Interactive Fan Dance: Towards a Community-Informed, Culturally Situated Interactive Dance Instrument

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Figure 1: Various physical prototypes of an interactive dance fan.

Abstract

Interactive Dance literature is dominated by instruments centered around contemporary dance, and to a lesser extent, ballet. This paper provides an alternative perspective of culturally situated, community-informed NIME design through interviews with 18 practitioners of Chinese and Vietnamese fan dance, examining how dancers negotiate traditional identity and culture in their practice. From these insights, we propose a conceptual framework that places fan dance as a living, highly contextual, and social practice. This framework provides the foundation for preliminary explorations of a culturally situated interactive dance interface, investigating how NIMEs can be embedded within existing intangible cultural heritage (ICH).

Keywords

interactive dance, intangible cultural heritage, communities of practice, interview

1 Introduction

Interactive dance is the predominant term to describe dance in which, just as the music influences the performer's movements, so too does the performer's movement automatically influence the music [15].

We select fan dance practices surveyed in both Chinese and Vietnamese diasporic communities as the locus of our exploration in order to investigate designing within existing cultural practices outside of the dominant scholarship centered around Western dance. Here, "fan dance" does not refer to a specific tradition or historically distinct lineage of practice, but rather encompasses all dances using fans as the primary prop within the broader context of Chinese and Vietnamese dance. We choose "fan dance" specifically due to the centricity of a specific device within the practice—this situation of an object in culture allows for natural and contextual integration of technology within established routines. The investigation of fan dance through two adjacent but altogether distinct cultures allows for a comparative lens that illuminates how an interface's design can reflect cultural characteristics at different levels of granularity—what aspects are shared between these two cultures, and what distinguishes them, and what makes each dance group themselves unique.

A critical perspective inspired by post-colonial science and technology studies (STS) motivates our design for interactive cultural dance. Post-colonial STS foregrounds the importance of knowledge originating outside of the Global North, advocating for innovation or technology based on local systems of understanding in order to challenge dominant paradigms of scientific progress that may be based on latent assumptions of hegemony or imperialism [11].

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We offer an initial exploration of this landscape—focusing primarily on the construction of cultural identity—by investigating how individual dancers characterize their own practice.

2 Related Work

Most scholarship on interactive dance is based almost exclusively on contemporary dance [1, 8, 14], with some emphasis on ballet [2, 9]. There are, however, a few examples that explore other cultural dance traditions. Brown [5] investigates NIME design for Argentine tango, an established tradition of dance that primarily involves non-professionals in a social setting—very similar to our studied populations of Vietnamese fan dance . Brown's interface seeks specifically to further accentuate specific aspects of a dance—in this case, the connection felt between dancers, music, and each other. Kapur et al. [12] designs a general interactive system used in the context of traditional Korean dance—the NIME is used primarily as an interface that allows additional events to be triggered during the performance. Dahlstedt & Dahlstedt [7] develop an improvisational system that sonifies movement, explored through traditional Japanese theater dance; their system focuses on making micro-changes of position in space audible. Kapur et al. and Dahlstedt & Dahlstedt create more generalized controllers used in specific cultural contexts—less so designs adapted specifically to the affordances of a particular mode of dance.

Brown's NIME investigates the relationships constructed between different dancers within a community in a specific dance tradition—we provide an additional perspective focusing on the construction of cultural identity and plurality of community, situating knowledge in the individual and the specific systems of understanding embedded in their contexts. With this lens, we take a broader view of dance that explores how practitioners understand their definitions of culture and tradition, and thus aim to broaden the landscape of designing socially and community situated NIMEs.

In understanding how dance plays a part in individual dancers' mediations of their own identities, we engage dance as intangible cultural heritage (ICH), defined as "the practices, representations, expressions, knowledge, skills—as well as the instruments, objects, artefacts and cultural spaces associated therewith—that communities, groups and, in some cases, individuals recognize as part of their cultural heritage" [16]. Critically, ICH is understood as constantly recreated through specific groups, environments, and social contexts—living practice that descends from inherited traditions, but also embodies contemporary usage.

3 Methodology

The authors briefly reflect on their positionality in relation to the work discussed. Drawing upon the authors' identities as members of the Chinese and Vietnamese diasporas and recognizing that the authors are not dancers themselves, we leverage our perspective as culturally proximal, but not situated within the community of practice. Community connections and various shared cultural understandings facilitate interactions with dancers, while a distance exists that allows for a different and at times more critical view on fan dance as a set of cultural practices.

