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COS 436 – Perry Cook

WiiDJ

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Introduction:

Video games for musical performance, such as Guitar Hero and Wii Music, are very popular right now. However, options are limited for people who want to experiment with DJing because turntable equipment is very expensive. We have designed a system called WiiDJ that makes DJing more affordable by eliminating the need for expensive turntables. The system uses two WiiMotes and can be run on any bluetooth capable computer. The buttons on the WiiMotes are mapped to functions in an MP3 mixing software called VirtualDJ. To connect WiiMote functions to the computer, we are using RemoteBuddy for Mac computers and plan on exploring GlovePie for Windows computers. Our program is easy to use for DJ beginners and can be easily extended to achieve more complicated effects as users become more proficient.

Background:

The current video game market has started to carve a niche for music performance in mainstream video games. Some of the limited options include play-along games like GuitarHero® or RockBand® and other types of more free-form musical games like in Nintendo's WiiMusic. However, none of the current options include a fully functional digital solution for those who want to experiment with disk jockeying.

Disk jockeys, or DJs, produce music in an interesting way: instead of creating completely original material, they use already recorded songs to do things like blend songs together seamlessly or even mix them together into a mashup, play with their pitches and playback speeds, and add effects like scratching to their mixes. By thus altering the songs, they create entirely new pieces of music. It's a skill set that takes time to learn and can be expensive to pursue: beginner-level systems with physical turntables and a mixer can cost upwards of $1000 and more professional, complex systems can get as expensive as $2,500. Furthermore, those DJs who do use digital systems find themselves somewhat tethered to their machines: they need to use a mouse or keyboard to give input to their DJing program; they aren't free to move, enjoy the music, interact with others, etc. These DJs are criticized in the DJ community due to their lack of "real" equipment which causes them to loose credibility.

Our solution, WiiDJ, addresses each of these issues. WiiDJ is a setup for manipulating music playback using computer software and two Wiimotes. It can perform all the basic functions of a complete turntable setup and mixer using only two inexpensive Wiimotes and a Bluetooth enabled computer. This setup allows experienced DJs to go digital, by being able to use mp3s, without going broke. Furthermore, in addition to greatly reducing the price for those who just want to explore DJing, using a Wiimote, an already popular game controller, provides a more familiar accessible controller for less experienced users. It was important to us to create a hands-off experience as much as possible. We found this as yet another advantage of using a Wiimote: using their Bluetooth capabilities, WiiDJ is a wireless system and provides a newly freeing

experience of DJing. Lastly, the system is set up so as a beginner's skill grows, or as an already experienced DJ grows more comfortable with the system, the program's functionality can be extended and customized to achieve more complicated effects.

Previous Related Work:

DJ WiiJ (www.djwiij.com)

DJing with 2 WiiMotes, Traktor Scratch Live, Midi Support. Provides support for only Windows PCs, whereas WiiDJ is (currently, at least) Mac-oriented. In addition, although DJ WiiJ provides a great amount of functionality, the setup seems kind of complicated: scratching, for instance, is set up over 6 different buttons. For a beginner user, this could be very confusing; WiiDJ uses a simpler setup (scratching is over only one button) and is therefore less confusing for a less experienced user.

WiiMusic: DJ mode

DJing with 2 WiiMotes and the Wii game console. Provides only limited exposure to DJing because it focuses only on scratching, which is only a small part of what a DJ actually does with music. It is suitable for beginners who want to get a taste of DJing, but experienced DJs would not like its limited functionality. In addition, WiiMusic is not extendable so there is no way for users to extend or customize the game to achieve more complicated effects.

Our system WiiDJ has a more comprehensive range of DJ functions already implemented, and users can easily add more as needed.

Mixxx[1]

A digital DJ system with new controllers and visual interfaces, including traditional DJ controls like the mixer and turntable, and innovative interfaces such as OpenGL Visualization and augmented turntable. The system was designed so that DJs can easily extend the interfaces and use them in novel ways.

