

HOLLI  
ELIZABETH

JAN | 11

## Technical Evaluation

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## Background

Holli Smith received her Associates degree in Interactive Media Design in 2007 from The Art Institute of Atlanta; soon after she went to work with John Wieland Homes as a designer and developer.

Holli decided in 2008 that she wanted to start a business with a graphic designer, so they started their own design firm called Digital Coffee. For two years they worked on projects ranging from medium sized business websites to concept designs for large businesses and social networking sites. Holli's primary roles at Digital Coffee were information architecture, user experience design and development. After two years of working at Digital Coffee, Holli decided to leave the business and return to school.

Holli currently works as a freelancer and has on several clients doing primarily development and design when it is requested. Some of her more recent clients include the woodruff arts center, Terrapin IT, Sagepath, Discover Media, IMLCORP and GoKickball.

## Strengths

Holli is a very well rounded designer and developer. Her strengths can be broken out into two parts, user interaction and development.

- A) **User Interaction:** Holli's experience with user interaction primarily comes from her time working at Digital Coffee. She was responsible for all the information architecture there starting with user personas all the way to wireframes, prototypes and testing.
- B) **Development:** Holli's background in development goes all the way back to high school where she studied algorithms and C++ as an elective. Because of her extensive education with programming Holli easily picks up languages and is known to do so when it is necessary for a job. The languages she most currently uses are php, javascript and actionscript 3.

## Weaknesses

Holli's weaknesses include a moderate-level of experience doing visual design and little to no experience in game design. She also has no experience in designing and developing specifically for physically challenged audiences.

## Examples

- a) [Digial Coffee](#)
  - i) Project Management
  - ii) Information Architecture
  - iii) User Personas
  - iv) Wireframes
  - v) Front – End Development
  - vi) Back-end Development
- b) [Woodruff Arts Center](#)
  - i) Information Architecture
  - ii) Design
  - iii) Development
- c) [GoKickball](#)
  - i) PHP
  - ii) MySQL
  - iii) Database design
  - iv) CMS user experience design
- d) [Student Work](#)
  - i) IA
  - ii) Flash
  - iii) Design
  - iv) Javascript development
  - v) PHP
  - vi) Actionsript 2 & 3

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## Project Concept

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## Introduction

According to the US Census Bureau 1 in every 5 Americans has some type of disability and 1 in 10 of them have a severe disability. This is a largely untapped market for the gaming industry, because accessibility is not a focus of many games (even though this is beginning to improve).

While there are some games that are specifically created for the blind, or deaf, or color blind there are not many games that are designed to be accessible to everyone. Such a project would not only mean creating a game that someone who is disabled can play but would also mean that they can enjoy playing it with someone who might not be disabled as well.

At the moment I am open to ideas for an accessible video game, but my hope is to create a game similar to guitar hero where the user is prompted to press buttons at the appropriate time in coordination with music. The final project should be accessible to as wide an audience as possible.

## Project Goals

- Create a fun and interactive flash game based on popular games like guitar hero and DDR. Users are prompted to press a button at the right time and are given scores on how accurately they press them.
- Consider accessibility during the design and development of the game. Making it accessible to people who are blind, deaf, colorblind, or have limited mobility, as well as people with mental handicaps and people without handicaps at all.
- The game should be playable with equipment that the market demographic already has (mouse and keyboard) but also may be used with special controllers.
- The game should be designed in a way that it could be ported to popular consoles like the playstation 3, xbox360 and the wii.
- The game should be designed for multiple players either 1-2 or 1-4. While this is not a goal for the initial demo the design should be done with multiple players in mind.
- The game should be playable without any special equipment beyond a keyboard and mouse to make it accessible to the widest audience possible.

## Target Audience

### Demographics:

- **Gender:** Male and female
- **Age range:** 12 – 30
- **Other:** The target demographic is mainly comprised of people with disabilities or special needs, but also will include users who are friends with or know people who have disabilities.

## Competition

### Blind Gamers

<http://www.omninet.net.au/~irhumph/blindgamers.htm#LIST>

#### Description

Blind Gamers is a website run by an Australian Ian Humphreys who makes freeware board game and card games for people who are blind. His games are desktop applications that utilize Microsofts' SAPI (speech applications programming interfaces) TTS (text-to-speech) engine.

#### Differences

This project features a game that is created to mimic popular video games that children, teenagers and young adults would like to play, instead of board and card games like Ian Humphreys'. Also Ian uses Microsofts' TTS engine that is useful to blind users but can also sound cold, mechanical, and inaccurate. This project will have custom audio files created so that the directions and commands are easily understood. It's also going to be built in flash so it is not dependent on Microsofts' operating system.

### BDDR: Just Dance

<http://www.bddr.nl/>

#### Description

BDDR: Just Dance is a rhythm game that was made for blind users that is very similar to DDR. Users are told a button to press and then given an audio cue to press the button.

