A Mobile Music Museum Experience for Children

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A Mobile Music Museum Experience for Children

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ABSTRACT

An interactive music instrument museum experience for children of 10-12 years is presented. Equipped with tablet devices, the children are sent on a treasure hunt where participants have to identify musical instruments by listening to samples; when the right instrument is located, a challenge of playing an application on the tablet is initiated. This application is an interactive digital representation of the found instrument, mimicking some of its key playing techniques, using a simplified scrolling-on-screen musical notation. A qualitative evaluation of the application using observations while interacting with the application and a focus group interview with school children revealed that the children were more engaged when playing with the interactive application than when only watching a music video.

Author Keywords

music education, interactive museum, educational games

ACM Classification

H.5.5 [Information Interfaces and Presentation] Sound and Music Computing, J.5 [Arts and Humanities], K.3.1 [Computer Uses in Education] Computer-assisted instruction.

1. INTERACTIVE MUSEUM EXPERIENCE

In a traditional museum setup, the interaction between visitor and installation is often limited to observing the exhibition passively. But especially children benefit from further interaction.([3] p. 22) In order to engage children more, we created a musical game in which children interact with a tablet.[1] The interaction is simple enough to be learned immediately and the required resources for the game are just a tablet computer. We qualitatively assess the experience of the children when interacting with the tablets in a setting that sketches out the actual museum space, where images of the instruments serve as space holders for the actual physical instruments.

2. MUSEUM AND MUSIC APPLICATIONS

The inherent paradox of a traditional music instrument museum is that the instruments can be looked at, but the visitor cannot listen to them, although the production of acoustic stimuli is usually the main function of a musical instrument. Moreover historical instruments are usually too fragile and precious to be used by unexperienced visitors. In [2], principles (e.g. somatic learning) are proposed to support engagement, sociality, and active interpretation in ubiquitous computing in museums for children. A tablet provides a cheap, handy, mobile, flexible and widely available platform. In [1], a mobile augmented reality guide for a museum is presented. We will review some music applications on the tablet. *GuitarPad*[2] simulates playing a guitar in a very simplified manner, by using large areas where to strike the desired notes. In *Magic Piano*[3], users play a song by touching displayed bubbles as they pass by a horizontal line. Points are given as a reward. In *Guitar*, the fretboard moves from left to right, indicating which strings to pluck in a vertical swap gesture. We adopt these ideas.

In order to increase engagement particularly for children, we chose a treasure hunt format as it provides a goal and still allows for freedom.([2], p. 240-1) The goal in the treasure hunt is to find a particular musical instrument, given the acoustic samples of that musical instrument. In order for the application to identify a particular instrument, an image of that instrument is attached to the showcase containing the instrument, so that the image can be captured by the built-in camera of the tablet and recognized by a computer vision software tool.

3. INTERACTION DESIGN

The physical museum experience consists of three parts, the search phase, the virtual instrument interaction phase and the composition review phase. As the experience begins, the children are presented with the choice to pursue one of three instruments: the harpsichord, the double bass, and the viola. As the right instrument is located, with the camera pointing at it, the instrument interface of the current instrument appears on the screen of the tablet, and visitors are required to play it. The interactions with our musical tablet instruments are simplifications of the interactions with the corresponding physical instrument. When the challenge is completed, a new instrument to pursue is suggested and the activities are repeated. After locating and completing all instruments, the application plays back the entire performance of all instrument interactions simultaneously, revealing that the instruments in collaboration constitute a harmonic composition.

Compared to traditional music notation, dynamic music score does not read from left to right, but from bottom to top (Fig. 1). In this way, the different pitches in the notation are aligned with positions on the keyboard and the finger