WiiDJ is also easily extensible, but it is different because it uses WiiMotes to interact with VirtualDJ software. The use of the popular WiiMote controller makes WiiDJ more accessible than Mixxx's custom controllers, especially to new users.

WiiArts[2]

WiiArts is a collection of games in which players use WiiMotes to collaborate on creating image, video, and audio processing art. While the project is not directly related to DJing, it makes the interesting point that in the arena of art creation, it is beneficial to encourage collaboration between multiple users. The WiiMotes are particularly well suited towards player collaboration. It would definitely be interesting to expand the interface of WiiDJ so that multiple DJs can colloborate on the same piece of music. This multiplayer function has not been implemented in the current version of WiiDJ, but this is an area that future work can address.

BlockJam[3]

A series of interlocking blocks that create music by steering a signal through a user-created path of blocks. It's not truly a DJing interface at all, because it creates original sound instead of altering already-recorded music (as WiiDJ does), but Block an interesting way

of interpreting user input on a completely original interface (the blocks themselves).

ColorDex[4]

A DJ system that allows a mix DJ to prepare up to six tracks at once, and perform mixes between up to three of those at a time. The DJ system is made up of two components: the HDDJ device (used for track selection, queueing and speed control) and the Cubic Crossfader (used for volume control over individual tracks). The Cubic Crossfader is connected by BlueTooth like the WiiMotes. One thing to note is continuous BlueTooth transmission consumes a lot of power which is a concern that should be tested with our WiiDJ System.

AudioPad[5]

One of the points talked up about AudioPad was that with the use of physical objects to interface with samples, there was a more immediate level of control over the music. Consider using VirtualDJ with a keyboard/mouse – if you want to crossfade you need to grab the mouse, move the mouse to the crossfader bar, and then slide it to the appropriate place. With a WiiMote, crossfading simply becomes a matter of pushing left or right on the WiiMote. This cut in steps necessary to complete basic actions puts the user in more direct control of what the user is doing and makes DJing more enjoyable.

***Equipment and Cost*:**

Hardware:

2 WiiMotes: $40.00 each

Bluetooth-capable computer: $0 for Macs

Bluetooth adapter for use with computers that are not automatically Bluetooth-enabled: $30.

Software:

Virtual DJ (Mp3 Mixing Software): $300

Software to connect WiiMotes to computer:

RemoteBuddy (for Macs): 20€

GlovePie (for Windows): $0

Group members/responsibilities:

Mark: Mark did most of the physical pointing and clicking: he was often the one actually working at the computer while the rest of us looked on. He chose which keystrokes should be mapped to which actions and provided a setup where we could develop and eventually test our system.

Hannah: Hannah explored the possibility of using the Wiimotes as IR pointing devices, both using candles as a primitive solution and later an actual IR emitter. She also provided an opinion as an inexperienced DJ.

Vyenna: Vyenna suggested additional functionalities to include in WiiDJ. She also provided a template for the questionnaire given to test subjects.

Dexter: Dexter knew far and away more than anyone else in the group about how an actual DJ works, so we asked him many questions about what would feel the most natural. He also assisted

in the testing process.

What did we build:
We built a system that integrates several computer programs (RemoteBuddy, VirtualDJ) and the Wiimote device itself, which allows DJs to use virtual DJing software to create and manipulate music with minimal need to touch the mouse or keyboard. Thus, WiiDJ provides a way of interacting with DJing software that more closely resembles the interaction between a conventional DJ and his turntables.

