MixPlore: A Cocktail-Based Media Performance Using Tangible User Interfaces

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Abstract. This paper presents MixPlore, a framework for a cocktail-based live media performance. It aims to maximize the pleasure of mixology, presenting the cocktail as a plentiful art medium where people can fully enjoy new synesthetic contents by the integration of bartending and musical creation. For this, we fabricated Tangible User Interfaces (TUIs): tin, glass, muddler, and costume display, etc. The basic idea of performance and music composition is to follow the process of making cocktails. At the end of every repertoire, the performer provides the resultant 'sonic cocktails' to audience.

Keywords: Cocktail, taste, computer music, tangible user interface, live media performance, recipe.

1 Introduction

Food and the sense of taste are very much intertwined and they are important elements in human lives. Essentially, everyday we eat food to survive, every food has its own taste, and taste gives us great pleasure when eating food. Also taste and food influence social interactions and communication in our lives; food brings people together in its preparation and in its consumption [1]. Therefore, taste and food play pivotal roles in human lives and cultures.

In the area of art, the word, 'taste' has been traditionally mentioned to appreciate art pieces and express artistic styles, but we never 'literally' tasted them with our mouth and stomach since artworks are not edible. In modern art, there have been several artists who introduced food (but not taste) to art territories. They considered food as a performance medium dissociated from eating, taste, and nourishment [1]. In Futurist Cookbook (1932), F.T. Marinetti, the Italian Futurist, asserted the importance of food and cooking as Futurist aesthetics and philosophy, and his Cucina Futurista (Futurist Cuisine) was the first systematic approach to performance-oriented aesthetics of food [2]. Since then, artists such as Ann Hamilton, Alice Rio, Jana Sterbak, et al. were inherited from Marinetti's aesthetics in their happenings.

On the other hand, the field of Human-Computer Interaction (HCI) has studies related to food and drink in some different ways. iBar shows how a table-top interface can enhance novel interactions between people in the context of bar [3].

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Lover's Cups presents an example of how drinking interfaces improve social interactions and personal communication channels [4]. There have been other research branches that are about interactive cookbook systems and interactive kitchens in ubiquitous computing environments. Studies [5, 6 and 7] in interactive cookbooks present novel cooking interfaces enabling users to easily search food recipes and prepare for food. Augmented Reality with computer vision, display, and sensor systems has been applied to interactive kitchen [8]. However, these works do not focus on media art and performances but on the introduction of computing to cooking areas. HCI has been rarely combined with food and taste in order to provide new user experiences to people. There seems to be only one example for using food and technology in media performance; Sound Kitchen presents how chemical reaction can make a musical performance [9]; it is not directly related to 'taste'; it is hard to be drinkable.

From the observation, though sound was not a central part in Futurist Cookbook, Marinetti inspires us to introduce cooking procedures to music and media art. Kirshenblatt-Gimblett proposed that food and performance converge conceptually in the three aspects [1]: First, to perform is to do, which counterpoints to make and serve food. Second, to perform is to behave; it means social practices in food. Third, when doing and behaving are shown, taste becomes a sensory experience and taste as aesthetic faculty converge [1]. HCI projects mentioned above also show potential that HCI techniques contribute to creating new user experiences in media art. Recently, Grimes and Harper proposed new visions of human-food-interaction in HCI and mentioned that making food is a way of expressing creativity [10]. They point out smelling, preparing, touching, and tasting foods, and even remembering past food experiences can evoke emotional responses. Finally they asserted potential in exploring systems that couple music with food in a variety of ways [10].

Previous artworks [Futurist Cookbook, Sound Kitchen] and studies [1, 10] motivated us to strongly introduce the sense of taste and the context of cooking to media performance. Here, we propose that cocktail a new medium for a performing art. First, cocktail, in itself, is a synesthetic medium; it has recipes, visuals, sounds and taste. Second, bartending, in itself, is performative; it has gestures and shows. Third, we think that the procedure of making cocktail is analogous to that of making sound. Fig.1 shows relationships between cocktail and music. Fourth, cocktail has appropriate attributes for us to formulate it as a media performance: simple recipes, range of ingredients, etc. compared with other food. Fifth, it is easier for us to design tangible interfaces from general cocktailware.

