A Study of Emotional Healing for Hospitalized Children Based on Art Programming Installation

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Abstract. The public interest in interactive installation art has been unabated since its inception. With the involvement of digital technology, people can have a more novel and diverse experience while interacting with the installation. For this reason, the renewal of technical means is pushing art to break through its own boundaries, constantly moving toward the masses and into people's lives. The interactive installation is not simply a repetitive overlay of technology; the humanistic thinking behind the coding is more worthy of research and discussion. Taking the installation work "Lighten" as an example, this paper analyzes how the interactive installation based on Arduino and Max/MSP programming language will be applied in the living space under the background of the digital age to assist in solving problems, thus exploring and researching the social practical value of the interactive installation.

Keywords: interactive installation art · Arduino · Max/MSP · hospitalized children · emotional care

1 Introduction

With the booming development of modern technology, real-time interaction, as an emerging medium of expression in new media technology, is widely used in installation art. Interactive installations in the context of the digital age, by data programming, open-source hardware and software, and various sensing technologies, allow for more design expression in the integration of art and technology. Different from the pure expression of the audio-visual form of traditional installations, interactive installations pay more attention to the emotional experience of the viewer. New media art redefines the relationship between the creation and the experience of the work, and the person in the space is transformed from the traditional role of the viewer to a part of the work [1]. The combination of rational technology and perceptual experience can lead the audience to participate in it and obtain real feelings.

Art, which tends to be routine and life-like nowadays, is gradually coming down from the altar into the scenes of public life [2]. Artists no longer present themselves as elites, thus the social and practical value of interactive installation art is gradually explored. Technology expands the living space of interactive art and makes art more

closely related to our lives. Some difficult problems in life may be properly solved through the artistic intervention of interactive installations [3]. The application of digital technology has made the presentation of interactive installations diversified and popular. While bringing convenience to humans and better integrating art, digital technology will progressively enrich humanity to serve and care for people.

2 Programming Platform

Arduino is a convenient and flexible open-source electronic prototyping platform that senses the environment through various sensors and provides feedback and influence on the environment by controlling other devices such as lights, motors, etc. The designer only needs to splice the components, and then upload the code written in the supporting software Arduino IDE to the microcontroller storage unit on the Arduino development board for burning, and then the design requirements can be realized. The open-source nature of the hardware and software and the simple development method allow designers to focus more on the creativity itself, providing not only a more convenient development environment for professionals, but also a way for non-professionals to realize their creativity.

Max/MSP is a visual programming language for music production and multimedia image generation, allowing the construction of complex interactive programs. Compared to Arduino's code-based programming language, Max/MS's modular programming is easier to get started. It is also known as a universal language for developing interactive music performance software because of its extensibility and graphical user interface (GUI).

The linked creation of Arduino and Max/MSP gives the interactive installation art a variety of colors. Arduino expands the flexibility and freedom of Max/MSP, while the sound design application of Max/MSP gives the interactive installation an additional layer of a more vivid sensory experience.

3 Analysis of the Application of Programming Technology in Interactive Installation

Programming language is a way of communication between man and computer, which makes the boundary between art and technology blurry gradually by means of digital technology.

The interactive experience is enhanced. The most significant aspect of the interactive installation is the interaction between human and object, virtual and reality [4]. The interactive narrative is to communicate with the audience on a cognitive level, while the interactive installation with the introduction of digital technology brings a full experience to the audience on this basis [5]. The field constructed by the new media interactive installation makes it easier for the audience to obtain the artistic aesthetic feeling, and the thinking and other aspects have also been sublimated in an all-round way, which leads to the reflection on life while appreciating. Besides, the warm interaction also dissolves the coldness brought by digital works, allowing our bodies and emotions to be more involved in the works.

It is audience-oriented. In the interactive installation, the viewer's physiological touch, psychological change and emotional experience are all important components of the work. The application of sensing technology and programming technology realizes the extension of human perception function in the digital world. For example, a hand-raising action can make the lights come on to obtain visual stimulation, allowing the audience to integrate into every aspect of the work display process from behavior to sense, creating a deep emotional link with the work. Different audiences get different feelings in the same installation [6]. The unique experience brought by the randomness of the code stimulates the viewers' desire to explore the work and gain a dominant feeling, thus achieving a better communication effect.

It is effectiveness. In the age of intelligence, compared to traditional art, interactive installations with digital technology are more accessible to the public, and the connotations embedded in the works can be understood efficiently. The impact of technology on people is subtle, and when people are exposed to the installation, the concept of art no longer needs to be deliberately instilled but can be naturally comprehended and perceived by the audience in the process of interaction, which means that interactive installations applied by digital technology possess a wider audience and wider popularity than traditional installations. All people may find their own emotional resonance in the installation, and the aesthetic no longer has to be conveyed through the installation in a one-way manner, but through actively experienced.

