruments. Additionally, I will investigate the challenges and difficulties participants may face when using electronic music to gain a more comprehensive understanding of their experiences interacting with music. By analyzing this data, I hope to provide useful insights for music education and technology

improvements, promoting more productive learning and artistic experiences.

### **3.1.2. Experimental population**

I purposefully selected 38 experimental participants, who were the target group for the design project. Among them, 30 valid data were collected. Among the valid data, the average age is 25 years old, including 18 women and 12 men, all of whom are healthy individuals. Of note, none of these participants had any formal violin, viola, or cello learning experience. Through the selection of this population, we aim to obtain more representative and focused feedback in order to better meet the needs and expectations of the target audience.

### **3.1.3. Details**

#### **A. Questionnaire design**

Design the electronic questionnaire survey as follows:

- a) Have you ever attended a cello or violin recital? (Single choice question) [Yes/No]
- b) Are you interested in composing your own music for cello or violin? (Single choice question) [Yes/No]
- c) Have you ever experienced virtual electronic instruments? (Single choice question) [Yes/No]
- d) What type of virtual electronic musical instrument are you experiencing? (Questions and Answers)

e) What do you think is the hardest thing about playing virtual instruments? (Q&A)

## **B. Data collection process**

To collect data, I used an online survey platform to send designed electronic questionnaires to participants. Participants will access the questionnaire via the link they receive and select appropriate options or provide detailed text responses as required by the question. To ensure data accuracy and consistency, I will set deadlines to collect feedback from all participants within a certain period of time.

### **3.1.4. Data analysis**

Quantitative and qualitative analysis methods were used to integrate and interpret the collected data. Through statistical analysis, I will derive specific results on participants' level of musical understanding, interest in cello and violin, and challenges they may encounter when using electronic music. Qualitative analysis will provide an in-depth understanding of participants' perspectives and feelings.

Participant number	Have you ever attended a concert?	Interested in creating?	Have you ever experienced virtual instruments?	Experience the types of virtual instruments	Problems encountered
1	Yes	Yes	Yes	virtual piano	—
2	Yes	Yes	Yes	virtual strings	Make harmonies
3	Yes	No	No	—	—
4	Yes	Yes	Yes	virtual strings	Pitch
5	No	Yes	Yes	virtual piano/guitar	Can't read the score
6	Yes	Yes	Yes	virtual piano	Small interface
7	No	No	No	—	—
8	No	Yes	Yes	virtual drums	Rhythm and drum beats
9	Yes	No	No	—	—
10	Yes	Yes	Yes	virtual piano	Make harmonies
11	Yes	Yes	No	—	—
12	Yes	No	Yes	virtual guitar	Learn fingering
13	No	No	Yes	virtual guitar/drums	—
14	No	Yes	No	—	—
15	No	Yes	Yes	virtual piano	Small interface
16	Yes	No	No	—	—
17	Yes	No	Yes	virtual piano	—
18	Yes	Yes	Yes	virtual strings	Pitch
19	No	Yes	Yes	virtual guitar	playing techniques
20	Yes	No	Yes	virtual strings	Learn to compose
21	No	No	No	—	—
22	Yes	No	Yes	virtual strings	—
23	Yes	Yes	Yes	virtual drums	Pitch
24	No	Yes	Yes	virtual guitar	Learn to compose
25	Yes	Yes	Yes	virtual strings	playing techniques
26	Yes	No	No	—	—
27	Yes	No	No	—	—
28	No	No	No	—	—
29	No	No	No	—	—
30	No	Yes	Yes	virtual piano	Can't read the score

Through the analysis of the above table, the following preliminary observations and conclusions can be obtained:

a) Heard a recital: Most participants stated that they had attended a cello or violin recital, which may mean that they have some knowledge or interest in these two instruments.

b) Interest in creating music: About half of the participants expressed interest in creating music, which shows that some respondents are interested in actively participating in music creation.

c) Types of virtual instruments experienced: Participants experienced a variety of types of virtual electronic instruments, including virtual piano, virtual guitar, virtual drum set, virtual orchestra, etc. This reflects participants' interest in diverse musical tools.

d) The most difficult problem: When experiencing virtual instruments, participants mentioned difficulties including finding rhythm, editing notes, small operating interface, rhythm, not recognizing music scores, learning fingering, etc. This feedback provides designers with useful information for virtual music tool improvements and user training.

Through further statistical and qualitative analysis, these observations can be mined to help better understand user needs, thereby guiding subsequent music education and technology improvement projects.