#### Differences

While BDDR: Just Dance is very similar to this project it is only designed for blind users to play, someone who is deaf would not be able to play this game at all because there is no graphic interface. In fact it is very hard for someone who can see and hear to play because they are not accustomed to listening to and remembering large amounts of information at once. BDDR is also a desktop application with no way to play in multiplayer modes. The user must be using Microsoft and have .NET2 and direct x9 to install it. This project will be built in flash in order to make it accessible to as many people as possible.



## Drive

<http://www.audiogames.net/drive/>

### Description

Drive is a racing game that is completely based on sound. The goal during the development of this game was to create a game that is as fun as mainstream games but is only based on sound. It is a desktop game so it requires Microsoft to be installed to play.

### Differences

The primary difference between Drive and this project is that Drive is entirely based on sound, the goal of this project is to create a game that is accessible to as large an audience as possible so both auditory and visual feedback will be necessary.

## Game For Helen

<http://www.specialeffect.org.uk/pages/helen.htm>

### Description

Game for Helen was a project created to make an accessible game for a young girl named Helen who suffered from a metabolic disorder that made it hard for her to control her body. A game was created specifically for her that allowed her to use her eyes to control a screen in order to play the game.

### Differences

The differences between Game for Helen and this project are that Game for Helen was designed specifically for a very young girl with very simple gameplay, it also requires special equipment in order to be played. This project will only require a mouse and keyboard while this would not work for Helen it would work for a much larger audience, which is more in line with this project's goals.

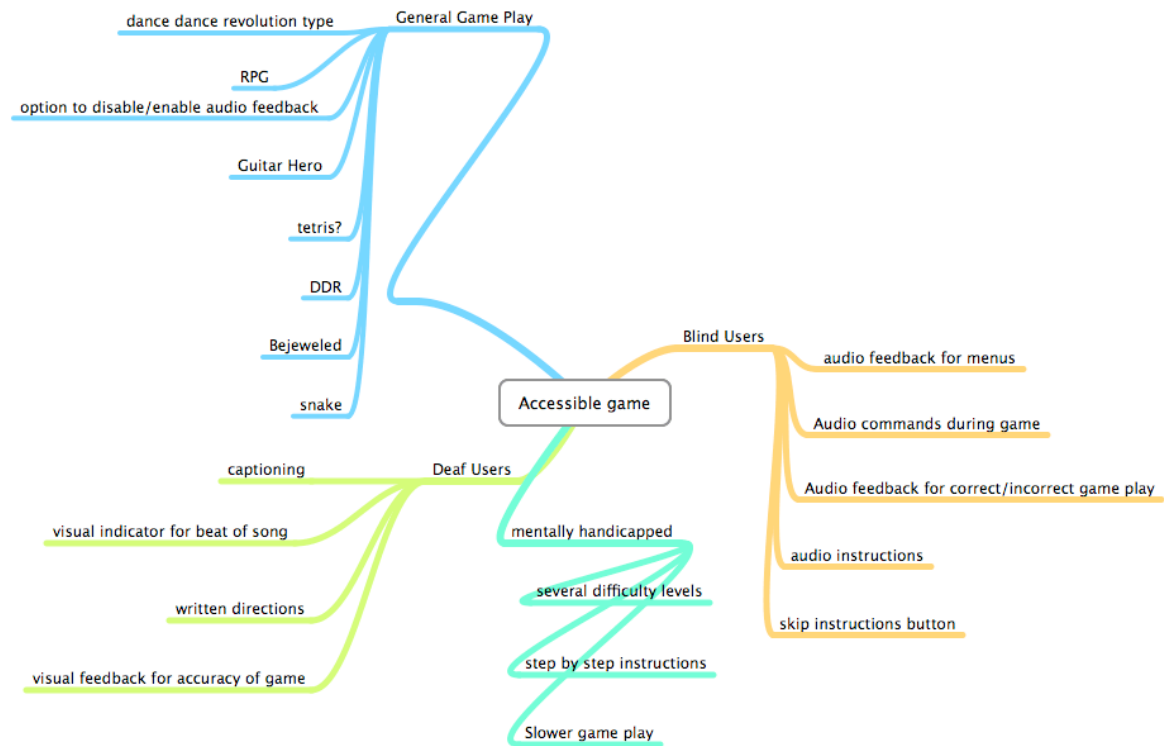
## Inspiration

This project was inspired by a [youtube](#) video where a crowd of people makes different noises in order to help a person who is blind play guitar hero. The thought occurred to me that if this audio feedback was an available option by default on several games that they would be much more accessible without much more effort. After doing research on accessibility in video games became very interested in the subject because it is nearly uncharted territory, and decided it would be a wonderful idea to make a game that is accessible to both blind and deaf users and still very fun to play for people who do not have disabilities.

## Skill and Resources

Required skills and resources	Status
Flash	Available
Actionscript 3	Proficient
Music	Available
Focus Group / Testers	In Progress
Strong understanding of Interface design, visual design and usability	Proficient
Strong understanding of accessibility and user needs	In Progress

## Mindmap



## Career Goals

The relevance of this project to my career goals relates to my goals to work with video game interfaces. Currently I am a freelancer but if I ever choose to stop doing freelance work I would like to work on interface design and testing for video games. Having a good understanding of video game accessibility would give me an edge over other interface designers, and it's a topic that sincerely interest me.

