Research on the Design of Site-based Interactive Installation Concerning Cyber Speech Violence Grounded on Arduino

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Abstract. Cyber speech violence is committed in the non-physical form on online social platforms. In some online incidents that have already drawn much attention, what the victim said and did is often infinitely exaggerated and misinterpreted. Meanwhile, a large number of netizens usually criticize these incidents with their own limited perceptions and understandings, standing on the commanding heights of morality. In consequence, with the on-going development and spread of the incidents, more netizens will participate in such violence. Despite the helplessness of the victims, more criticisms emerge as follows, thus fueling the violence in virtual world to become real-life violence. In order to alert people to deeply understand the harm of online speech violence, the research applies Arduino, the open-source platform, in the design of site-based interactive installations. Such application aims to present intricate virtual perceiving behaviors in a structured and storyboard manner, thereby surpassing the design of traditional experiential interaction. Furthermore, it enables the operator to enter the scene from the first perspective, which is more in line with human cognitive habits. By means of constructing scenes, shifting plots and designing interactive process, the prevailing virtual speech violence in the online world will unfold before the eyes of the viewers. Taking the “site-based interactive installation of internet speech violence”, supported by Arduino as an instance, this research has evidenced the feasibility of employing Arduino in site-based interactive installations, as well as has provided reference for the reform and development of constructing experiential interactive installations.

1. Introduction
With the high-speed development of technologies such as the Internet of Things, cloud platforms, and Big Data, new media technologies including the Arduino open-source platform are no longer limited to be utilized in education and detection systems. In addition to holographic projection imaging and new media interactive technologies, the digital technologies employed in interactive installations also include pressure-sensitive sensing technology and Arduino, the open-source platform [1]. Arduino serves as an open-source electronic prototyping platform based on the AVR microcontroller, which helps developers to learn quickly and complete design development by themselves in accordance with the C language. It primarily consists of two parts as below. One is the hardware, referring to the Arduino circuit board used for circuit connection, and the other is the software, called the Arduino IDE for short, which represents the computer’s integrated development environment [2]. Moreover, Arduino can assist the building-up of the logic in experiencing the installation of online speech violence, so as to enable the experiencer to have an immersive “real” feeling. In the site-based interactive installation, the experiencer can complete interactive operation via information exchanges and other interactions.
2. Application and advantages of Arduino in site-based interactive installations

2.1. China’s and overseas application of Arduino in site-based interactive installations
Arduino, the open-source platform, has been popularly utilized in creating site-based interactive installations for its several advantages. Specifically, it is not only economical, visually constructable, multi-modal interactive, and scenario-based, but also vivid and immersive. Here are several cases to present the fore-mentioned features. The interactive installation named “Heal the Ocean” is a site-based interactive device in the application of Arduino. Through a variety of expression methods, this installation can give feedback considering marine waste to arouse the participants’ attention on ocean pollution and reflect their own behavior [1]. The application of SuperCollider technology enables the interactive installation to accomplish real-time sound synthesis and algorithm composition. This aims to present a forest scene created by the “Forest”, a site-based interactive installation for the participant. Additionally, participants can explore freely, trigger sounds and lasers by shaking and tapping the “music tree”, as well as can play music via stereo surround sound [3]. Furthermore, “teamLab Borderless” installation uses the “environmental experience” and “multi-channel interaction” modes to make the audience fully participate in the artistic atmosphere created by the installation [4].

2.2. Advantages of Arduino in site-based interactive installations
Arduino’s unique advantage consists in providing a new multi-level immersive experience in site-based interactive installations. In addition, Arduino gradually matures in step with the development of EDA circuit automation technology and TTL integrated circuit technology [5]. Traditional interactive installations statically transmit information via combining texts, pictures, plastics and other materials. Unlike these installations, the information can be provided after the application of Arduino, which will make interactive behaviors dynamic and diversify experience perceptions, so that experiencers can better understand the harm of online speech violence. In this way, the experiencer can reflect more on the speech violence online. In this innovative sit-based interactive installation, the immersive experience regarding online speech violence is supported by the Arduino and indicates the following characteristics.

2.2.1. Being economical: there is almost no expense in developing traditional open-source software, while the development of open-source hardware requires relatively high cost. Since Arduino has both software and hardware development functions, its low-expanse provides feasibility for designers to establish human-computer interactions.

2.2.2. Being visually constructable: Arduino can present abstract speech violence in a more logical, intuitive and comprehensive way. Specifically, the technology can construct control sentences through simple operations such as listing and dragging of logical language modules and sensor functional language modules, thereby realizing the corresponding functions in the experience of internet speech violence and enhancing the immersivity of the experiencer.