Therefore, our goals are as follows: For achieving high level artistic pleasure and plentiful expressions, we try to make further integration of human's senses such as taste, audio, visual in MixPlore. We explore new aesthetic territories by linking the factor of taste to musical creation; the taste becomes a primary element when interacting with sound elements. We attempt to design appropriate tangible user interfaces for edible performance. This paper will show how cocktail, taste, sound, and technology can be coupled to produce a new synesthetic media performance.

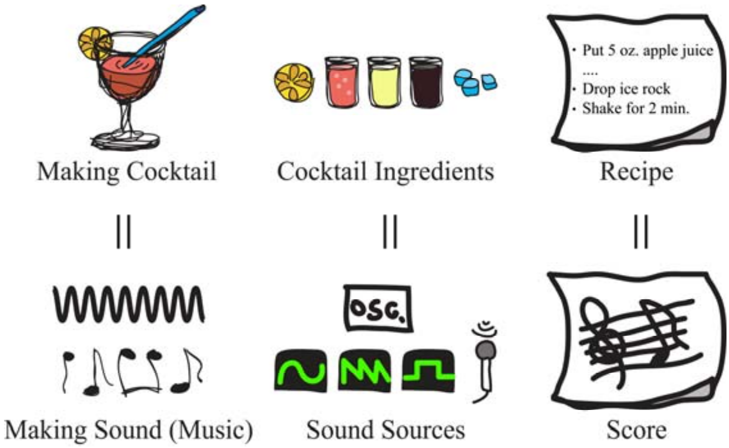

Fig. 1. The analogies between cocktail and music

2 Scenario and Approach

The primary design strategy with this framework has been to build an interactive system for simultaneously making cocktail and sound, and to propose suitable performance scenarios and contents. Early in our design stage, three video interviews were conducted with full-time bartenders to transfer more ideas directly from the field of bartending to our research. In the proceeding of interview, we observed and recorded their behavior and found the procedure of cocktail generally have preparing, mixing, serving, drinking cocktails and other actions. These actions were used to extract atomic gestures for our performance design. Additionally, we observed general cocktail instruments and recipes from the interviews and articles [11, 13]. Atomic gestures and interface design will be described in 3.

2.1 Recipe Observation

Most of all, we started our research with observing existing cocktail recipes. By analyzing them, we realized that recipes are deeply related to their own mixing methods and tools. If we could find a few formalized procedures of making cocktail from recipes, it would be ideal to design the entire performance. Considering a great number of existing recipes, we came to briefly categorize them into two types: The shaking-based type (scenario #1) and the layering-based type (scenario #2). For example, in the case of Mojito, the bartender muddles mint leaves, puts them and other ingredients in a shaker, and shakes (stirs) it [11]. In the case of B-52, s/he carefully pours liqueurs, which have different densities, with a stirrer to make several visible layers [13]. Our observation allows us to have criteria for necessary actions and interfaces in our performance design.

2.2 Possible Scenarios

Thus, we have two possible scenarios in this research as seen in Fig. 2. In the preparing step, the performer is ready for the performance with setting the table. Generally, the act of preparation is a part of performance but sometimes it can be done in advance of the performance, which means the step would be excluded in the real performing. The step of mixing, the core part of performance, has two kinds of act: shaking and layering. With the act of shaking, the bartender mixes up cocktail ingredients and sound sources by using the shaker/tin interface. Differently from shaking, the act of layering enables her/him to make multiple layers of cocktails and sounds (tones) by using the glass-laying interface. Then, the resultant sonic cocktail might be served to audience in the step of serving. Finally, audience can drink it.

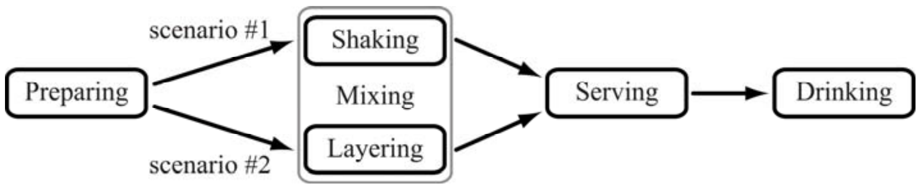

Fig. 2. Two scenarios based on the procedure of making cocktail

Therefore, this whole procedure becomes the process of performance. All performance repertories of Mixplore followed those two scenarios. We will describe them in 4.