Due to the distance authors have from the dance communities investigated, we employ a qualitative approach involving exploratory, semi-structured interviews, common within human-computer interaction and sociological literature [13], with members of the community in order to develop a critical understanding of Chinese and Vietnamese dances as living practices.

Authors conducted a set of online interviews over Zoom with 18 different dancers, each lasting approximately one to two hours. Each dancer was individually interviewed by either one or two researchers—in the latter case, one researcher would facilitate and the other would take notes. Interviews were machine transcribed and then reviewed and edited for accuracy and anonymity. Taking advantage of the authors' positions adjacent to the communities of practice, dancers were recruited through authors' personal networks, outreach to local studios and organizations dedicated to Chinese or Vietnamese dance, and finally snowball sampling from early participants who introduced their own connections.

Authors drew upon a grounded theory informed approach, conducting thematic analysis to derive insights from the interview data [4]. Two interview transcripts, from a Chinese and a Vietnamese dancer respectively, were initially selected based on their representation of ideas common throughout the 18 interviews. Authors individually assigned open codes to each of these interviews, met to consolidate similar codes into a unified codebook, separated to assign the unified codes individually to the two interviews again, and then finally reconvened to check the degree of inter-coder agreement between the codings. For sections or applied codes that disagreed, authors discussed differences and created or edited codes to address differences in definition or scope.

Authors used this edited, unified codebook to individually code batches of interviews after the initial two, meeting after every batch to discuss new codes that emerged or other notes. In this manner, authors individually coded the rest of the interviews separately and discussed results, periodically expanding or editing the codebook.

The final codebook contained 204 open codes, which were organized into 29 axial codes, and further arranged into 9 subthemes centered around 4 broad themes describing technology and three levels of social mediation, discussed in the results section. An excerpt of the codebook can be seen in Table 1.

4 Interview

The process consisted of a single interview with each dancer, roughly split into the following 5 sections but flexible enough to accommodate digressions for further context, aiming to facilitate a holistic understanding of the dancers practices in the context of their environments and identities, their physical and embodied experience dancing, and their thoughts and opinions on possible opportunities for NIME exploration.

(1) Background in dance and motivations
(2) Performing, embodied feeling of fan dance, and existing pain points
(3) Artistic vision, creativity, choreography, storytelling, and music
(4) Definitions and contexts of culture and tradition
(5) Possible interactions with technology

We concluded the interviews by opening up the discussion to dancers, allowing them to discuss any missed points or ask questions about ongoing research. We also discussed any interest in continuing collaboration as part of future research.

Table 1: Excerpt of Codebook

Theme	Sub-theme	Definition	Example Quote
Culture	Nebulous Boundaries	Chinese and Vietnamese fan dances draw from diverse and often global influences.	"I don't know if there's necessarily ever been, like, traditional fan dance, like, moves, but sometimes we'll incorporate, I guess, more modern and more pop moves into our choreo... which I think probably makes it less traditional."
	Situated in Community	Dance groups foster unique community engagements in culture based on their different contexts and histories.	"The founder's daughter will choreograph a 3 or 4 part mini dance drama... about Vincent Chin or Mabel Pinghua Lee or migrant workers moving to the city, like, things like that... And it didn't used to be that way. When the original founder, the first director, started up in the 90s, it was kind of just more, here are these beautiful dances without much of a story. But now her daughter has been taking it more into a political side and historical side and showing these different events."
Tradition	Prop Centricity	Emphasis and respect of dance props is a core tenet of traditional identity.	"I think the, the Chinese dance, I think, it's using more those *dàojù*s [props] than any other country..."
	Embodied Culture	Traditional dances have specific movement philosophy that reflects cultural values.	"There is always this rounded feeling that we need to have within our torso... If I need to like connect to the Chinese culture, right, it's a lot about balance, right? The yin and yang being balanced..."
	Holistic Environment	Holistic material, thematic, and aesthetic environment contribute to a dance's perceived traditionality.	"I think, you know, referencing nature is great. Chinese dance references a lot of nature, you know, flowers and water... weather..."
Community	Prioritize Immediacy	The present needs of a group and their audience determine how they interact with culture.	"If there's something that our group as a whole doesn't really like, we can all just kind of agree to change it in a way, like, early on in the process."
	Social Practice	Dance is enjoyed as a physical, social practice that empowers individuals.	"I do teach dance, so I try to encourage my teammates to dance because I think... My heart is really to encourage other ladies to, to have the confidence in themselves."

