Media Players for Accessibility

Kensuke Nishimura and Michael Cohen
Spatial Media Group, Computer Arts Lab.
University of Aizu
Aizu-Wakamatsu, Fukushima 965-8580; Japan
{s1160160, mcohen}@u-aizu.ac.jp

ABSTRACT
We have developed two versions of a media player designed for differently abled users. The media player, suitable for selecting and playing songs or videos, runs on either computer-hosted “Alice” or an iOS smartphone or tablet. Even though special users have trouble with normal mouse and keyboard, such accessibility allows them to enjoy selected media.

Categories and Subject Descriptors
K.4.2 [Computers and Society]: Social Issues—Assistive technologies for persons with disabilities; H.5.2 [Information Interfaces and Presentation]: User Interfaces

General Terms
Design

Keywords
accessibility, multimedia, special needs, universal access

1. INTRODUCTION

Our group was invited to consult with Aizu Yōgo Gakko School for the Challenged. The special education school, next to our University but rarely sharing joint activities, serves students with disabilities: a faculty of about 40 teachers attends about 80 students. Nearly 20% of the students there have severe motor and intellectual handicaps, and cannot control their limbs. The teachers are trying to develop learning materials that are easy for the students to operate: toys and multimedia applications that make sound, have animation, or move. However, the faculty lacks confidence in their IT skills, and therefore requested collaboration with the U. of Aizu to develop interfaces that could encourage and entertain students with special needs. Our group is interested in accessibility, multimedia applications, and mechatronic interfaces.

1. www.aizu-sh.fks.ed.jp

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, to republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

Copyright 2012 ACM 978-1-4503-1191-5 ...$10.00.

We developed several kinds of interfaces for Yōgo Gakko. Using a special budget for promotion of social welfare activities within Aizu-Wakamatsu, we were able to purchase some accessibility equipment which we deployed, tested, and donated. In the accessibility community, such equipment is sometimes referred to as

ECUs: Environmental Control Units, giving persons with special needs the ability to control real-world devices, other than computers,

EADLs: Electronic Aids for Daily Living,

AT: Assistive Technology, or

AAC: Alternative & Augmentative Communication.

For instance, some students would like a way to play a CD. For a cheap cassette player it’d be easy, since we could just leave the mechanical transport control in Play (even if the capstans get slightly flattened between plays) and simply turn the unit on/off, but usually CD players have a “soft power on” so it isn’t obvious how one might make the control accessible, except by pulling off the case and somehow patching into the control electronics. They would also like to be able to use computer-displayed multimedia contents.

Since the students at Yōgo Gakko are unable to use conventional computer mouse and keyboard interfaces, we configured handicapped-accessible (oversized, conspicuous, brightly colored) buttons, appropriately positioned via articulating arms. These can be connected to switch-adapted devices, such as specially-adapted CD players, allowing the accessible button to toggle play on and off. (Many Yōgo Gakko students seem to especially enjoy “AKB48.”)

In consideration of the needs of the special students, we are developing both manipulable tools (specially deployed mouses, buttons, and control appliances) and multimedia contents appropriate to the applications, including semicustom configurations. A media player can be configured to start with mouse clicks proxied from switch-adapted mouse devices (“SAMS”). Further, some students would like to be able to choose a particular song from a set of musical samples, but lack the coordination to directly select the respective button from a grid. Therefore we provide them a two-button “Dual Button Box,” a “step-scanning” affordance, as seen in Figure 1, which supports pushing one button to step through options and a second button to select one.
We use “Alice”\textsuperscript{2} [1, 6, 11, 2, 10], a cross-platform, rapid prototyping “machinema” multimedia package with which many of our students have experience (since it is used in our “Human Interface and Virtual Reality” course). The authoring environment allows customized multimedia (perhaps eventually including photographs taken around or inside Aizu Yogo Gakko, locally recognized landmarks and characters [Aka Beko, Noguchi Hideo, etc.], regional music, as well as appropriate photos and videos [of Yogo Gakko students, teachers, family, school & home]). Aizu Yogo Gakko mostly uses computers running Windows XP. We developed simple media players for pc and iOS platforms. These applications are described in the following sections.