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## Deliverables

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## Deliverables Overview

Deliverable	Due Date
1) User Interviews/ Research	02/02/2011
2) Requirements / Sitemap	02/09/2011
3) Wireframes / Script	02/16/2011
4) Branding / Design Compositions	02/23/2011

### 1) User Interviews / Research

User interviews need to be conducted in order to find what users with particular disabilities need and want out of a video game. Research also needs to be done to establish any best standards for video game accessibility that already exist.

### 2) Requirements / Information Architecture

Once user needs and best practices are established a requirements document needs to be compiled in order to address all user, technical and accessibility requirements. User personas will be created. A site map will be created for the menu system.

### 3) Wireframes / Script

Detailed wireframes will be created to provide a detailed visual guide for the interface. Wireframes will also detail the script for auditory feedback for the game, including instructions, menu feedback and in-game commands.

### 4) Branding / Design Compositions

Branding will be established for the game including a logo and theme and color palette. Design compositions will be created to reflect the established branding.

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## Game Concepts

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## Rhythm Game

The rhythm game is a game that is made primarily for entertainment. The game idea is loosely based on the popular game Dance, Dance Revolution. Music plays and icons indicate that the user should press the up, down, left or right arrow keys when the icons reach a certain area on the screen. Audio feedback is given to indicate when the buttons should be pressed for blind users. A score is kept based on how many buttons the user presses at the correct time.

## Word Game

The spelling game is an educational game made for grade school children K-5 to 2nd grade. It would show a picture on the screen and give the child 30 seconds to spell the word, once they enter the spelling and press enter it would show if the word is correct tally the score based on if it was correct or not and move to the next screen. For users who are blind the game would say the word. There would also be different difficulty settings for children with different capabilities. (A Braille keyboard might be necessary to assist users who are visually impaired).

In later levels users are given a partial sentence, they are given four options of words to complete the sentence and are asked to pick the correct word that finishes the sentence. Then their score is tallied based on the number of correct answers and the amount of time it took to answer them.

## Math Game

The math game is an educational game for grade school children. The game will show math problems on the screen and ask for the correct answer. The user will have a limited amount of time to answer as many questions as possible. Once the time is up the users score is tallied based on how many questions they answered correctly. Audio feedback will be provided for visually impaired users and several difficulty levels will be available for users with different abilities.

## Music Game

The music game is an educational game for grade school children. It teaches the users how to read music. Notes are shown on the screen and played for the user. Then the user is expected to hit the letter that corresponds with the notes a, b, c, d, e, f and g. As the player plays the game scores are tallied based on their accuracy. Different difficulty levels are available for different users.

## Trivia Game

Trivia game has the option of being educational or purely used for entertainment. The game asked the user questions with and gives them four options. The user has 30 seconds to pick the option that they think is correct. The score is tallied based on how long it took them to answer the question and if the answer is correct. The game can be expanded so that teachers or whoever has access to the game can create their own questions (and necessary audio files).

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## Accessibility Research

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## Introduction

Because of the lack of interest on the part of the video game industry in making games accessible to people with disabilities there are few standards set for video game developers on how to make video games accessible to people with disabilities. So this research is primarily based on the WCAG standards for web accessibility, interviews and sites devoted to people who play games with disabilities.

## WCAG accessibility standards and how they apply to video games

### 1.2.2 Captions

*“[1.2.2 Captions](#) are provided for all [prerecorded audio](#) content in [synchronized media](#), except when the media is a [media alternative for text](#) and is clearly labeled as such. (Level A)”*

In video games captions are often used but not thoroughly enough for a deaf user to get the full experience of the game. Often not all voice-overs are captioned during game play and music that indicates what is happening in the game is rarely indicated visually on the screen. For example sometimes music is used in video games to indicate that danger is approaching but users who are hearing-impaired are not given any indication of the danger, this problem can be (and has been in the past) fixed by showing a visual danger meter on the screen.

So for hearing-impaired players it is important that all sound effects including music and voice-overs are visually represented on the screen.

### 1.2.3 Audio Descriptions

*“[1.2.5 Audio description](#) is provided for all [prerecorded video](#) content in [synchronized media](#). (Level AA) [Understanding Success Criterion 1.2.5](#)”*

WCAG standards for audio descriptions are primarily focused on videos. For example an audio description might say, “A man walks into the room and says”, Audio descriptions can be applied to video games by creating audio cues that indicate to the user what is happening on the screen visually and giving them an indication of what they must do to in order to interact with the game. These can include descriptions or sounds.

### 1.3.3 Sensory Characteristics

**“1.3.3 Sensory Characteristics: Instructions provided for understanding and operating content do not rely solely on sensory characteristics of components such as shape, size, visual location, orientation, or sound. (Level A) “**

Sensory characteristics in instructions are essential to game design as well. When giving the user instructions on how to play the game it's not enough to say *“When you see the red icon press up”* because someone who is color blind might not be able to see red, so the instructions must give multiple ways to indicate to the user what to do for example *“When you see the square red icon and hear the sound \_\_\_\_ press the up button”*.