5 User Context

Several salient features for categorizing users arose from our discussion of dancer backgrounds. Participants ranged from ages 16 – 62, and can be split along various axes. 15 participants were all either students or early in their careers, and grew up within the United States. 3 participants were older dance instructors and first generation immigrants from China or Taiwan, where they had professionally trained and studied dance. Two of these instructors were under 40. Out of all 18 dancers, 12 had experience doing fan dance in Chinese contexts, and 7 had experience dancing in Vietnamese contexts—1 dancer had experience in both contexts. 16 of the dancers were women, 2 were men; both men danced in a Vietnamese context.

From our interviewed population, we found that all Chinese dancers learned dance in a formal setting starting from a very young age—around 5 years old—usually a studio or academy, and often had experience in other styles that were taught in conjunction with traditional Chinese dance. This was most often ballet, but also included assorted minor experiences with styles such as hip-hop, contemporary, jazz, and character. Reflecting this multi-faced background, many Chinese dance studios blended elements of ballet and other styles into their repertoire, and in their more formal contexts, most Chinese dancers performed primarily for recitals and competitions, though also doing cultural, extracurricular, community, and public events. Chinese dancers most often danced with a single fan, citing greater versatility of

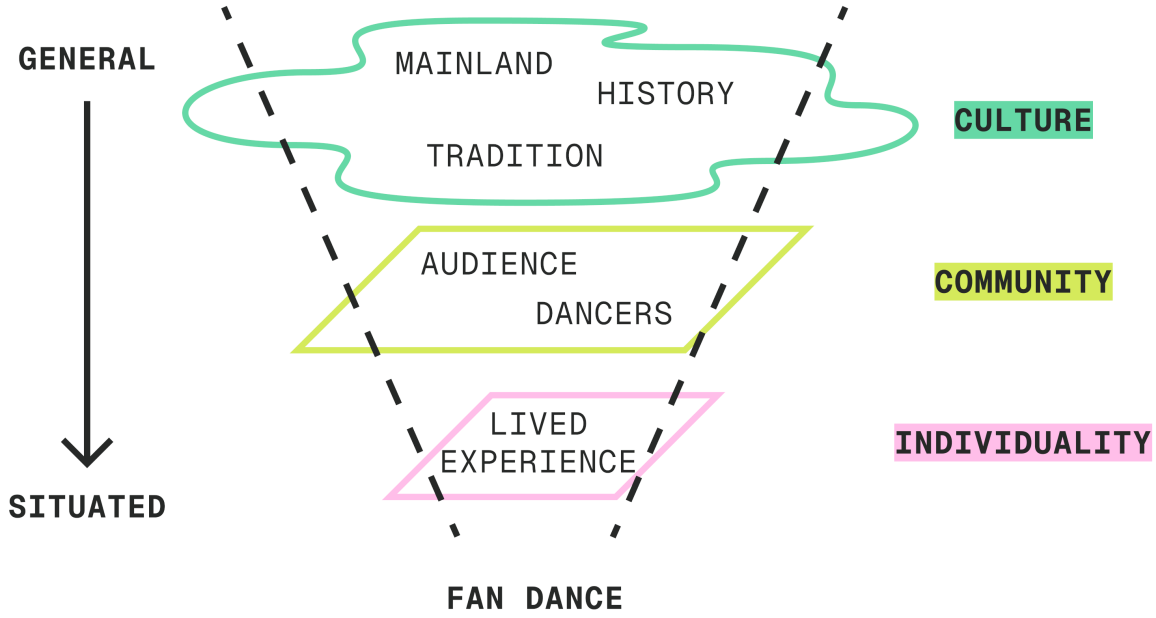

Figure 2: Fan dance is mediated by increasingly situated layers of identity.

movement when they had a free hand, only occasionally using two in dances when they needed to accomplish specific purposes. Conversely, most Vietnamese dancers were self or community taught, learning from resources such as YouTube videos, temple dance groups, or school clubs, and began their practice in high school or college usually centered around cultural demonstrations or exchanges tied to their attended institution, most often starting these groups themselves due to lack of previous representation. Interviewed Vietnamese dancers almost always used two fans in their practices, one in each hand. Across both contexts, dance fans appeared in various forms, composed of either plastic or bamboo, coming in short, medium, and long tail lengths, referring to the length of free floating fabric extending from the leaf (pleated fabric) outwards past the guards (outside handles). Notably, shorter fans were also described as "percussive", referring to their ability to create a signature loud "snap" when opened, often timed to music.