If traditional interactive art installations are created based on the creator's own aesthetics, experience and thoughts, digital interactive installations are created around the relationship between the creator, the viewer and the installation [7]. The intervention of programming technology allows the viewer's subjectivity to be re-emphasized, thus giving birth to more social and universal values in installation art [8].

4 Design Application Practice of "LIGHTEN"

4.1 Design Concept

Hospitals are synonymous with "pain" and "fear" for young children, and even more so for the group of "hospitalized children" who cannot escape from a specific hospital environment for a long period of time. This is a major traumatic event for sick children and can even affect their future physical and mental development.

"Lighten" is an installation based on Arduino programming language to achieve real-time interaction. Communication and interaction with the balloon device help children relieve their anxiety, create a relaxing and healing therapeutic atmosphere, and improve the therapeutic experience of children, their families and medical care. The installation is divided into two parts. Upon admission, the child is given an independent balloon device. By introducing a reward mechanism, the positive behavior of cooperating with treatment is quantified and corresponds to the number of light beads that light up in the balloon's internal light strip; the brighter the balloon is, the more sense of accomplishment the child receives. The process of stimulation, feeling and reward indirectly affects children to deal with the originally feared therapeutic behavior with a positive attitude. After lighting, when the child feels loneliness, anxiety, fear and other negative emotions, the balloon can be confided, and the balloon will respond to the light flashing and expression change
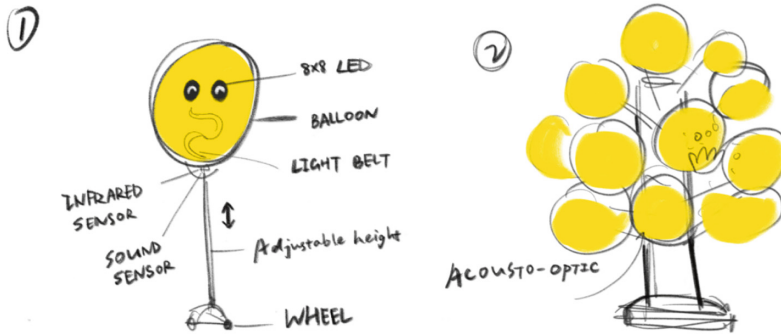
Fig. 1. Preliminary Draft

according to the sound, thus achieving the effect of healing the soul and distracting the patient's attention to the pain. At the time of discharge, the balloon lit by the child will be transferred to the balloon tree installation. Each balloon sound device is a melody formed by sampling the child's voice after processing. When a person passes by the balloon tree installation, the balloons close to it will become brighter and at the same time emit melodic mingled harmonies, allowing the viewer to intersect with people in different temporal and spatial conditions, constructing a unique audiovisual field and giving a rich emotional experience. (Fig. 1).

The balloon that children often come into contact with is used as a medium to endow them with personalized images, so that children can have curiosity and reduce their resistance psychology, and it is easier to establish initial trust relationship compared with strangers or things. Unlike traditional interactive installations, "Lighten" has a certain social aspect. Based on Collins' theory of interactive rituals, when children start to participate in this programmed activity together, emotions will be awakened and children can use the balloon as an opportunity to establish more social connections, form a sense of belonging to a group, and feel the value and power of each other. This process helps sick children integrate into the group and society as soon as possible after they are discharged from the hospital [9].

The name of the work "Lighten" has three meanings: i) During the process of the child actively cooperating with the treatment, the light strip inside the balloon is gradually lit; ii) Balloons act as companions to reduce the psychological burden of children and make them no longer feel lonely and sad; and iii) Leaving the fully lit balloon in the balloon tree installation in the ward after recovery and discharge is intended to convey courage and goodwill to other ward children and encourage them to overcome the disease with hope as well.

4.2   Pre-preparation

The major part of the installation consists of balloons, LED matrix and RGB light strips. The balloon color is bright and warm yellow. Research in child psychology has shown that children with high levels of dependence prefer yellow. Bright yellow, as a warm

color, can stimulate the anxiety-related areas of the brain as well as the nervous system, facilitating recovery from illness.

4.3 Programming Implementation

In Arduino, when a person approaches the balloon, the infrared sensor sends a signal and the light strip in the balloon lights up and emits a free-breathing light flashing effect. If someone speaks, the sound sensor will sense the decibel size of the sound and transmit the signal to the light strip, so that the light changes with the rhythm of the sound, and the LED matrix will start to change. (Fig. 2).

The LED matrix will serve as the eyes of the balloon after anthropomorphism, and when a person talks to it, the 8*8 matrix will be arranged in different light beads to form the expression we perceive. (Fig. 3).

When a person passes by, the second installation recognizes closer biosignals to generate feedback on sound and light changes, allowing the audience to become the creator of the light show and musical score. (Fig. 4).