2.2.3. Being scenario-based: the personal experience of online speech violence requires the experiencer to construct the plot development of according to the guidance in the interactive installation, rather than one-way information transmitting. In addition, the experiencer should not only be the receiver of information, but need to actively construct the information. Arduino helps to structure the logic of interactive behaviors and diversifies the perception ways, so as to provide a “real” environment for the experiencer to explore based on their own cognition and experience.

3. Research on the design of site-based interactive installation on cyber speech violence

3.1. The status and features of Cyber speech violence
As a product of the speeding-up development of the Internet, different from traditional violence, online speech violence is indicated as insults, slander, rumors, and privacy prying online. With such violence
even worsening, the extreme consequences are too numerous to count. Cyber speech violence not only destroys the safety of the Internet, but also affects the online social harmony. It mainly has the following characteristic.

Being emotional and vulgar: on all online communication platforms, there are always sensitive words involving insults and sarcasm, and the incidents are spread and distorted through netizens. “Online speech violence” represents more possibly the anger of netizens, than a reasonable analysis of incidents. The netizens cannot maintain the rationality and fairness of their speech in the face of various sensational online incidents, and even worse their speech behaviors tend to be vulgar and emotional.

Direct personal attacks: internet dissatisfaction speech signifies mostly the expression with logical organization or merely emotional catharsis. As a result, it may be abusive and aggressive, and the abusive speech often develops into extreme behaviors, such as personal slander and attack. In the case of insufficient information, people’s moral accusations and criticisms have become common means to punish these victims. This explosive emotional vent gradually contributes the development of online speech violence to behavioral violence.

The threat of physical violence: the remarks made by some netizens on public heated events have surpassed normal rationality. They not only made moral accusations against the perpetrators in the virtual network world, but also gradually shifted to becoming the perpetrators. They might expose personal private information online, such as the trajectory of the victims' life, thus, the pressure suffered by the victims shifts from the virtual network world to the real life, which is seriously harms social stability.

3.2. Design of the installation
This installation is a site-based interactive device for “internet speech violence”. By creating the “real” online violence environment, the installation provides the participant with the guidance of the development of the storyline, so that he or she can truly feel the harmful impact of speech violence from the first perspective. With interactive process and multi-sensory experience, participants can think deeply about online speech and their own behavior.

3.2.1. Research targets: first and foremost, the visual display design of “Internet speech violence” is carried out for Internet audiences and this design can fully reflect its innovation and interaction; second, the interactive experience designed for the entire installation can be highly reusable and popular. The application technology includes researching and developing and constructing technology platforms for installation-related software and hardware. The site-based interactive installation utilizes well-developed interactive programming language and software and hardware platforms. Through integration and R&D, the installation can push the growth of this design field, improve its own visual effect, thus arousing public’s in-depth thinking.

3.2.2. Research methods: first of all, case study is applied to search and read a large number of references, summarize the ways to express feelings and speech violence online, as well as render the research results more authoritative and convincing. In addition, the research also conducts the study concerning the current cases of site-based interactive installations from China and other countries, which is dedicated to offer some references for the design and development of interactive installation on “internet speech violence”. Second, this installation design combines the research results from multiple realms such as psychology, linguistics and social sciences in order to give theoretical support for the subsequent practice. Third, the technical research takes installation design as evidence and identifies the technical needs for proper installation display effect.

3.2.3. Innovation of the installation: first, according to the synesthetic translation theory, the violent behaviors of online speech are displayed in a visual form, which helps the users experience through multiple senses, and improves the interaction effect and better present the real situation. Second, the research utilizes Arduino, the open-source platform, pressure sensors, MP3 modules and other
technologies to design and integrate the space shifting between virtual and real “Internet speech violence”. The interactive installation gives full play to the immersive, interactive and inspiring guidance of the site-based device, and provides visual, auditory, tactile and other multi-channel perceptions, hoping to bring a strong sense of presence to the audience and make them feel as if they were on the Internet and pressured by the bombarded public criticism.