Among the dancers raised in the United States, most were second generation immigrants—their parents migrated from the country of the dance they practiced, either China or Vietnam. However, there were some exceptions. One of the Chinese dancers was an adoptee to a non-Chinese household. The dancer with experience in both fan dance contexts was ethnically Chinese, but had practiced more fan dance in a Vietnamese context. Another one of the Vietnamese context fan dancers was Laotian, dancing with a majority Vietnamese friend group. These latter two dancers participated in fan dance as part of the same school, where their dance team began as part of an Asian American student organization in a community with little Asian representation. These individual and group contexts change how identity and culture are negotiated through practice.

The historical context of both dance and migration also informs cultural differences seen in diasporic practices. Dance in both China and Vietnam has deep traditional foundations, and has seen modern innovation through the creation of "national dance" in tandem with the creation of the modern Chinese and Vietnamese states, including collaboration with Soviet dancers, field research by institution choreographers into ethnic traditional customs, and synthesis with Western and contemporary practices. In this sense, the term "traditional dance", as used by our dancers and in this paper, though also referred to as "classical dance", actually refers to an amalgamation of various folk conventions with modern and global elements, synthesized for multiple purposes including post-colonial nation-building [6, 17]. Taiwan, vying with the People's Republic of China as the "true" inheritor of Chinese history and customs, drew upon similar inspirations of folk, ancient, and modern elements in the creation of "Chinese dance" [18]. The historical patterns of migration for Chinese and Taiwanese versus Vietnamese immigrants to the United States also affects the degree of formalization and loci of diasporic fan dance—the socioeconomic and geographic distributions of migrant communities may affect the demographics trends observed, such as Chinese dancers being more formally trained and Vietnamese dancers being more self taught, more so than any inherent cultural difference between the dance traditions.

6 Results

Understanding this complex web of relations that define Chinese and Vietnamese dance, we position these living practices as drawing upon a shared understanding of "culture", an amorphous set of symbols, aesthetics, and themes, and a subset of these ideas that defines a sliding scale of "traditionality". These broad concepts are configured by localized community and further by

individual identity to arrive at the phenomena that dancers own as "fan dance" (Figure 2).

In order to create a NIME that is critically embedded within both culture and community practice, we propose that these three levels of identity negotiation must be engaged through specific and intentional design.

6.1 Culture

"Culture" is a shared understanding of an amorphous and constantly shifting set of ideas, created by dancers, that nonetheless center around certain recurring themes, symbols, and aesthetics, while all being seen as elements inherent to a larger understanding of fan dance as a whole beyond any local practice. Because of the inseparable relation between ethnicity and nationality, culture embodies ideas of "tradition" as well as history and modern practice of the Chinese and Vietnamese people and their motherlands, especially among our surveyed diasporic population.

6.1.1 Mainland Identity. One of the core ideas of culture, distinct from tradition, was the idea of drawing inspiration from modern practices of the mainland when designing fan dance. Many dancers looked to Vietnamese pop music, Chinese dance trends, or other contemporary practices when choreographing their performances. These included popular media and cultural exports, such as wuxia films, kungfu, or dramas as valid material for inspiring hypothetical future fan dance, as well as references to mainland Chinese performances or fan dances, such as those on CCTV galas, when looking for choreographic inspirations.

6.1.2 History. Besides modern trends from the mainland, culture also embodies history, which includes the history of dance as well as of the Chinese or Vietnamese peoples practicing these dances. Various dancers describe the importance of understanding the context and rationale behind how dance practices came into fruition—whether that is Chinese traditional dance tracing historical inspiration from Chinese opera and traditional martial arts, or questioning how Dai ethnic dance is taught as one of the classic Chinese folk dances when the Dai designation is itself product of state consolidation of Chinese ethnic minority groups, and is not typically accepted as a uniform definition by any of the people that fall into this official designation. Here, historical context is vital in determining whether or not dance is considered cultural by these dancers. History also encompasses people—a Chinese dancer expressed how her troupe incorporates Chinese-American history into their productions, and Vietnamese dancers reference popular diasporic TV program *Paris by Night*, which often depicts Vietnamese culture as well as historical and political events, as an inspiration for dance—as well as practices—a dancer described using calligraphy among other non-dance historical practices as an inspiration in designing choreography.

6.2 Tradition

Among these wellsprings of holistic cultural identity, "tradition" encompasses a strict subset of ideas that we center around three principles: centricity of the fan, permeance of cultural values within embodied movement, and the prevalence of objects, themes and symbols. A fan dance's differing levels of interaction with these three ideas determines the level of perceived traditionality.