2.3 Design Approach

Interface Design approach. Based on our observation of recipes and scenarios, the motive of interfaces came from the ordinary cocktailware, tableware, or glassware to provide good affordances for usability to performers (as users) and audience. Interfaces should have proper controllability, visibility, mobility, feedback, and waterproofing for guaranteeing the performance's spectacle and stability. Also, interfaces should display audio-visual effects to audience in the performance. Besides, they should also make it possible to easily be installed and uninstalled in the stage at every repertoire.

Performance Design (Recipes) and Sound Design. Since they can dominate the entire performance design, cocktail recipes and mappings have the highest priority. We have three strategies for performance design and mapping between elements of performance: sound, taste, and interactions. The first strategy is to use original cocktail recipes and then devise the appropriate sonic recipes. This can guarantee us tastes and visuals of cocktail to some extents. The second one is to first consider the music recipes (or music composition) and then adjust the cocktail recipes to the sound factors. This method lets sound designers relatively free from the conflict between the two recipes. The last one is to intuitively consider two recipes at the same time. In the early design stage, we chose the only first strategy, but we currently follow the second and third one.

3 MixPlore System

Through our observation on recipes, MixPlore system has a set of tangible user interfaces: Shaker/tin, cup, muddler, mat, costume display, glass-layering interface and auxiliary interfaces. These interfaces can capture the bartender's simple gestures and brain part facilities her/his mixing of cocktail and sound. All components are connected via a wireless/wired network as shown in Fig.3.

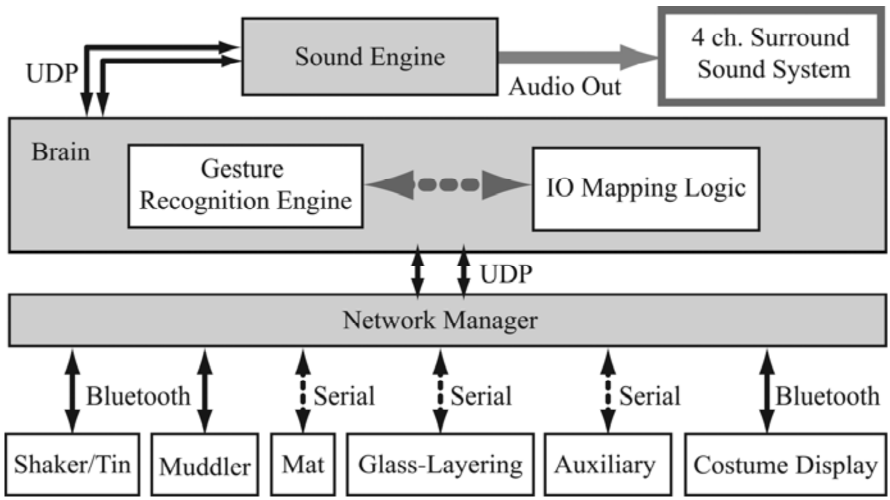

Fig. 3. Overview of MixPlore system

3.1 Interfaces and System Design

Tin and Cup. These are for mixing sound and cocktail ingredients. These capture gesture values of the performer, transmit the values to the network manager to generate sound and make a visual feedback. As shown in Fig.4a and 4b, the interfaces consist of sensing, control, communication, visual feedback (LEDs), and battery (3.3V). A three-axsis accelerometer is to capture the motion data of the performer and measure the slope of the tin and cup. A switch is a trigger. A micro-controller (Atmega168) is the core for sensing and interfacing. For the wireless communication, we use Bluetooth (SENA ESD100).

The tin mainly functions as a shaker to mix sonic and cocktail ingredients in the step of mixing. In the step of preparing, cups are used for containing each ingredient and just modulating sound before mixing. Some special tins and cups incorporate a microphone for recording samples to use them as live sound sources.

Muddler. This interface, which also has the almost same architecture of the tin, functions as a stirrer that mixes and mashes the ingredients (e.g. mint leaves or grapes) and sounds (Fig.4c). The LED display on the upper part gives us several visual feedbacks to enhance performance spectacle (e.g. shifting and blinking).