### 1.4 Distinguishable

**“Guideline 1.4 Make it easier for users to see and hear content including separating foreground from background. <http://www.w3.org/TR/UNDERSTANDING-WCAG20/visual-audio-contrast.html>”**

All fonts need to be easy to read, they should be at least 14 pt. font for low-vision readers and should be sans-serif so they are easy to read on the screen.

#### 1.4.1 Use of Color

**“1.4.1 Color is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element. (Level A)”**

Because of the possibility of color blind users color cannot be the only indication of an action, or a prompt. Some other indicator must be used text or an icon must be provided as well in order to give the user feedback.

#### 1.4.2 Audio Control

**“1.4.2 If any audio on a Web page plays automatically for more than 3 seconds, either a [mechanism](#) is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level. (Level A)**

This standard can be applied to an accessible video game indirectly, because audio feedback has to be available in order for blind users to play the game the option to turn off this feedback should be available to users who might not need it and find it irritating. At the same time background music that might interfere with a blind person's ability to hear instructions must have the option to be turned off as well.

#### 1.4.6 Contrast (Enhanced)

**“1.4.6 The visual presentation of [text](#) and [images of text](#) has a [contrast ratio](#) of at least 7:1, except for the following: (Level AAA)”**

This also can be an important guideline for games to make sure that the user interface has enough contrast to be readable for someone who has color blindness, and/or low-vision.

### 1.4.7 Low or No Background Audio:

1.4.7 For [prerecorded audio-only](#) content that (1) contains primarily speech in the foreground, (2) is not an audio [CAPTCHA](#) or audio logo, and (3) is not vocalization intended to be primarily musical expression such as singing or rapping, at least one of the following is true: (Level AAA) [Understanding Success Criterion 1.4.7](#)

- **No Background:** The audio does not contain background sounds.
- **Turn Off:** The background sounds can be turned off.
- **20 dB:** The background sounds are at least 20 decibels lower than the foreground speech content, with the exception of occasional sounds that last for only one or two seconds.

*Note:* Per the definition of "decibel," background sound that meets this requirement will be approximately four times quieter than the foreground speech content.

This standard is especially important for video games to be accessible. In order for a video game to be accessible it must have audio feedback that gives the users cues to play the game the background could interfere with the users ability to play so there must be a volume setting or a way for the user to turn off disruptive background music that might be acceptable for users who can both see and hear.

### 2.1.1 Keyboard

2.1.1 All [functionality](#) of the content is operable through a [keyboard interface](#) without requiring specific timings for individual keystrokes, except where the underlying function requires input that depends on the path of the user's movement and not just the endpoints. (Level A)

Keyboard functionality can be applied to any video game technology meaning that the game can be played with only buttons and does not require an analogue stick (similar to the mouse) in order to play the game. This is an important rule for video game accessibility because people who have low-vision may not be able to see a mouse on the screen and people who are completely blind will have difficulty using a mouse to navigate. Also anyone who has trouble hand – eye coordination will find it difficult to use a mouse or analogue stick.



### 2.1.2 No Keyboard Trap:

*“[2.1.2](#) If keyboard focus can be moved to a component of the page using a [keyboard interface](#), then focus can be moved away from that component using only a keyboard interface, and, if it requires more than unmodified arrow or tab keys or other standard exit methods, the user is advised of the method for moving focus away. (Level A)”*

This standard is an overall good practice for any user interface including video games that are made to be accessible. However it is important to note if building a computer or flash game using the tab button to navigate through the menu would be the obvious choice but that would require the game trap the keyboard because in browsers and natively on Operating systems the tab button is used to navigate. So it might be best to use arrow keys to navigate through the menu system so that the tab button can be used for the webpage or to navigate through the operating system. However using something other than tab means that there needs to be instructions telling the user how to navigate through the menus.

### 2.3.1 Three Flashes or Below Threshold

*“[2.3.1](#) [Web pages](#) do not contain anything that flashes more than three times in any one second period, or the [flash](#) is below the [general flash and red flash thresholds](#). (Level A)”*

This standard is put in place in order to help prevent photosensitive epileptics from having a seizure when looking at website. When creating a game that is accessible it is also important to apply this standard and make sure that all flashes or blinks are less than 3/second.

### 2.4.1 Bypass Blocks

*“[2.4.1](#) A mechanism is available to bypass blocks of content that are repeated on multiple Web pages. (Level A)”*

Bypass blocks are typically used to skip navigational elements that are present on every page of a website, so that blind users do not have to listen to them every time they navigate to a new page. Bypass blocks should also be considered when developing a game, because an accessible game would need to have audio instructions the user might not need to listen to them every time they start to play the game, so all information that is optional should give the user the option to skip it.