2. IMPLEMENTATION

2.1 Physical buttons

We tried to use playthings and devices that feature physical buttons, thinking that they could be good or useful for handicapped. A brightly colored, oversize button can be used for CD player and switch-adapted mouse accepts supports its cable. More sophisticated equipment, also donated to Yogo Gakko, allows connection to latched (toggled) or timed (one-shot with time-out) switches that can control toys and appliances (lights, fans, music players), both battery- (DC) and mains-driven (AC). Such equipment could be useful for group activities in which each student takes turns doing something, like play part of a song during “circle time,” blend chocolate milk, or turn on a fan on a hot day. In addition, we investigated applications which handicapped students can use easily, especially for modern multitouch tablets, and presented an iPad on which such applications were deployed to the school, as seen in Figure 2. For instance, various music (including “Cat Piano,”\textsuperscript{3} “GarageBand,”\textsuperscript{4} & “Verbal Victor”\textsuperscript{5}), drawing applications (including “Gravilux”\textsuperscript{6}), and game ap can be easily used by special users because they require only soft touch (not hard push) and flick, so one can use these applications even if coordination is impaired.

We also developed two versions of a multimedia player allowing semi-customizable contents, described in the following sections.

\textsuperscript{2}www.alice.org
\textsuperscript{3}catpiano.slushboy.com
\textsuperscript{4}www.apple.com/ipad/from-the-app-store/apps-by-apple/garageband.html
\textsuperscript{5}sites.google.com/site/verbalvictor/
\textsuperscript{6}www.snibbe.com/store/gravilux/

2.2 Alice-platformed multimedia player

The PC version of the media player is compatible with the step-scanning dual-button box. There are two functions of the application: One can select a song from a matrix of cover art, and one can listen to a selected song, including stopping and listening to another song.

2.2.1 Alice

This application was developed using Alice, rapid prototyping software for developing 3D programming. For instance, one can make 3D animation using this software. It runs on Mac and Windows platforms.

The interface features album covers arranged in 3×3 matrix, as seen in Figure 3. If any cell is touched, the respective song is played. One can use the Dual Button Box, featuring Next and Play buttons, as shown in Figure 1. Connection by only Alice is impossible because Alice cannot support multi-button click. Therefore we compose another utility, “SAM-X,”\textsuperscript{7} which turns mouse events into keystroke sequences interperable by Alice.

It is easy to apprehend which song is currently playing. Duration of playing and album cover of selected music are conspicuous, and other album covers are blurred. When another song is selected with the Next button, the album covers of other alternatives are blurred. In practice, rather than dynamically blur album cover artwork, we generate in advance two versions of each, blurred and unblurred, and simply display one or the other at runtime.

2.3 iOS mobile multimedia player

The iPhone is a line of internet and multimedia-enabled smartphones marketed by Apple, Inc. An iPhone can function as a video camera, a camera phone, a portable media player, and an internet client with email and web browsing capabilities. It can send texts and receive visual voicemail, and has both Wi-Fi and 3G connectivity. With the port of our application to iOS, one can play music selected from cover album art of display using iPhone or iPad.

2.3.1 Corona SDK

This version of the application was developed using Corona SDK. Corona SDK is a software development kit and the first product of Corona family created by Walter Luh, co-founder of Ansca Mobile. The SDK does not charge per-app royalty.

\textsuperscript{7}www.rjcooper.com/sam-joystick/
Figure 2: Equipment presented to Aizu Yōgo Gakko

Figure 3: Alice interface
or impose any branding requirement, and has a subscription-based purchase model that allows new features to be rolled out immediately to users. It allows software programmers to build mobile applications for iPhone, iPad, and Android devices. The main programming language of Corona is Lua [8, 7, 9, 3], a lightweight, multiparadigm programming language designed as a scripting language with extensible semantics as a primary goal. Lua has a relatively simple, C-like API compared to other scripting languages. Corona lets developers use integrated Lua, layered on top of Objective-C, to build graphically rich applications that are also lightweight in size and quick in development time.

2.3.2 Design

Figure 4: iPhone interface

The design of this software resembles the version made with Alice. There are album covers arranged in 3×3 display, as seen in Figure 4. If any of these soft buttons is touched, the user can listen to the indicated song. On the iPhone, a 3×3 album cover matrix seems appropriate, but iPad can display more or larger album art, as seen in Figure 5.

3. CONCLUSION

These proposed interfaces are not especially sophisticated, nor are the general needs of the special students unique within the broader accessibility community. However, it behooves our university to encourage and assist our education sibling neighbor, the quite different constituencies notwithstanding, confirming our humanitarian mission, and, as a welcome side-effect, allowing our own students the challenge of goal-directed development with direct human feedback, the promise of satisfaction and gratification if such activities are successful, and the personal growth nurtured by direct exposure to and interaction with special needs students.

4. ACKNOWLEDGMENTS

This research was supported by a grant from the University of Aizu “Research Projects for Contribution to the Aizu Region” fund. We thank our collaborators at Aizu Yōgo Gakko, especially Chikako Manabe and Kazuyuki Katou.

5. REFERENCES

Figure 5: iPad interface