In Max/MSP, MSP is the module in Max that processes audio signals in real time, which converts real-time vocals into chordal melodies and stores them in the system.

```
void loop() {
    irSensorOutput = digitalRead(irSensorPin);
    decibelValue = analogRead(A0);
    if (decibelValue > 5 && irSensorOutput    == HIGH) {
        drawFaces();
        for(starColor = 0;bright < 255;starColor++){
        decibelValue = analogRead(A0);
        bright = (decibelValue - 130) / 2;
        fill_rainbow(leds, 60, starColor , 0);
        FastLED.setBrightness(bright);
        FastLED.show();
        delay(100);
        Serial.println("HIGH");
        Serial.println(bright);
            }

    } else {

        Serial.println("LOW");

    }

    }
```

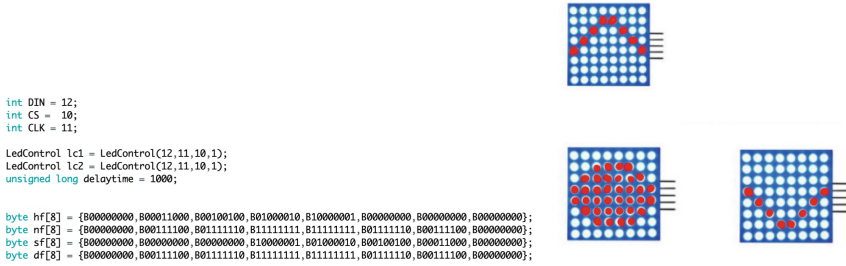**Fig. 2.** Changes in lighting effects during the interaction

```
int DIN = 12;
int CS =  10;
int CLK = 11;

LedControl lc1 = LedControl(12,11,10,1);
LedControl lc2 = LedControl(12,11,10,1);
unsigned long delaytime = 1000;

byte hf[8] = {B00000000,B00011000,B00100100,B01000010,B10000001,B00000000,B00000000,B00000000};
byte nf[8] = {B00000000,B00111100,B01111110,B11111111,B11111111,B01111110,B00111100,B00000000};
byte sf[8] = {B00000000,B00000000,B00000000,B10000001,B01000010,B00100100,B00011000,B00000000};
byte df[8] = {B00000000,B00111100,B01111110,B11111111,B11111111,B01111110,B00111100,B00000000};
```

Fig. 3. Changes in LED matrix expression

```
void loop() {
        irSensorOutput = digitalRead(irSensorPin);
        if(irSensorOutput    == HIGH){
        CRGB myRGBcolor(255,188,255);
        fill_solid(leds, 10, myRGBcolor);
        FastLED.setBrightness(255);
        FastLED.show();
        delay(100);
        }
}
```

Fig. 4. Code of the Balloon Tree

The program of this installation is based on melody generation, melody combination, melody storage, melody pickup and output. (Fig. 5).
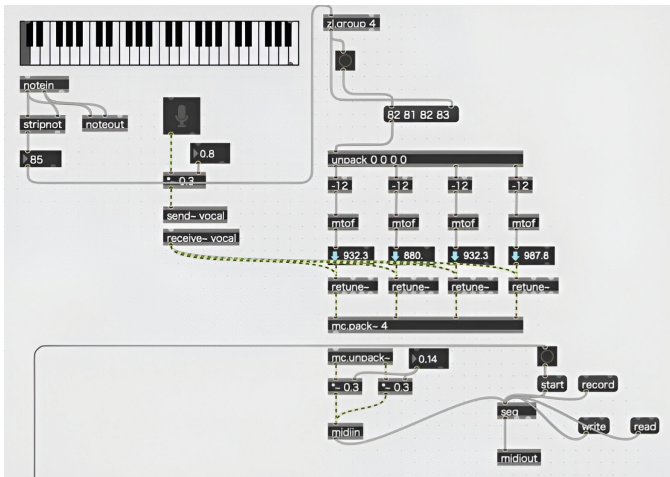

Fig. 5. Code of Max/MSP program

Fig. 6. Final presentation

Communication of Arduino and Max/MSP. In Arduino, Serial.begin() is the communication function to initialize the serial port; in Max/MSP, Serial component is used to send and receive serial port signals. When the serial port information corresponds to the same, real-time communication between the two programming platforms can be achieved. When the infrared sensor senses the biosignal, Arduino transmits the signal to Max/MSP to retrieve the sound file and play it.

4.4 Final Presentation

All components were assembled with balloons and columns after debugging and normal operation, and the final effect was tested. (Fig. 6).

5 Conclusion

At the moment when intelligent interaction is widely used, human subjectivity is strengthened again. How to make the design better serve people is a topic worth thinking about. Technology and art are no longer unattainable heights for people, and the organic combination of the two gives the design a new vitality, conveying aesthetic experience while creating a pathway for design to solve real needs and benefit all of humanity [10]. We can foresee that in the near future, with the further development of interactive technology, interactive installation will be presented in a more innovative form of artistic

expression and more routine and humanized interaction. Artistic creation is integrated into the environment of scientific and technological society and global culture to create more emotional and social values for mankind.

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