6.2.1 Centricity of the Fan. The fan is the predominant focus of "traditional" fan dances; movements and aesthetics revolve around the prop's physical affordances. Dancers contrast modern and non-cultural fan dances, which treat fans more as an accessory, with traditional fan dances which locate fans as the center of the performance and the embodied motion. Especially in Chinese culture, props are seen as a critical part of tradition. Here, centricity of the fan also means taking full advantage of a folding fan's versatility compared to these other props. Dancers consistently describe the smaller, handheld nature of the fan (as opposed to a larger prop such as a sword, or umbrella), as well as the ability to switch between open and closed forms, as integral to artistic expression—it is variously opened to mimic objects such butterfly wings or flowers, closed to be wielded as a baton (short fans) or a ribbon (long fans), and combined to form group visuals with other dancers, enabling an extreme amount of variation and inventiveness in both mobility and emotional expression.

6.2.2 Cultural Values Permeate Movement. Further expanding on the idea that the fan is a focus rather than an accessory, dancers position fans as an extension of the arm and body. They contrast traditional Chinese and Vietnamese fan dances with other Western practices that use fans, which may have the same prop but lack the holistic embodied ecosystem, immediately setting them apart. In Chinese dance, this involves not only the fan hand, but the waist, the non-fan hand, and the entire body engaging in, as one Chinese dancer describes, "Chinese folk dance-y sort of things". Another first generation Chinese instructor describes this specifically as indirection, circular movements, and a circuitousness of motion—in Labanian terms, the usage of indirect paths through space [3]. This is understood by Chinese dancers as embodying virtues of modesty and indirection, ideals that are seen as ingrained in the Chinese cultural genome and consciousness, described by the instructor as a reflection of balance and the concept of yin and yang. Vietnamese and Chinese dancers also describe cultural norms embedded within the motion of dance, specifically femininity, grace, and softness in traditional dance, especially when using longer fans, though they also note that this does not imply weakness—often grace is simultaneously understood as and paired with an expression of inner power and confidence. In all these cases, we see fan dance as the manifestation through the body of cultural values at large.

6.2.3 Prevalence of Objects and Themes. Specific ideas, concrete objects, narratives, and tropes are deemed more traditional. This includes music that features traditional instrumentation, "traditional" clothing (as opposed to Western streetwear or contemporary dancewear), such as Vietnamese *áo dài*, and more "traditional" narrative elements—common themes of dances include nature, celebrations and festivals, myth and folklore, depictions of rustic village life, and love stories. Here, traditionality, to varying degrees, is enacted through the inclusion of any subset or combination of concrete cultural objects and themes.

Fan dances can engage at different levels with each of these aspects, defining their level of "traditionality"—a Vietnamese fan dance perceived as very traditional might figure dancers dressed in *áo dài*, music featuring *dan bau* or other folk instrumentation, and depict a village love story, whereas removing any of these singular features might decrease that perception while still remaining distinctly culturally Vietnamese.

6.3 Community

"Community" defines the immediate context of practice that mediates a dancer's relationship with culture. Though fans can be used in a solo performance context, fan dance is most commonly done in a group. Community here refers to these groups of practice, which choreograph, practice, and perform their own productions, as well as their overarching networks of support including audiences, family, and ancillary cultural groups. Common communities that our interlocutors occupy include dance academies, troupes, school clubs, and temple dance groups. These communities may either be self organized, where choreography is most often done by a constituent dancer, or administered under a more formal institution, in which case there will often be instructors that help organize practices, opportunities for performance, and dance choreography.

In all cases, these communities are defined by their own specific needs and goals, which affect how they cocreate fan dance identities. We propose that communities can be understood through two aspects—the context of the audience, and the social situation of the dancers.

6.3.1 Audience Perspective. Fan dancers across all surveyed demographics have stressed the importance of the audience in how they define their practice. Fan dance is performed for others, and this outside perspective changes the priorities of the dance. Chinese dancers, both students and instructors, recount that when they attend dance competitions, there is a strong emphasis on technique and precision—this reflects the audience perspective, which is usually a panel of judges. Dances may be choreographed to showcase difficult techniques, and dancers themselves report a stricter practice regime focused on these details. In contrast, dance for a public audience at a festival is far different—dancers can afford to make minor mistakes, as they know that non-professional onlookers will most often never notice, and the priority shifts most frequently to providing an entertaining show or facilitating cultural exchange. To this end, dancers report specific audiences having specific preferences—one Chinese dance instructor reports events within broader Asian communities enjoying folk dances more, while other dancers often report the appeal of dancing with a narrative or storyline when performing for their classmates. In this way, audience composition affects how dancers select and opportunistically engage with various parts of culture and tradition within their practice, foregrounding some aspects while neglecting others in the name of creating an enjoyable and memorable experience.