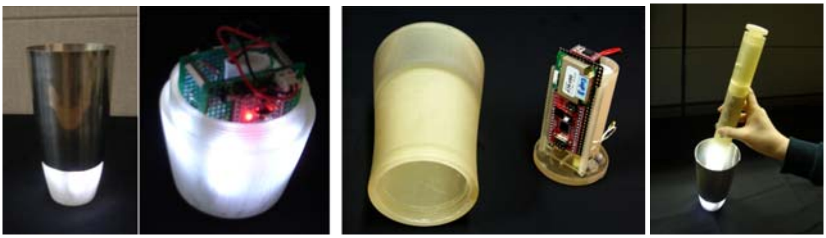

Fig. 4. The tin (a), cup (b), and muddler (c). Tin (95x 185mm), cup (85 x 130mm), and muddler (35 x 330mm).

Mat. The mat with switches is a trigger for starting and ending sound. We put cups and tins on the mats. The mat with FSRs (Force-Sensing Resistor) measures the variation of weight. We use it for detecting resultant cocktails. The simple LED display is embedded in it.

Glass-layering. It is specially designed for the novel integration of visual, sound, and taste by simultaneously layering liquors with different alcohol proofs (or drinks with different specific gravities) and sound. The glass has a liquid level detector and two dials for sound modulation. We designed a capacitive sensor for detecting the liquid level. By adjusting the liquid level and layering other liquors, the performer can express an intriguing change of sound as well as imaging a merged taste.

The costume display. The display, as a wearable media, receives gesture information from tin and muddler via Bluetooth and displays visual patterns on the specially designed a 16 x 16 LED grid in the costume. The display responses to the bartender's gestures. It shows different patterns depending on gesture patterns of tin and muddler.

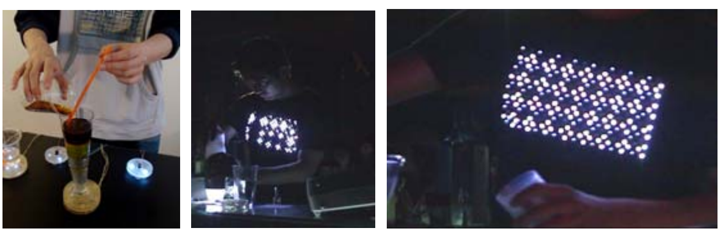

Fig. 5. The glass-layering interface (a) (50 x 240mm), costume display with graphic patterns (b, c), (260 x 180mm)

Network Manager. We used a 1:N Bluetooth network based on the polling communication model. For this we used SENA Parani MSP100, a Bluetooth Access Point directly connected to a brain PC and SENA ESD100 Bluetooth modules of each agents: the shakers, tins, muddlers and costume displays.

Brain. The brain functions as a central control logic consisting of a gesture recognition engine and IO mapper. The brain is built by Max/MSP [14]. The brain works in following ways. After initialization, it first observes the status of mats: The status indicates if the mat is triggered or not. It is important since the information represents which cup/tin is held up or put down. According to it, 1) The IO mapper determines whether to go to the next state or stay at the current state. The procedure list is similar to Fig.2, but pre-defined for each repertory. 2) The IO mapper properly routes data of each interface to targets such as the sound engine or costume display. In this process, the mapper needs a specified mapping table between sound properties and cocktail ingredients for each repertoire.

While using the muddler or tin, the recognition engine receives acceleration parameters to discriminate the performer's gestures. We used Gesture Follower (GF) [12], a HMM-based gesture recognition external for Max/MSP. In MixPlore, we defined several atomic gestures such as up-down, front-back, rotating, left-right and right-left. It is observed that it takes 1000 ~ 1500 ms for GF to receive the reliable recognition result and return it to the mapper. Such amount of time could become significant delay in the real-time performance.

4 Sound Engine and Performance Design

The performance idea is to have a performer making a cocktail in the process that s/he controls or triggers various musical sounds. As mentioned in 2.3, early in our design stage, we had to first decide the cocktail recipe and then determine the corresponding music recipe to the cocktail: It is because there are many possibilities to determine sound design and mappings, which can make us confused in our design processes. The two methods of making sound, considered in the early design stage, were roughly a step sequencer and the combination of sound synthesis. Currently, we have basically 2 types of sound engine based on scenario #1 and #2. The sound engines were written as a patch in Max/MSP [14]. The main advantage of this way was that we could fix and modify the engine instantly with practices of applying many recipes.