4. Application of the site-based interactive installation on cyber speech violence

4.1. The primary content of the design

4.1.1. Story script design: the story script lays down the foundation for the introduction of scenarios in this installation design. This display design is mainly composed of two storylines. The first storyline is that the experiencer is exposed to cyber violence as his or her behavior is described with great exaggeration and malicious speculation online. This storyline focuses on the inducement of “Internet speech violence” and how to let the experiencer complete the situational task naturally and subconsciously. Particular to note, it is worth serious consideration to present speech violence behavior realistically in the interactive situation during the entire research. The second storyline provides the story background of the internet violence environment for the first line, and it includes various story plots. Moreover, the interactive hints can also guide the experiencer to complete the interactive behavior and enjoy a smooth experience.

4.1.2. Installation script design: the script design is primarily grounded on studying the status change of the installation in the progressive development of the story plots. It is the designer's five-sense design presentation of the complex emotional changes of the victim's ranging from confusion, sadness, grievance, anger and collapse. In addition, the tone changes of a single person or many people bring the participant a diversified experience.

4.1.3. Operation design of software and hardware: Based on the interactive programming language, the installation acts as the foundation for accomplishing the interactive behavior between objects and participants. The Arduino main control board can take into account the developer's multi-modal somatosensory interaction requirements for the installation. Also, it can be combined with Adobe Flash, Processing, PureData, SuperCollider and other software, to achieve cross-field technology integration and produce interactive works. In addition, the installation also has external interface devices, which
can be compatible with electronic components such as switches and sensors to perceive the environment and provide feedback to the Arduino Uno chip. It can respond to and affect the environment by controlling other output devices such as LED lights and MP3 modules. The micro-controller on the Arduino circuit board can write program in a programming language and compile it into a binary file [7]. This installation can bring multi-directional and multi-sensory experience to users. Given the site-based interactive device environment, the participants can better understand online speech violence through multi-modal interaction including watching, hearing, and touching.

```
void loop() {
  if (press1 == HIGH) {
    digitalWrite(led, HIGH);
    analogWrite(topLight, 255);
    delay(5000);
    digitalWrite(sound1, HIGH);
    for (int a = 255; a >= 200; a--) {
      analogWrite(topLight, a);
      delay(500);
    }
    digitalWrite(sound3, HIGH);
    for (int a = 150; a >= 100; a--) {
      analogWrite(topLight, a);
      delay(500);
    }
    digitalWrite(sound4, HIGH);
    for (int a = 50; a >= 0; a--) {
      analogWrite(topLight, a);
      delay(500);
    }
    digitalWrite(led, LOW);
  }
}
```

Figure 3. Arduino code

4.2. The display of design

The first scene: in a dark environment, what can merely be clearly seen is the forward-pointing arrow composed of warm yellow point light sources on the ground. In front of the arrow, the experiencer can faintly see two roses and an envelope in a black paper box, creating a tranquil and cozy atmosphere.

Figure 4. The first experience procedure of users

The second scene: the user picks up the rose, then drives the installation to start. Specifically, the pressure sensor receives the signal, and the top light suddenly lights up. The user can clearly see the arrow full of mocking words pointing to him or her, and hear the multi-layered sounds around him or her that promote the development of the plot, as well as feel a sudden ridicule in the end.

Figure 5. The second experience procedure of users

The third scene: the experiencer looks around, guided by the sound in the plots, and then turns his attention to the arrows written with evil words pointing to him. While the user is reading, the noisy voice is about the accusation and criticism of the “netizens”. With the further plot development, the violent
atmosphere of online speech will arrive at its peak. The brightness of the lights also varies from bright to dark at this time, indicating the psychological changes of victims plagued by online speech violence.

![Figure 7. The second script of auditory interaction](image)

The fourth scene: as the volume of the sound gradually increases and becomes noisier, the experiencer feels irritable and tedious due to the auditory stimulation. When the voice of public opinion reaches its peak, accompanied by a deafening scream, the surrounding sounds stop and the lights turn off abruptly. Then, the scene returns to the dark environment, symbolizing that victims of online speech violence cannot be saved and become caught in collapse and despair.

5. Conclusion

Based on Arduino, the open-source platform, the site-based experiential installation design on “Internet speech violence” differs from the traditional interactive installations, since it can give users a real experience as a cyber violence victim. Given the promotion of the two storyline, the interactivity of the installation is enhanced between human and computer, while the interest of the interactive experience is also sparked. Therefore, this installation fully embodies the combination of “new media technology, social thinking subjects, and perceptible design methods”. Furthermore, this installation turns experiencers from “bystanders” to “intuitive feelers” of online speech violence. Thanks to the integration of art and technology, the public can gradually realize the harms of online speech violence and reflect on their daily online language, as well as even have an in-depth thinking and exploration over the social status caused by the flourishing boom of the internet.

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