6.3.2 Dancers' Context. The needs and perspective of the dancers within a group is also critical to the construction of cultural identity within fan dance. Why was this group formed? Who occupies this group? What can dancers do? These are questions that center the community identity of a fan dance group. We can gain a perspective on different groups' constructions of identity through reviewing their websites—a key touch point in a group's communication with the public and community. We find that one Chinese participant's dance company specifically centers a focus on the education and advocacy of Chinese and Chinese American identity on their website. This, in turn, facilitates their prominent inclusion of Chinese American political history and Chinese mythology within their work. It also defines the social relationships of constituent dancers—our interviewed participant mentioned that her team would also meet regularly as a book club discussing Asian American literature, further cementing cultural identity. A different Chinese dancer's studio had a website with a greater visual emphasis on producing technically elite students, with less mention specifically of cultural education of out-group members as their core mission. While the school was dominantly Chinese, the studio also focused heavily on professional, classical training as a ballet studio. Similarly, dances choreographed by the studio were less focused on Chinese American identity and history specifically; syncretism of Western ballet and Chinese traditional, while present in many Chinese dance troupes, was often more implicit in the fan dances of this and similar studios, and thus facilitated cultural exchange and identity creation of its constituent dancers through a different, though no less complex, lens. Social relationships among dancers in these types of studios also differed—participants reported bonding over boba or ramen after class, where culture was more passively absorbed through the environment rather than intentionally enacted through historical discussion or political action. Group ability and preference also affect the cocreation of fan dance—Vietnamese participants reported learning dances off YouTube and then changing moves to better suit their groups differing levels of abilities, or selecting more traditional or V-pop influenced music based on group voting.

In these settings, specific dynamics of the community, defined by the identities of their individual dancers, their contextual purposes as organizations, and their relationships with surrounding communities and audiences, dictates to what degree and from which specific areas is culture and tradition is reified in fan dance.

6.4 Individuality

Finally, individuality encompasses the lived experience of each individual dancer, and represents the most intimate and immediate level of cultural identity. Individuality is based on memory, experience, personality, and individual relationships. This can be seen in differing individual motivations that define how individuals understand culture, such as a Vietnamese dancer who describes his own fan dance as an opportunity for celebration denied to his immigrant parents or a Chinese instructor who describes her practice as a way to stay connected with the country of her birth so long after her own emigration. This may also be seen through movement background and preference—though fan dancers typically operate in groups, their dances are based on the composition of individuals. One Chinese dancer, who oversaw choreography as part of her university dance team, described how she worked with fan dancers who came from martial arts or figure skating backgrounds, and how their experiences in these bodies of movement heavily impacted their dancing style. For instance, she developed more gymnastic movements and a combative narrative for the dancer with martial arts experience. Dancers variously also mentioned their preference for certain aesthetics of dance more than others based on their demeanor, personality, and conceptions of cool. A Chinese dancer describes her personal style as having a "sweetness" to it, versus that of a recent graduate from her school, who she described as more "strong and fierce". Even when performing the same dance, a Vietnamese dancer describes the satisfaction of being able to select the individual color of her outfit, and a Chinese instructor notes that different dancers can express different nuances, such as "happiness" as opposed to "hope". These personal preferences also manifest in choreography—a Chinese dancer describes being

Figure 3: A Chinese dancer uses the prototype in a brief evaluation through improvised choreography.

drawn to certain types of narratives—such as "man versus society"—which variously influence how she selects her movements and symbols.

In this way, individuality represents a dancer's personality, shaped by their personal experiences, memories, and preferences. Within the subsets of culture defined by the group, individuality further affects how fan dancers vote, influence, choreograph, and assign personal relevance to their group's selection of choreography, and within that choreography how they express themselves through their moves and individual decisions to make fan dance their own.

7 Design Implications

Through an understanding of how fan dancers define identity within their practice through successively more situated lenses of culture, community, and individuality, we develop a set of recommendations for the design of a hypothetical NIME embedded in this framework.

Returning to our initial post-colonial motivation for situating the exploration of interactive dance research within Chinese and Vietnamese fan dance, Harding highlights feminist critiques of post-colonial STS theories that obscure discrepancies across gender when modeling technoscience [10]. Investigating fan dance as an alternative site of exploration from contemporary dance reveals precisely this importance of plurality, of the various needs of different individuals and communities within a heterogeneous space. How, then, can we create a NIME informed by and embedded in cultural practice, while still acknowledging and empowering plurality?