### 2.4.6 Headings and Labels

*“[2.4.6](#) Headings and [labels](#) describe topic or purpose. (Level AA)”*

Just like a site needs consistent and descriptive headings and labels a well designed game must also have well written labels and heading so that the user understand what particular buttons do or where they are in the navigation.

The only alteration I would make to this standard for the sake of a video game is that all labels/buttons must have audio feedback describing what they are.

### 2.4.7 Focus Visible

*“[2.4.7](#) Any keyboard operable user interface has a mode of operation where the keyboard focus indicator is visible. (Level AA)”*

Visually showing the keyboard focus makes it much easier for someone who is navigating the game to be able to see what element of the game they are interacting with.

For blind users there should also be audio feedback given when to indicate what the keyboard focus is.

### 3.1.5 Reading Level

*“[3.1.5](#) When text requires reading ability more advanced than the [lower secondary education level](#) after removal of proper names and titles, [supplemental content](#), or a version that does not require reading ability more advanced than the lower secondary education level, is available. (Level AAA)”*

For video games the best standard should be to not require a reading ability lower than secondary education. It's also important to not that the reading level may be even less depending on who the target market is for the video game.

### 3.2.1 On Focus

*“[3.2.1](#) When any component receives focus, it does not initiate a [change of context](#). (Level A)”*

Typically the way users interact with an interface and buttons is to highlight or mouse over the button they wish to click and click it. Users who have disabilities like limited-motor functions or limited hand-eye coordination skills use the tab button to focus on buttons or links in order to select them to be clicked. When a user focuses on the button it should not initiate an action until the user hits enter or whatever other button is typically necessary to indicate the user wants to take that action, this is how the user expects the interface to work and may not be able to use the interface if it does not work in the way they expect it to.

### 3.2.2 On Input

*“[3.2.2](#) Changing the setting of any [user interface component](#) does not automatically cause a [change of context](#) unless the user has been advised of the behavior before using the component. (Level A)”*

Users do not expect that creating input will change the context of the interface. So when entering input the page should not change until the user provides an action that indicates that they are finished with the input (i.e. hitting the tab button or the enter button).

### 3.3.2 Labels or Instructions

*“[3.3.2 Labels](#) or instructions are provided when content requires user input. (Level A)”*

All games should require some kind of instructions on how to play the game and how to navigate through the menus. Audio instructions should be available for users with hearing impairments.

### 3.3.5 Help

*“[3.3.5 Context-sensitive help](#) is available. (Level AAA)”*

Context sensitive help should be available for users with disabilities, users with limited temporary memory, attention deficit disorder, or blind users who may need to remember a lot of information may benefit from a form of help that does not interrupt their progress through the game.

### 4.1.2 Name, Role, Value

*“[4.1.2](#) For all [user interface components](#) (including but not limited to: form elements, links and components generated by scripts), the [name](#) and [role](#) can be [programmatically determined](#); states, properties, and values that can be set by the user can be [programmatically set](#); and notification of changes to these items is available to [user agents](#), including [assistive technologies](#). (Level A)”*

This standard could be used to help users who are blind understand how different interface elements are set. For example when the user focuses on a button designed to control the background audio the game would give the following audio feedback:

*“Button Name: Background Music;  
Button Role: Toggle background music on and off;  
Button Value: Background Music is currently off;”*

## DeafGamers.com

DeafGamers.com is a site that reviews mainstream video games based on how playable they are for people who are deaf. I have taken their review criteria and used it to create standards for creating a game that is accessible to deaf users.

### Captioning and subtitles

All text and important audio must be captioned or have subtitles, this includes in game instructions, dialogue and dialogue in game cut scenes. Any sound effects must also be captioned.

### Color-Coded Captions

Color-coded captions are important for two things.

- 1) To distinguish who is talking during dialogue
- 2) To distinguish sound effects from dialogue and music

## Text Speed

It is very important that users who depend on the sub-titles and captioning to play the game be able to read the text in its entirety. So users should either be able to give the dialogue a prompt to move on to the next section of text or be able to control the speed of the text as an option in the game.

## Objectives

All objectives should be accessible by text, if objectives are given only with audio then deaf gamers will be unable to play the game, because they will have to guess at what they are doing.

## Listening Games

Some games like puzzles rely on the user to be able to listen to the game in order to solve the puzzle (for example stepping in certain spots makes a noise that indicates if there is a trap there or not). If audio feedback is provided to help the user progress through the game some form of visual feedback should be available as well.

## Flash Accessibility

Because my plan is to build the prototype for this game in flash I have listed below some of the best standards for flash accessibility according to the [Adobe Flash website](#).

### Text Equivalents for visual elements

There are two ways to handle accessibility in flash for users who are blind, the first is to create audio voice over's for the user that are not native to flash and embed them into the flash application and the other is to provide text alternatives that screen readers can read (new feature available in flash 10). Text equivalents can be provided for graphics, animations, movies, and form elements by using the accessibility panel (F-11), or with actionscript 3.

### Make looping elements inaccessible

Screen readers have issues reading looping elements so they should be made inaccessible to screen readers.