## **3.2. Experiment**

### **3.2.1. Experimental purpose**

Through this study, I aimed to delve into the different effects that major and minor music have on users in the same context. By observing the characteristics of the test subjects' emotional experience (through question and answer methods) and physiological changes (body temperature) when listening to music, we will gain an in-depth understanding of the impact of these two modes on the psychological and physiological levels. This helps expand our understanding of the complex relationship between emotional and physiological responses to music, providing useful insights into the fields of music psychology and health.

### **3.2.2. Experimental population**

I selected 5 experimental participants who were the target group for the design project. The group had an average age of 21 and included 3 women and 2 men, all healthy

individuals.

### **3.2.3. Experimental fundamentals**

This difference in musical color stems from the musical arrangement rules of major and minor keys, that is, the scale structure they adopt. The arrangement of ‘ *whole, whole, half, whole, whole, whole, half* ’ in the major key presents a bright and cheerful atmosphere, making people feel relaxed and happy. On the contrary, the arrangement of ‘ *whole, half, whole, whole, half, whole, whole* ’ in the minor key brings a deep, melancholic musical texture that often triggers emotional resonance. Therefore, the arrangement rules of musical modes are not only the basis of music theory, but also play a key role in emotional communication, creating a completely different psychological experience for listeners.

### **3.2.4. Experimental materials**

#### ***1) Violin Concerto in D Major Op.61***

This is Beethoven's only violin concerto, completed in 1806.

I chose the third movement, Allegro, Rondo, in D major.

The third movement is a lively and powerful rondo, with the main violin melody giving a deep impression. The violin plays the theme on the four strings at the beginning. This jumping theme is full of joyful emotions. The overtone performance, up to the high position of the first string, spans a huge range and fully expresses joy and high emotions. The recurring main body is full of the simple colors and vitality of folk dance, full of joy and enthusiasm, while the interspersed parts show contrast and change in a unified pattern

and mood. The climax of this movement is also the climax of the entire piece.

## ***2) Tchaikovsky violin concerto Op.35***

This is a violin concerto composed by Russian composer Pyotr Ilyich Tchaikovsky in 1878.

What I chose was the first movement. Moderate Allegro, D major, 4/4 time, sonata form.

At the beginning of the first movement, the audience can feel the strong Russian style. As the rhythm continues to change, the notes can be felt jumping happily. After that, there are contrasts again and again in the music, whether it is strong or weak, or Rhythm, or mood, provides a wonderful preparation for the appearance of the violin. The violin, as the protagonist, plays a series of melodious and singing melodies with a soft tone that makes people think richly. The first movement is generally dominated by joyful emotions. The most exciting part is the alternating performance of the solo violin and the entire orchestra. The joyful atmosphere reaches the audience's heart, as if they are singing about youth, life and nature.

## ***3) Paganini: Violin Concerto No.1, Op.6***

Italian composer Niccolò Paganini composed it in 1811.

I chose the first movement, solemn Allegro, in D major, 4/4 time, sonata form.

The music is gorgeous and varied, leaving the listener without any sense of fatigue. Immediately after the orchestral introduction, the lead violin presents a light, lively theme. After that, the violin's various skills are brought into full play, leading the audience into a romantic and dreamy realm. This movement is grand in scale, and the lead violin is

gorgeous and elegant, and is often played alone.

#### **4) *Mendelssohn's Violin Concerto in E Minor***

I chose the first movement: Passionate Allegro, in E minor, in 2/2 time, which is the most famous movement in the entire work.

This music melody has joy as the main line, but a touch of sadness is cleverly blended into it, forming a wonderful musical experience that is both happy and emotionally rich. With the melodiousness of the ballad, a moving musical picture unfolds, making people intoxicated and feeling the depth and richness of emotions.

#### **5) *Violin Sonata in G minor, B.95 'Devil's Trill'***

I chose the first movement of this piece: Larghetto affettuoso, in G minor.

The first movement is Adagio, played very slowly. The violin melody is full of sadness, a bit resentful, and some of the stronger and longer notes even sound a bit like crying. It presents a tearful theme, with strong emotions lurking, as if the devil has come to visit in a world of melancholy and sadness.

#### **6) *Introduction and Rondo Capriccioso***

This is the most popular of the small musical works written by Saint-Saens in 1863.

The music has a strong Spanish style, with passionate and wild masculinity intertwined with melancholy and desolate emotions, and the romanticism characteristics are very



obvious. The introduction part is a fantasy-like song played by the violin. This tune is melancholy and desolate, yet beautiful and gorgeous.

### **3.2.5. Experimental process**

In this music experiment, I used violin playing as the main body and selected three sections each of major and minor music, for a total of six sections of music, to study the impact of music on individual physiology and subjective feelings.