7.1 Affordances

We propose and begin to develop a NIME that takes the physical form of a folding fan, pictured in Figure 3, augmented with additional sensing affordances that enable it to generate and affect sound. In accordance with our understanding of culture as configured specifically to group and individual contexts, we design our fan to encode general aspects of culture and tradition at a platform level, allowing groups to instantiate specific elements of their cultural source material according to their unique needs.

By focusing on our definitions of tradition, we affirm dancer sentiment that the maintenance of a greater degree of traditional elements allows other aspects of the dance to be changed more freely without losing its identity as fan dance.

Drawing upon the centricity of the fan, we recognize the physical shape of a folding fan as the ideal vehicle for NIME exploration—rather than a technocratic disruption, focusing on the fan aligns with traditional reverence and usage of the prop. Furthermore, fan dance in the broader cultural sense is constantly evolving, as dancers seek to use every affordance of the physical device in order to pioneer new techniques. Besides the already covered methods of use reported by Chinese and Vietnamese dancers, Chinese participants also report throwing and catching the fans, holding the fan by different parts besides the bottom of the guard, and even attaching ropes to them to make them "fly". In this way, adding new ways of interaction to the fan is in line with the object's identity as the most versatile prop, a key factor in the popularity of fan dance.

Along these lines, we implemented sensors in our prototype fan to both capture existing and provide new interactions.

(1) **Potentiometer:** Measures how the fan opens and closes; dancers typically snap open a fan to create a percussive beat.
(2) **Force Sensitive Resistor:** Measures grip pressure on the fan's guard.
(3) **IMU:** Captures Labanian movement qualities, which encode cultural values.
(4) **Buttons:** Allow for triggering discrete events regardless of how the fan is held along the guard.

Figure 4 illustrates where these sensors are embedded into a custom designed guard. We also choose to specifically build our NIME as a single, short-tailed fan, more commonly used among our Chinese practitioners:

(1) **Single Fan:** Frees the other hand for a wider range of novel interactions with embedded sensors, aligning with the observed rationale among Chinese dancers of dancing with one fan.
(2) **Solo Performance:** While all Vietnamese dancers expressed the importance of shared spotlight in their practice, Chinese dancers were open to solo performances or dances with one central role, allowing for use of our single prototype.
(3) **Short Tail:** Dancers expressed a long tail acting like a streamer or water sleeve, trading grace and beauty for more complex interactions. In accordance with centralizing the unique properties of the fan, a short tail allows for more movements that are unique to the prop.

The design and aesthetics of the fan are currently white; they represent a blank canvas that future iterations can customize based on the specific communities that use this fan. The physical adornments and aesthetics of the NIME do not detract from its sensing capabilities, which extend traditional aspects, empowering individuality in the creation of cultural identity. In addition to this, the fan NIME may be used as any other fan in stories that revolve around these traditional elements and themes.