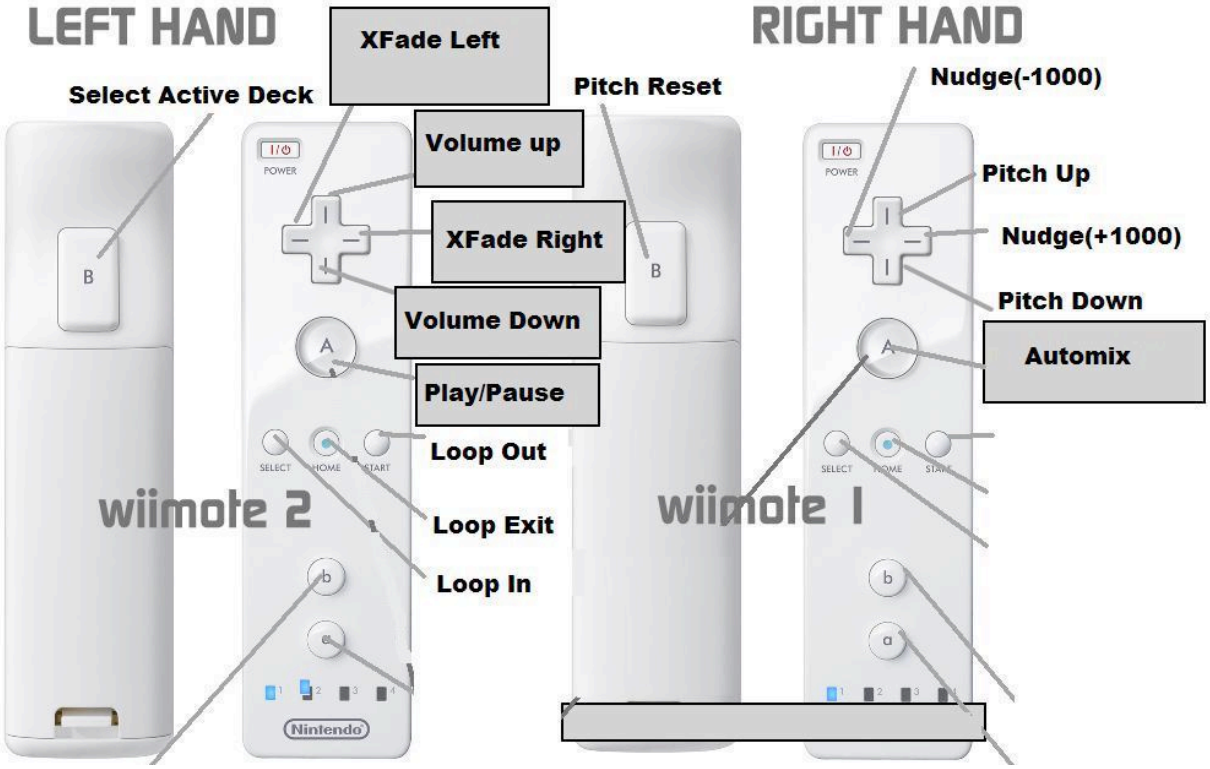
Who will use it:
A wide variety of people can use our system, from the experienced DJ who wants to either use a digital system inexpensively or have a more hands-off DJ experience to the complete novice just looking for a fun way to interact with music.

How did you built it: Same as "What We Did"
We used a program called RemoteBuddy to facilitate computer-Wiimote communication on a Mac, which we used first because those machines have Bluetooth capabilities built in automatically. Once discovering all the remote-centric gestures RemoteBuddy can handle (button pushes/holds, etc.), we connected each remote gesture to an action in VirtualDJ. We did this by mapping remote gestures in Remote Buddy (a keystroke, a held key etc.) to a particular keystroke (on the actual computer keyboard). Then, we would map the same keyboard action to a music-altering action in Virtual DJ (pitch bend, scratch, etc.). In this way, the keystrokes (and therefore kind of the computer keyboard) acted as a sort of middleman between the Wiimotes, RemoteBuddy, and VirtualDJ.

We also explored utilizing the infrared light capabilities of the Wiimote: using an infrared light source, the Wiimotes can be used as pointing devices. We were hesitant to utilize this functionality in the final product, though, because the onscreen programs we use require very specific pointer input that's hard to do correctly with a Wiimote over an IR connection.

How did you test it:
We wrote a questionnaire asking users to rate WiiDJ on the basis of ease of use, intuitiveness of mappings, etc. The system was tested by three experienced DJs. Group members also informally tested the device during creation as new features were mapped.