4.1 Sound Engines Based on 2 Scenarios

Sound Engine 1 (SE1). Based on Scenario #1 (see 2.2, shaking), our interfaces were mats, cups, tin and muddler. Sound Engine 1 was designed to synthesize sound by shaking, the main concept of the scenario. As we illustrated in system overview (Fig.3) and brain part (3.1), SE1 receives data of each interface and gesture type. Fig. 6 simply shows the schema of SE1.

This patch works as follows. In the case of cups mapped to sinusoidal sounds, we can modulate the sounds through shaking the cup. The type of modulation is selected by the gesture type received (e.g. up/down, rotation, etc.). In another case of cups mapped to a sampled sound such as human voice, the gesture type routes it into granular synthesis or convolution filter. Therefore, authors conclude SE1 suits for scenario #1. It is because the type of shaking gesture directly selects the method of sound synthesis as we intended. Finally, we wrote some presets for SE1 in out music composition stage. Additionally, we used some VST (Virtual Studio Technology) plug-ins from Pluggo [15] for sound effects.

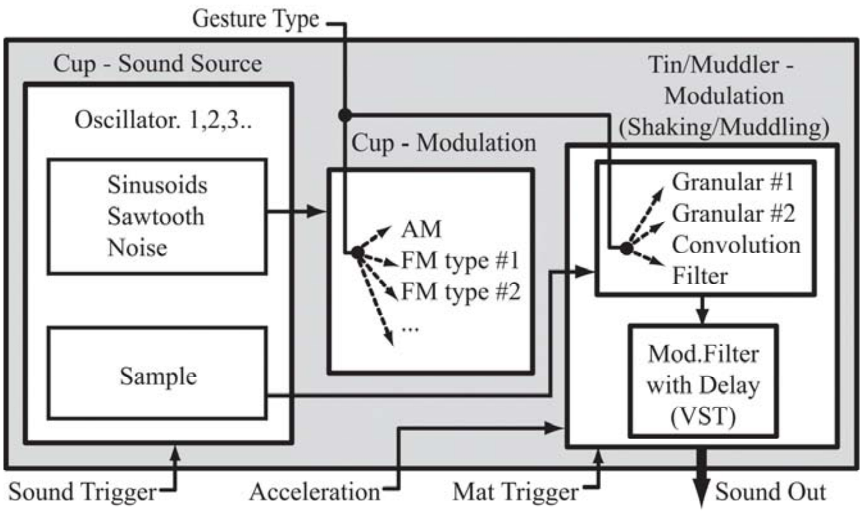

Fig. 6. The sound schema of Sound Engine1, based on Scenario #1

Sound Engine 2 (SE2). Based on Scenario #2 (see 2.2, layering), interfaces to be used are mats, layering-glass, and cups. SE2 was designed to synthesize sound by layering. In Fig.7, the central block represents a note modulation with a step sequencer, which modulates actual note pitches. One step has one note. Firstly picking up a cup starts the sequencer to play a step repeatedly. Picking up a new cup then simply generates a new step. By in/decreasing the level of liquors in the glass, the performer tunes up/down the pitch of the selected note in real-time. To convert the level into the pitch of a note, the sequence rounds off to the nearest pitch based on a chromatic scale. To control the tempo of the sequencer and filter modulation, we added 2 auxiliary potentiometers to this engine. Finally, the performer can end up the performance with a finish shot cup. Then the result sound is processed by the convolution of the sequenced music and the finish sample sound.

4.2 Composition

Based on 2 scenarios and each coupled sound engine, 7 repertories (recipes) has been composed and performed by authors. In our composition, a very experimental mind was needed. Basically it was crucial to make recipes meeting both good tastes and plentiful musical expressions. On the other hand, each recipe needed its own performance duration. Therefore, we experimentally composed recipes minimum 2 minutes up to maximum 18 minutes long for playing.

4.3 Performance Repertoires

Example #1. Here, we show an example of performance, based on scenario#1.