Before the experiment started, the subject wore a temperature test sensor (MLX90614 Infrared Temperature Sensor) and recorded the initial body temperature in a quiet environment. Such initial recordings help establish the subject's physiological baseline.

The music playing arrangement is divided into two parts. First, three sections of major music are played. After the playback is over, I will record the body temperature and subjective feelings of the experimenter. Such records include the physiological changes and emotional experiences of the experimenters during the music process.

After the major-key music ended, I provided subjects with a short rest interval to ensure they could recover from the effects of the previous piece of music. During this interval, I again recorded the subject's body temperature.

Next, I play three sections of music in a minor key. Similarly, after the music ended, I recorded the body temperature and feelings of the experimenter.

Finally, after the minor music played, I recorded the body temperature of the experimenter again to obtain the physiological changes during the entire experiment.

The purpose of this experiment was to gain insight into the effects of music in major and minor keys on an individual's emotional and physiological state. By carefully recording the reactions of experimenters when listening to music of different modes, I hope to reveal the regulatory effects of music on emotions and physiology, and provide useful data support for music therapy and emotion research.

### 3.2.6. Experimental results and analysis

Serial number	Gender	Initial body temperature	Major (30 minutes duration)			Minor (30 minutes duration)	
			Feel	Body temperature		Feel	Body temperature
1	Female	36.5	The music is very exciting and the feeling is very cheerful	36.7	Interval 2h	Feeling very melancholy	36.3
2	Male	36.3	Make me feel happy and uplifted	36.4		It should be music that describes sadness	36.2
3	Male	36.6	Exciting feeling	36.5		Mysterious sad feeling	36.4
4	Female	36.4	A feeling of warmth and harmony	36.6		Sad music	36.4
5	Female	36.5	Some are lively and some are magnificent.	36.8		Make people fall into deep thought and sadness	36.4

#### A. Influence of major music:

Subjective Feelings: Music in a major key is generally considered to have a bright, cheerful atmosphere. Judging from the subjective feedback of the participants, the major music part triggered a positive, relaxed, and pleasant emotional experience. They may describe feeling a cheerful, high-spirited atmosphere.

Physiological changes: When the subject listens to major-key music, the body temperature may rise slightly, reflecting the positive mental state.

#### B. Influence of minor music:

Subjective feeling: Minor-key music generally has a deep, melancholy musical texture. Participants may describe the emotions they feel during the minor-key musical section as pensive, melancholic, and soulful.

Physiological changes: When listening to minor music, the subject's body temperature may drop or remain relatively stable, reflecting a calm or deep psychological state.

## **4. Project**

### **4.1. Project introduction**

"Voice of the Heart" is a creative and emotionally resonant installation art that aims to detect the user's body temperature, determine their mood, and instantly play music that matches the user's mood. This device is designed with the appearance of a violin and equipped with Arduino laser sensor technology, creating a space that allows users to experience music in different moods through playing without any music knowledge. Each performance is unique, as the musical melody changes depending on the user's mood at the time.

The inspiration for the project comes from the creator's personal experience of learning the violin. Playing the violin has become a unique way of expressing emotions, allowing creators to play completely different music according to different moods. This personal experience inspired the creator to combine this emotional expression with technology, creating an installation that is accessible to all and plays to individual moods.

### **4.2. Technical principle**

The device uses Arduino laser sensor technology to detect the user's body temperature and determine the user's mood state in real time. Based on the body temperature value, it

is divided into three groups of different chord tones. At the same time, processing is used to display small animations that change according to the user's mood.

When the body temperature is low, the device uses major-key chords to play calming, gentle and soothing music, and the animation color appears warm pink; when the body temperature is within the normal range, the device uses major-key chords. Spin and play a brisk tune to express the user's relaxed feeling. At the same time, the animation color shows a calm and pleasant green; when the body temperature is high, a minor-key chord is used to play a melodious and calm tune to help users calm down their excitement or excitement. , while the animation color appears calm blue.

### **4.3. Exterior design and sensing technology**

The device looks like the four strings of a violin and uses laser sensor technology to detect the user's body temperature in real time. The violin-shaped design aims to enhance the user's sense of intimacy and identification with the device through the combination of visual elements and musical elements.

### **4.4. User experience and results**

The design of this device not only allows those with musical knowledge to perform, but also provides a way for those who are not musically inclined to express their emotions. Users simply feel their mood and instantly create their own music by playing the violin-shaped device. This interactivity not only allows users to understand their emotions more deeply, but also provides a unique and pleasant way to vent their emotions.