Detail on design:



Testing Protocol Section:

- We tested 3 DJs:
    DJ 3X Dex, Dexter Doyle
    DJ Killa, Garaudy Etienne
    DJ Azalea, Meg Lee

They each have different DJ experience with Virtual DJ:

- DJ 3X Dex uses Serato Scratch Live (vinyl emulation) so he is used to using actual turntables and a mixer. Not much experience with Virtual DJ.
- DJ Killa uses Virtual DJ and a year and a half experience with the software. He uses his keyboard and touchpad to control VirtualDJ.
- DJ Azalea just started DJing about 2 months ago and uses Virtual DJ. She uses an all-in-one-controller for the software that is a mixer/turntable in one. The controller is connected through MIDI support.

The information below was supplied to each subject:

Welcome to WiiDJ: DJ Interface with WiiMotes and VirtualDJ

Intended Users: Virtual DJ Users, DJs who use digital WIMP (Windows, Icons, Mouse, and Point-and-click) based interfaces.

WiiDJ currently is a DJ interface intended for live music mixing. It includes the essential controls for beat matching.

The controls that have been implemented are:
- Individual track volume control
- Pitch track control
- Crossfader control
- Loop In/ Loop Out
- Deck Focus
- Automix

User Survey

1) How effective was the pitch control mapping, in ease of changing pitch and intuitive controls.

Not at all					Very effective
0	1	2	3	4	5

2) How responsive was the crossfader control, in relation to changing songs or DJ techniques such as cutting.

Not at all responsive					Very Responsive
0	1	2	3	4	5

3) How functional was the volume control, was the max volume loud enough, too loud, too soft?

Not at all functional					Very functional
0	1	2	3	4	5

4) How efficient was the loop control, in relation to making loops and exiting?

Not at all efficient					Very efficient
0	1	2	3	4	5

5) How responsive was the play/pause control?

Not at all responsive					Very responsive
0	1	2	3	4	5

6) How natural was it to change the focus on the decks?

Not at all natural					Very natural
0	1	2	3	4	5

7) Overall, how intuitive is WiiDJ when compared to other DJ interfaces?

Not at all intuitive					Very intuitive
0	1	2	3	4	5

Final Questions:

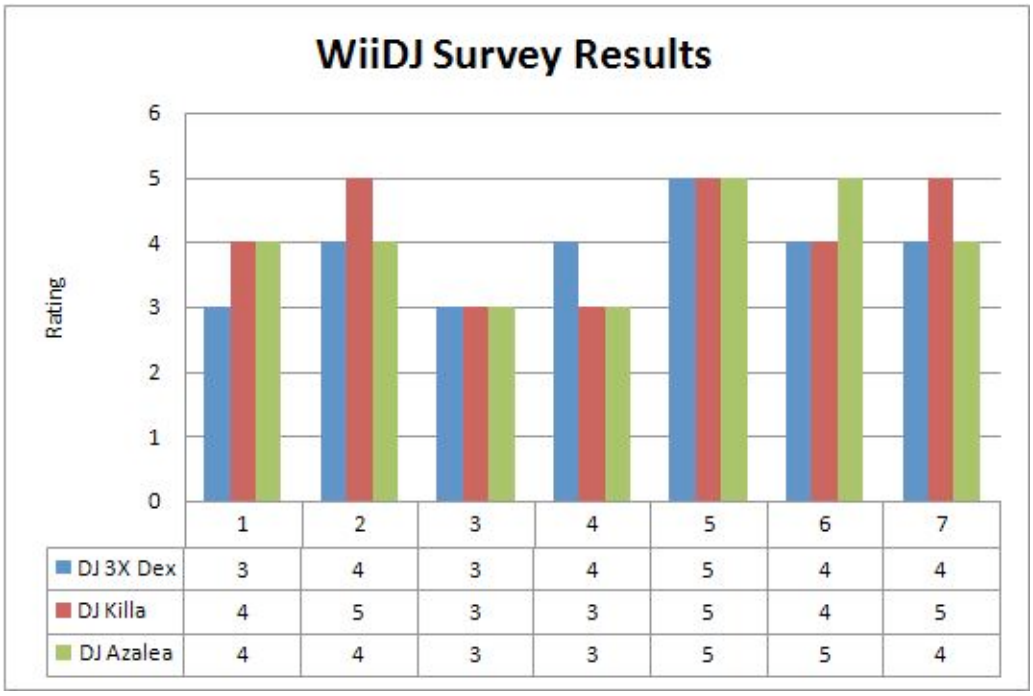
Do you think that you would be able to actually DJ with WiiDJ?