Ingredients: Muscat (suitable amount), Blue liquor (1/2 Oz), Orange extract (1/2 Oz), Gin (1/2 Oz), Ice rocks, Alice’s voice (taken from audience) (Duration: 15 minutes).

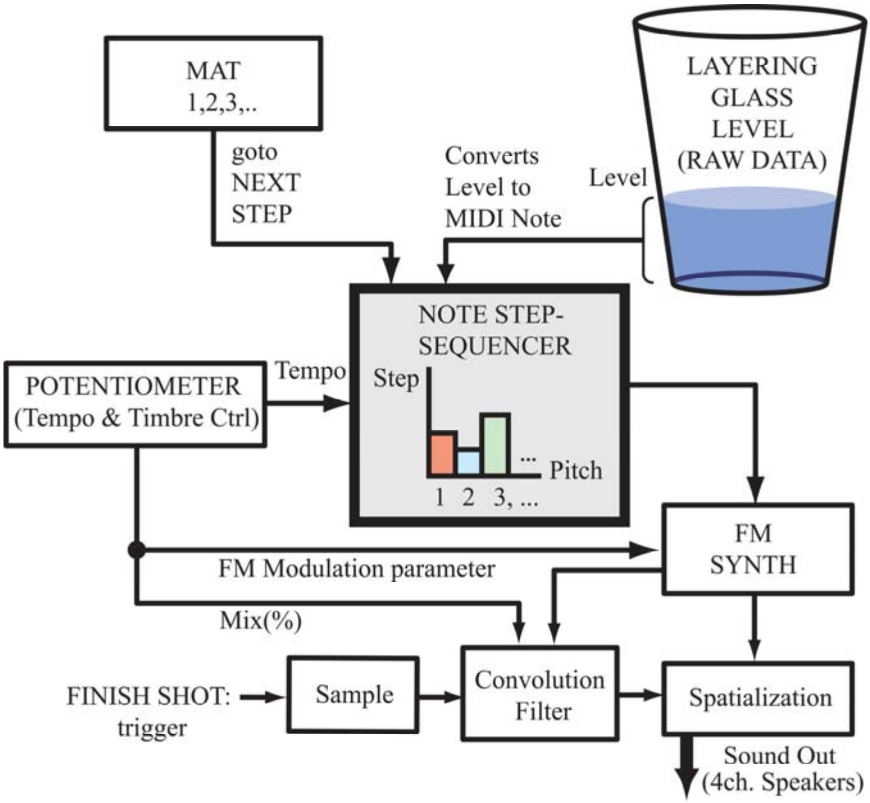

Fig. 7. The sound schema of Sound Engine2, based on Scenario #2

Fig. 8. Setting for an example of performance: cups, tins, mats and tins

1) Put each ingredient in the tin interface in a given order. Such ingredients are pre-mapped to the particular sound (sinusoids, sample sounds). Or, with the cup interfaces, the performer can record the voice of a selected audience during the performance. It could be one of good sonic ingredients.

2) Mix all the ingredients into a cocktail by bartending gestures. Sometimes, the performer can partially mix up some ingredients instead of mixing all ingredients simultaneously. Then put one of other ingredients and mix them. Iterate this process until the last ingredient is inserted, and then mix up all things. This procedure is necessary to create a long enough performance and music. Here, we suggest 10 minutes.
3) Those gestures are pre-mapped to particular sound properties to make effects on them; up-down: ring modulation; front-back: adding an echo effect to the particular sound; right-left: controlling panning of the stereo sound; shaker rotation: filtering the entire sound (dissolve filter)
4) Pour the mixed cocktail into a glass to generate a resultant sound.
5) Serve the cocktail with sound to an audience and let her/him drink the cocktail and the sound.

Example#2. This example shows that we make the integration of cocktail layering and note layering (arpeggio) with simple unique modulations like tempo and timbre. It is based on scenario#2.