## **4.5. Social significance**

"Voice of the Heart" is not only an installation art, but also a perfect combination of emotional expression and technology. It provides users with a unique and intuitive emotional output channel, helping people better understand and manage their emotions. This innovative installation art may also become a new tool in the fields of music therapy, emotional expression and other fields, providing people with a pleasant and calm spiritual experience.

## **5. Critical self-reflection**

When conceiving the "Voice of the Heart" project, I was committed to integrating the emotional experience of personal musical expression with technology to create a unique artistic experience for users. The original intention of the project is positive, aiming to provide people with a way to express their emotions through music and art. However, during the design and execution of the project, I became aware of some shortcomings.

### **A. Technology**

The Arduino temperature sensor is used in the project, but in actual operation, body temperature and people's mood may be inaccurate due to individual differences among users.

### **B. Diversity of emotional expression**

Although the project strives to reflect the user's mood changes through different harmonic

timbres, music as a medium for emotional expression is extremely subjective. Users' emotional experiences are diverse and may not always be simply classified as major or minor. Therefore, whether sufficient diversity of musical expression is considered in the design is a question worthy of reflection.

### **C. User experience**

In the project, I emphasized the fact that users can participate in the performance without any musical knowledge. However, have potential accessibility issues been considered, for example, are there groups of people who may not be able to play due to physical conditions, or are there enough instructions and tips to make it easy for first-time users? These are areas that require further attention and improvement.

### **D. Social influence**

The project conceptually focuses on the combination of emotional expression and mental health, but whether it can truly have a positive impact on users' mental health in practical applications requires more scientific research and empirical data to support. In addition, whether it can be combined with professional psychotherapy methods to achieve deeper psychological support is also a direction that requires in-depth consideration.

### **E. Art value**

The project pursues the perfect integration of music and technology, but whether it has achieved the expected results in terms of appearance design and the aesthetic value of music generation, and whether it can truly resonate with users, is an aspect worth examining.

## **F. Future development and sustainability**

Finally, the sustainability of the project is also an issue to consider. In future development, I should pay more attention to user feedback and make adjustments and upgrades based on user needs from different cultural and social backgrounds to ensure the long-term vitality of the project.

Overall, "Voice of the Heart" is a creative project, but in practice, it still needs constant reflection and improvement to ensure that it achieves more comprehensive and positive results in terms of technology, art, and social impact.

# **6. Discussion**

## **A. The connection between emotion and music**

This project establishes a unique connection between emotion and music by matching body temperature changes with musical chords. This method of emotional expression goes beyond traditional verbal communication and provides users with a more intuitive and personalized way of expression. However, it is worth discussing whether body temperature can fully accurately reflect the user's emotional state, and whether other factors should also be taken into consideration to improve the accuracy and comprehensiveness of the system.

## **B. Personalization and user experience**

Although the project emphasizes a personalized music experience, whether it takes into account individual differences and diversity of users, and whether it provides enough user customization options, are issues that need to be discussed. In future development, whether the project can better adapt to the preferences and emotional expressions of different users through more intelligent learning algorithms is a direction worthy of attention.

### **C. Social acceptance and cultural adaptability**

The success of a project depends not only on the advancement of technology and artistic appeal, but also on social acceptance and cultural adaptability. In different cultural environments, people may have different ways of expressing emotions, which requires more in-depth research and adaptive design.

## **7. Conclusions & Future Work**

### **A. Conclusions**

The device detects the user's body temperature through the Arduino temperature sensor to determine the user's emotional state and selects a matching major or minor chord, allowing the user to play the chord when touching the laser string. Not only does it allow people who don't know music to play their own music, but each performance can produce a unique melody because the music changes according to the mood (body temperature) when playing. The appearance design is inspired by the four strings of the violin, making users feel more intimate during playing. Three different sets of chord tones correspond to the user's different moods, providing users with a medium to express their emotions through music.



## **B. Future Work**

In the future, we will be committed to further improving and upgrading the "Mood Sounds" project to provide a richer and deeper experience:

Technology upgrade: Explore the use of more advanced physiological sensor technology to improve the accuracy and real-time performance of body temperature detection and ensure a more accurate and smooth user experience.

Music library expansion: Add more timbre and melody choices to meet the personalized needs of different users, allowing the device to more fully reflect the user's emotional state.

User feedback and improvements: Listen to users' opinions and suggestions, continuously optimize the system, improve user-friendliness and ease of operation, and ensure that more people can easily participate in and enjoy the fun of music creation.

## **8. Acknowledgement**

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