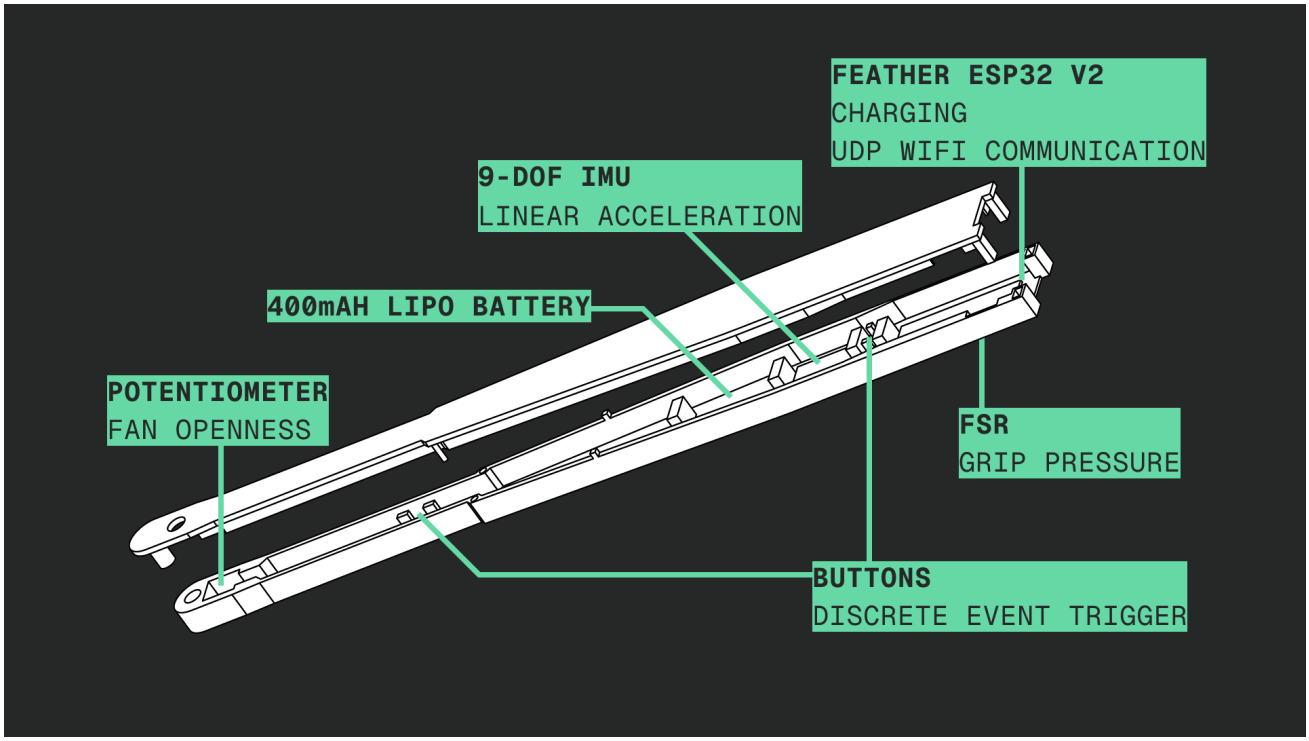

Figure 4: Diagram showing sensor-embedded guard of prototype and what each sensor measures.

7.2 Sound

Our prototype generates sound by sending sensor data to Max MSP via WiFi. We choose a simple sonification scheme, following the existing tradition of using fans as percussive instrumentation to emphasize beats and movement. Synthesizing this context of use with the ever-prevalent theme of nature, mentioned frequently in both Chinese and Vietnamese contexts, our prototype maps three simple interactions to sounds of water. We chose these three sensors from our broader implemented range to simplify mapping and enable preliminary evaluation by users.

(1) **Linear Acceleration:** Controls the volume of looping track of water flowing. Greater magnitude of acceleration maps to increased volume, and zero acceleration results in silence.
(2) **Grip Strength:** Higher pressure grip seamlessly interpolates mixes between a gentle stream and a raging river, changing the base timbre of the track.
(3) **Button Press:** Triggers a discrete, loud splashing effect when activated.

These interactions allow dancers to use the fan in contexts they are already familiar with—by adding additional sounds onto an existing backing track, the NIME serves to accentuate their dance movements, keeping the focus on their performance while translating their embodied culture into concrete sound. A brief video demonstration of the fan, used by two different Chinese participants and shared with their consent, can be found at this link[1].

Initial evaluations with these two dancers show excitement and enjoyment from using the instrument—participants mentioned how it increases their feeling of expressiveness and prompts them explore new movements while still falling within their schema of Chinese fan dance.

8 Future Work

Our investigation surfaces a framework for the understanding of Chinese and Vietnamese fan dances, design recommendations to ensure a NIME is situated within individual and community understandings of importance and cultural identity, and finally a prototype NIME enacting some of these principles through one specific set of mappings.

Since this paper, additional participatory design and evaluation with the community has been conducted. This and discussions from interviews have revealed many other possible and more complex schemes for both interaction and sonification, ranging from altering and directly manipulating the sound of backing tracks to generating all music—rhythmic, melodic, and harmonic—from the fan dance with no backing track. While our initial exploration features only a small set of mappings fit into the most natural schema of traditional Chinese and Vietnamese dance—the fan as a generator of sound effects that accentuate movement—future work would explore these additional sonification schemes while taking more complete advantage over the affordances of the fan, including the potentiometer as well as other potentially new interaction points mentioned by some of our interlocutors.

Physical refinement and in-depth evaluations of the current system are also critical to the success of this NIME as an instrument cocreated by these communities of practice. Understanding how both dancers and audience members understand a complete cultural performance created with the NIME, beyond initial demonstrations and improvised choreography, is necessary to evaluate how well such a system mediates fan dance as intangible cultural heritage.

[1]https://youtu.be/TO0WJCfqOOc

9 Ethical Standards

There are no known conflicts of interest in this project. In accordance with ethical guidelines approved by their Institutional Review Board for conducting research with human subjects, authors received written informed consent from all interlocutors for participation in this study, assent and parental consent from minor participants, and anonymized all transcripts and data containing potentially identifiable information. Participants featured in videos all consented to the sharing of their recordings.

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