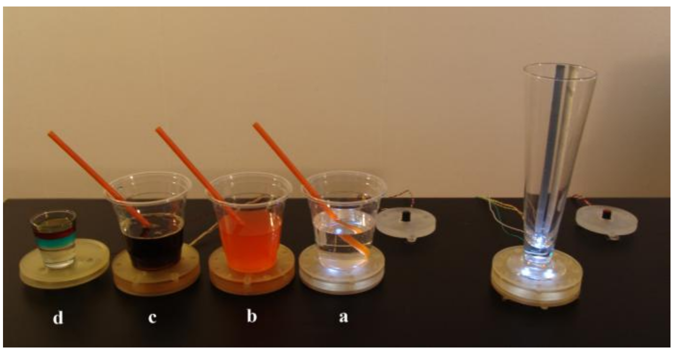

Fig. 9. Setting for example #2: cups, mats and layering-glass

a. Light syrup (1st cup): Pick up the 1st cup and pour its content into the glass with a level detector (capacitive sensor). The glass tunes up the pitch according to the level of the ingredient.
b. Mixed orange extract (2nd cup): Pick up the 2nd cup and pour its content into the glass. Then freely modulate the tempo and timber with auxiliary knobs.
c. Black liquor (3rd cup): Pick up the 3rd cup and pour its content into the glass. Then improvise with controlling the knobs as you wish.
d. A layered cocktail in a small glass (4th cup): A finish shot. Pick up the last small cup and drop it into the glass for layering to create the result sound.

5 Discussion and Future Works

The first performance of Mixplore was showcased in People, Art, and Technology 2007, an international network performance festival, Seoul, Korea, 2007 [16]. We also had two workshops with experts and general audience after the festival. Before and after the festival, we had meetings with professional bartenders. These all gave us precious feedbacks with which we could discuss our interfaces and performance.

5.1 System and Interfaces Aspects

Tin and others. When using the tin, cups and muddler, they are coupled with the gesture-recognition engine to discriminate several gestures. For more exact recognition, it is very important that the engine knows when the performer starts and finishes gestures. Since it is not usable to return the time data by those interfaces, we let the performer use pedals to return each start and end time at every gesture.

Glass-layering. The capacitive sensor is used for the glass-layering interface to measure the height of liquid and reflect it for sound modulation. Since human fingers have capacitance and it can give noises to the capacitive sensor, the performer must carefully handle the interface. This fact decreases in the usability of the layering interface and we will solve this problem in future.

Latency. The entire latency of our system is about 20 ~ 40 ms, which is ignorable for real-time performances. However, it is observed that the costume display has the 400 ~ 800 ms, which is not suitable for a musical performance. It is caused by the delay of Bluetooth communication and that of processing LED patterns in the costume display.

Visibility. We devised the costume display for audience to concentrate on the performer and it was effective as a visual feedback. Yet, it was suggested that some visual devices be added to MixPlore for more visual spectacles. It would be visually improved if a table-top interface is together with this work.

5.2 Performance Aspects

Performance repertories. When performing with new interfaces, audience cannot help being unfamiliar with it. This fact influenced our performance design. It was very difficult for us to decide how many portions of a performance we should assign to the interface demonstration as a performance since we thought performance and demonstration are in different areas. We still have questions on the issue, but in MixPlore, we divided our performance repertories to two categories: the demonstration-based repertory and the art-based repertory.

Performing duration. The duration is important since it is directly related to cocktail tastes. Actually, it takes less than 2~3 minutes for a bartender to make a cocktail in the bar and it is not enough time to make a performance. Thus the main issue is how we could increase the performance duration up to 10~15 minutes without losing original tastes. The performance duration prolonged can influence cocktail tastes, so too much long shaking and muddling can make tastes worse. Such a thing occurred in our performance and we solved this problem by inserting other performing elements into the performance without changing cocktail-making duration.

Interaction with audience. Early in design stages, we considered audience' participating in our performance. We planned that the performer provided audience with chances to shake the tin or muddler during the performance, or to drink the resultant sonic cocktail at the end. These situations were very welcome.

6 Conclusion

We have described MixPlore, a framework for designing a cocktail-based media performance with tangible interfaces. MixPlore has shown that cocktail is an attractive and plentiful medium for new performative expressions by introducing the sense of taste and synesthetic interactions into the circle of media performance. In the future, we plan to couple MixPlore with more visual expressions. Table-top interfaces could be one of the best solutions for enhancing synesthetic expressions and visual feedbacks. Another consideration is to install an LCD display and camera module into the tin and cup interface to mix sound, image and taste. It would make them fully capable interfaces for synesthetic performance.

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