### Allow users to control motion

Information that is presented for a short period of time on the screen can make it difficult to comprehend for people with mental disabilities, and it can make it difficult for screen readers to keep up with the text and alternate content. To prevent moving content from being difficult allow the user to indicate when the animation should go to the next scene/slide rather than having a timer control the movement.

### Use Accessible Components

Flash provides a variety of accessible components that can be used to solve several accessibility problems including labeling, keyboard accessibility, and testing. In order to use these accessibility components the developer must use the `enableAccessibility()` with actionscript 3.

## Reading Order

Screen readers can only read a flash application or website in a linear fashion, creating a reading order will help flash read the side in the correct order. There are several different ways to control the reading order but the ideal way to control reading order would be to program it into the flash applet with actionscript 3.

## Facilitate keyboard access to all controls

For users with several types of disabilities (or users in specific situations where a mouse is not available) it's important to make the entire application work with the keyboard alone. To make it easy for the flash movie to work with the keyboard keep the script in the frame, and avoid using empty movie clips because they are not recognized by screen readers. Using actionscript 3 make keyboard shortcuts that will work the same as buttons on the interface (for example use the space bar for pause).

## Usage instructions

Flash applications can be much more complex than the typical website that a user using a screen reader might be accustomed to so it's important to provide users with directions on how to use the flash application, so they understand what they are listening too. One way to do this is to add a description to the website that the flash is embedded in. However this may become redundant because every time the user comes to the site they will have to listen to the description so other options include offering a skip instructions button or having a link that goes to a page with the instructions.

## Button states

The state of a button can change but if the labeling doesn't change this could confuse the user, so when a button is clicked and the state is changed it's important to change the labeling as well. For example a pause button becomes a play button when it is pressed, this could be confusing for the user if the button labels don't change as well.

## Interviews

I was able to interview two people on video game accessibility. The first is an Australian developer who creates card games and board games for people who are blind. The second is a special education teacher for the Georgia Public School system.

### Ian Humphrey

Ian Humphrey is a developer based out of Australia. He also develops games for the visually impaired in his free time. He was kind enough to offer me some advice on what types of feedback work best and what standards he uses for navigations through his games.

#### **Q. What types of audio feedback are best to use during game play?**

**A.** *"Notifications of certain situations during the game are best given using a sound effect, so as not to overburden the player with too much speech. Speech also takes longer than a quick beep or buzz..... Most of my games, especially the more recent ones which have a lot more experience behind them than my earlier ones, use a mixture of both speech and sound effects."*

**Q. Are there any buttons that have standard actions?**

A. *"I have developed certain standards within my blind accessible games for which keys are used for what, mainly so that people who play several of my games can learn the new games quicker, because some of the commands are similar or identical to other games they have played previously. But I'm not aware of any industry standards for this sort of thing. I tend to use the function keys for providing information during a game and for setting options before the game starts."*

- *F8 to F12 I reserve for setting options.*
- *F1 is Help (standard windows convention)*
- *F2 through F5 provide information during a game*
- *F7 is usually for high scores*
- *F6 is reserved for announcing the program credits and version number.*
- *The arrow keys on the arrow keypad are used to move around the game*

**Q. It seems that giving all directions as audio feedback before the game begins could be overwhelming. What are the best ways to deal with instructions to make them easy to remember for the user?**

*"In addition to a text file of instructions of how to operate the game and which keys do what; I also have what I call "Keys Help". During the playing of a game, at any time if the player holds down the Ctrl key and hits another key on the keyboard, help is spoken for that key (if it is used in the game). This saves the player continually referring back to the main help file.*

*Yes, I agree with you that when first confronted with a new game and a massive help file containing detailed descriptions of which keys do what, a player might be a little overawed. But blind people tend to have better memories than we sighted people and so they find it easier to get into playing a game. Of course they don't learn everything at once, and to help ease a new player into a game, I sometimes have a quick start topic in the Help which introduces just the bare bones commands needed to play a game. The commands which provide additional information can be learned later once they have got a feel for the game. Some games may also benefit from having a set of tutorials, such as my BG Crossword Puzzle game."*

**Sarah Babb**

Sarah is a grade school special education teacher. The majority of her students suffer from expression and articulation deficits.

**Q. What are expression and articulation deficits?**

A. *"A speech impairment can be an articulation deficit or a receptive/expressive language deficit. A student with an expression deficit might have a very limited vocabulary"*



**Q. What kind of games would be good for children with these disabilities?**

**A.** *"A vocabulary game would be good: showing a picture, naming it, and listing 3 synonyms/antonyms. They often struggle with words that have multiple meanings and idioms. They have difficulty following multi-step instruction, ordering and sequencing words into a sentence or paragraph, or summarizing and retelling information that makes sense. I've come up with a lot of games to use, just not in computer format – they really simple, but they work."*

**Q. What are some games that you think would be useful?**

**A.** *"Look at knowledgeadventure.com - it has a lot of educational games that are pretty fun. That might give you some ideas about the games that are already out there. If you find one you like, you could just modify it however you want."*