Are there any suggestions you would make for future mapping layouts?

What features would you like to see in the future with WiiDJ?

Thank you for filling up this survey…

Data Analysis from WiiDJ Survey:



	1	2	3	4	5	6	7
DJ 3X Dex	3	4	3	4	5	4	4
DJ Killa	4	5	3	3	5	4	5
DJ Azalea	4	4	3	3	5	5	4

Notes:

It seems that there is room for improvement in Pitch Control, Volume Control and Loop Control. From the surveys,

DJ 3X Dex is used to pitch control being on a slider and not directional button which is why he gave a low rating.

DJ Killa liked the responsiveness of crossfader which he compared to himself previously using the keyboard to crossfade.

DJ Azalea liked how she was able to change focus on decks using the trigger button (B) on the WiiMote.

All DJs gave average rating to Volume Control because they noted that volume could not go as high as compared to their own systems. They also felt that the play/pause control was very responsive.

Final Question Results:

DJ 3X Dex thinks that there are limitations in DJing with WiiDJ since there is no way to cue for beatmatching. In the future, he is looking for WiiDJ to have headphone input so that he can hear the track he is trying to mix into because it is an important feature for beatmatching. He believes that it might be difficult to DJ an entire set with WiiDJ but it probably is possible.

DJ Killa thinks WiiDJ will be a cool addition to his own DJ Set. He is used to just the keyboard and touchpad so the WiiMotes make DJing a lot more interactive and interesting for him. In the future, he is looking for mappings for special effects and WiiDJ to utlize the motion of the WiiMotes. He particularly mentioned he wanted "to crossfade by moving the WiiMote

horizontally"

DJ Azalea thinks WiiDJ is almost efficient as the all-in-one controller. It has most of the same functions to allow her to do mixing. The feature she is looking for is scratching since her all-in-one controller does not do it efficiently.

Conclusions:
WiiDJ is a system for disc jockeys to manipulate music using mp3 mixing software and two WiiMotes. The system is designed so that novices and experienced DJs can perform a wide range of DJing tasks without the need for expensive turntables. The use of WiiMotes minimizes the need for users to touch their computers, while still giving them a way to access the functionalities of the DJing software. Thus WiiDJ transforms the digital WIMP (Windows, Icons, Mouse, and Point-and-click) based interface of VirtualDJ into a more freeing and movement based interface similar to those used by traditional DJs.

Future Work:
In future work on this project, we still need to figure out how to get the system working with a non-Apple PC. To do this, essentially we need a PC alternative to RemoteBuddy. We've come across a program called GlovePie that might fit the bill, but we haven't yet completed work on that adaptation of WiiDJ, so future work should focus on accessibility and making the system available to other computers; specifically, we need to develop a Windows-compatible version of the system.

Also, it would be ideal if we could eventually figure out a way to make WiiDJ completely hands-free. Currently, the only time a user has to use their mouse and/or keyboard is to load new songs onto the decks. An additional future goal is to figure a way to do song selection and loading onto the decks without using the mouse and/or keyboard. Perhaps if there was a way to refine the IR input from a Wiimote and make it more specific, that might be one option, or additional button mappings (perhaps using more than one button at once) could be utilized for this functionality.

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[5] James Patten, Ben Recht, Hiroshi Ishii. Audiopad: A Tag-based Interface for Musical Performance. In *Proceedings of the 2002 conference on New interfaces for musical expression*, 2002. http://portal.acm.org/citation.cfm?id=1085175

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