[1]Video: `http://youtu.be/cGX0J10d59s`

[2]`http://youtu.be/Y2qiIQEnNYk`
[3]`http://www.smule.com/apps`

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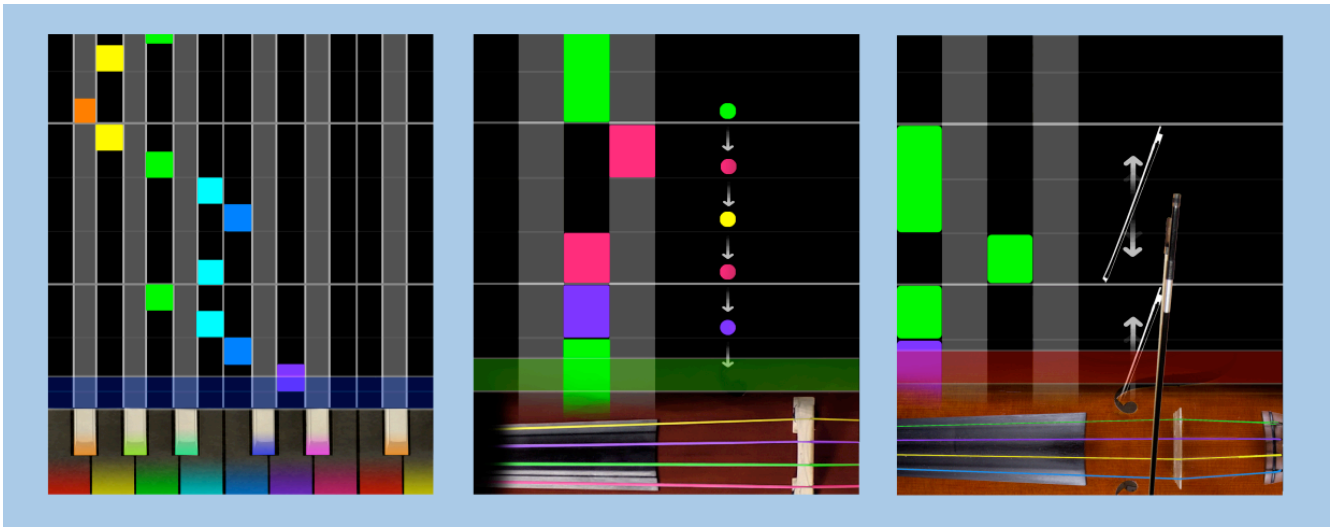

Figure 1: Dynamic score notation for harpsichord (left), double basss (center), and viola (right). See text for a description.

board. For the harpsichord, the keys extend into vertical columns, in which notes (rectangles in the same color as the key) descend (Fig. 1, *left*). At the moment when a key is hit, the key darkens, thereby simulating the visual experience of touching the key of a physical harpsichord.

For the double bass and the viola, the notes' position on the finger board extends into a vertical column of the musical score. The colors of the descending squares match the string on which they are to be played (Fig. 1, *center* and *right*). For the double bass (Fig. 1, *center*), on the right half of the notation screen, the color of the circle indicates which string should be plucked. For the viola, a bow icon appears that needs to be swiped vertically to simulate bowing (Fig. 1, *right*). The colored rectangular note symbols keep scrolling downwards. When passing through a horizontal bar above the keyboard/string instrument, the participant is supposed to play that note. Correct/incorrect timing will be indicated by a color change of the horizontal bar to green/red respectively.

The application is programmed in *Java* using *Android Developer Tools* (ADT).[4] *Vuforia*[5] is used for image recognition. *Pure Data* [6] and *LibPd*[7] are employed for sound processing.

4. EVALUATION

We evaluated the app at a primary school in Copenhagen with children aged 10-12 years. Children were divided into 6 experimental groups that were using our application, and 5 control groups, who were provided only with videos of performances of the instruments. For all groups, we recreated a setup similar to a museum experience, where children were allowed to freely interact with the application provided, while the test conductors were observing them interacting. We noticed that children exposed to the condition with the complete app were more keen to interact with each others, help each others, and were interested in successfully completing the games. The results of the focus group interview where participants were allowed to discuss freely and informally among themselves, confirmed our observations. Four experimental groups showed signs of having had a very positive experience. Two groups seemed to only have had a relatively positive experience, however, more positive than the typical control group. According to observations during the experiment and verbalisations during the focus group interview, it appears that the test participants in the experimental group were more engaged than the test participants in the control group, confirming earlier findings.[2] When the interviewer asked: '...Would you like to play it [the piano] yourself or see a professional playing it on a video?', one among several similar answers was: 'I'd rather play it myself.'

[4] `http://developer.android.com`
[5] `http://developer.vuforia.com`
[6] `http://puredata.info`
[7] `http://libpd.cc`

5. CONCLUSION

The musical tablet instruments presented in this paper comprise an interesting enjoyable musical experience for primary school children, letting them grasp the gist of playing the physical instrument through interaction. Further testing and possible adaptation is necessary to assess how well the application integrates into the physical space of the museum[1], without diverting the focus from the exposed artefacts, and encouraging discovery learning.[2]

6. REFERENCES

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