**Q. What about some of the games you use for class, could any of them be turned into an educational video game?**

**A.** *"The games I've created are all board games, but they could be adapted for use on a computer. The games aren't as exciting as regular video games because I was using them to teach a specific skill. But you could use the basic concepts/game format to build on to make a more computer-friendly, interactive game with lots of colors and sounds."*

**Game 1: Students identify synonyms and antonyms by playing a game.**

1. 1. Place header cards face up in a row at the center in the following order:
2. SYNONYM, WORD, ANTONYM. Place word cards face up in a column under the WORD header card. Place synonym and antonyms cards face down in a stack. Provide each student with a student sheet.
3. 2. Taking turns, students select the top card from the stack and read it.
4. (e.g., "firm").
5. 3. Determines if it is a synonym or antonym by reading the designation at the
6. bottom of the card (i.e., synonym).
7. 4. Read the words in the middle column and determine where the synonym or
8. antonym card should be placed (i.e., next to "hard").
9. 5. Reverse roles and continue until all words are placed.
10. 6. Record synonyms and antonyms next to the words on student sheet.

**Game 2: Students match abbreviations to their corresponding words by playing a memory game.**

1. Place the abbreviation cards face down in rows.
2. Taking turns, students turn over two cards. Read the abbreviations and words (e.g., lb. and pound). If the cards match, place the matched cards aside. If the cards do not match, return the cards face down in their original spots.
3. Continue until all the cards are matched.
4. Peer evaluation

**Game 3: The student will identify words to complete sentences.**

1. Place sentence strips in a stack at the center. Place word cards face up in rows.
2. Taking turns, student one selects a sentence strip and reads the sentence, saying “blank” for the missing word.
3. Student two finds the word, places it on the blank, and reads the sentence. If the sentence doesn’t make sense, chooses another word until the correct word is found.
4. Reverse roles and continue until all the words are matched to corresponding sentences.
5. Peer evaluation

**Game 4: Students retell a story while sequencing sentences on a pocket chart.**

1. Place the pocket chart and scrambled event sentence strips at the center.
2. Working in pairs, students read the sentences and select the title strip. Place the title in the top pocket of the chart.
3. Select the sentence strip that tells about the first event in the story, reread the sentence, and place in the next row of the pocket chart.
4. Continue until all sentence strips are in sequential order.
5. Read the sentence strips in order.
6. Peer evaluation

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## Personas

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## Introduction

User Personas give insights into how software might be used by different groups of people. The goal for this user personas document is to give us insight into special needs of each user persona in order to make the “Music Game” as accessible as possible.

### Persona: Chad Arnett



“I wish learning to read music was fun”

Chad is 13 years old and has just started middle school. He is not the most popular kid in school but he does have a group of friends he generally hangs out with and eats lunch with. He is an A –B student and rarely gets in trouble (except for on rare occasions).

Chad is in band and is having trouble learning to read music for the first time. In order to help Chad in class his band instructor suggested that he play “Music Game” in his free time. Initially Chad’s feeling about “Music Game” is that it’s kind of silly for someone his age to be playing a elementary school level game to learn to read music, but after starting to play the game Chad becomes very competitive and wants to beat the online high scores. Chad improves his grade in band but still enjoys playing “Music Game”, and even tells some of his friends about it and asks them to try to beat his high score.

Not only has Chad had fun playing the game but he also has improved his ability to read music and without even knowing it has fined tuned his ear to recognize musical notes.

## Persona: Jacob Dunahoe

“I love music more than anything”



Jacob Dunahoe is nine years old and has Optic nerve atrophy from an accident he was in when he was very young. The optic nerve atrophy caused his vision to dim; he lost his ability to see fine detail and eventually lost his vision entirely.

Jacob does not let blindness stop him from being a normal kid. He does well in school, likes to read and loves music more than anything. He also has a seeing eye dog named “Butch” that doubles as his eyes and his best friend.

Jacob has decided that he wants to study music more in depth and eventually learn to play the guitar. One of his teachers suggested he play “Music Game” to tune his ear to music. Jacob started playing the game and was surprised to find out that the directions were read to him automatically, and menu items had audio feedback telling him what they are used for. Jacob played through the training and found that it was difficult to remember how each of the notes sounded. So after saving his progress he would return to the training section and play through it again paying special attention to the notes he had a hard time memorizing. Overall “Music Game” was a lot of fun for Jacob and he better tuned his ear to music, which enabled him to eventually learn to play guitar by ear.

## Persona: Diana Harris



“I just want to fit in with my friends”

Diana Harris is twelve years old. She is in 4<sup>th</sup> grade and is relatively popular at school. She has a stable home and generally fits in with most kids in her class.

Diana has been deaf since she was five years old. She has Alport Syndrome a genetic condition that is commonly known to cause deafness. Because Diana was not born deaf she can communicate verbally with friends and family but she is self-conscious about her voice, and feels like she is an outsider.

Diana's friends like to play video games a lot but Diana sometimes has a hard time following what is going on in the game because she can not hear the music or the dialogue. Some games even give instructions on how to play verbally and are impossible for her to play because she cannot hear the directions.

Diana also feels left out because her friends like to talk about their favorite musicians like the Jonas Brothers and Justin Bieber. She feels left out because she cannot listen to music and discuss it with her friends.

Some of Diana's friends were introduced to “Music Game” in their chorus class and were playing it at a sleepover party. Initially Diana just stood behind and watched them play thinking that it would not be possible for her to play the game but after watching her friends play Diana realized that the game is actually very accommodating to someone who is deaf. The game gives written directions for everything and has visual indicators of when the music starts so she is not taken by surprise when the game starts. It even gives visual feedback on how well she is doing in the game.

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## Requirements

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## Introduction

The requirements for “Music Game”(Name Pending)include accessibility/designand technical requirements for the design and production of the game.

## Accessibility / Design Requirements

The accessibility requirements are vital to making “Music Game” available to as large an audience as possible. Due to the closeness of accessibility and design requirements they are both included in this section.

### Directions/Help

Directions must be given at the beginning of the game in written form and in spoken form. Users must have the ability to skip over the spoken instructions by pressing the “Enter” button.

Directions must be given each time the gameplay is changed when the user graduates from easy to medium and medium to hard new directions should be given to let the user know that the way the game is played has changed for the current difficulty level.

Contextual help also must be available during game play in both written and spoken form. The user should have two ways of accessing this information one from the keyboard “F1” and the other by navigating through the interface. Once the user pauses the game they should be able to navigate to the directions/help section.

All directions and instructions on screen should have adjustable font sizes to accommodate users with low-vision.

Users should have the option to turn off the spoken instructions if desired. This can be done by using an icon on the user interface that toggles audio instructions on and off and by pressing a button on the keyboard “F5”.

### Menus

All menus must give audio feedback on focus. When the user navigates to a menu item there should be spoken feedback telling the user what the menu item does.

Audio feedback for menu options should be optional, it may become tiresome having to hear audio feedback for every menu item for sighted users. The “F2” key should toggle the menu voice over’s on and off.

Menus also must use written words and icons to indicate what they are used for, not only will this make it easier for everyone to use the menus but it also will make it easier for someone who is illiterate to play the game.

### Game Cues

Game Cues indicate that the user take an action. In the case of “Music Game” a game cue would indicate to the user that they should identify a note by pressing the right button on the keyboard.



In order to make the game accessible all game cues must give visual and auditory cues to the user. When the clef for the staff is identified it must be shown visually as well as spoken allowed for the user. When notes are identified visually they must also play the corresponding note. In order to make the game as competitive as possible notes will be visually displayed one at a time and the note will be played at the same time that the note is displayed on the screen.

### Game Feedback

Game feedback is essential to any game. It lets the user know that they have done something wrong and potentially even corrects their mistake to help them learn in the future. It also lets them know when they have done something correctly so they can learn that they have made the correct decision.

For the purposes of “Music Game” game feedback will be given both visually and auditorily, to make the game easy to play auditory feedback will be given not in words but with sounds to keep from confusing the user.

In easy levels the user will be corrected if they get the answer wrong both by visually showing the correct letter and by speaking the correct letter.

The second part of game feedback is timing feedback. Because the game is time sensitive the user needs to receive feedback on how much time they have left to finish the current task. This will be done visually by showing the amount of time left on the screen and auditorily by having a ticking sound that increases in speed as the users time decreases.

Users have the option to turn off the auditory feedback by using an icon on the user interface or by hitting a button on the keyboard “F6”.

### Game Settings

When any game setting is changed it must show the user visually and auditorily that the status of the particular setting has changed. For example if the user turns off background music by pressing the “F3” button the screen must show “Background Music Off” and there must be a voice over as well that speaks “Background Music Off”.

### Scores

Scores will be tracked during game play based on the users time efficiency and accuracy playing the game. Scores should be visible at all times as part of the user interface. To make it possible for someone who is blind to hear their scores spoken the users score should also be spoken when the user hits a button on the keyboard “F8”.

All scores will be stored online for viewers to access later. High scores can be announced auditorily if the user presses “F8” or visually if the user navigates to the high score section in the menu.

**Animation**

In order to make the game playable for someone who has epilepsy animations must be very limited and if there are any flashes they have to be limited to 3 flashes per a second.

## Technical Requirements

The technical requirements explain what will need to be available technically in order to develop the game.

### Platform

“Music Game” will be played on computers because computers are the most accessible platform available. The majority of people in the U.S. have a computer at home and users with disabilities have been able to set their personal computers up in a way to make them most functional for themselves.

“Music Game” should be playable on both PC and Mac computers to reach the largest possible audience.

### Voice Synthesizing

In order to create the richest experience possible for a blind user some form of voice synthesizing should be available. This can be done with a mixture of pre-recorded audio feedback and programmed voice synthesizers, as long as audio feedback is available for every aspect of the game.

### Controls

The game should be completely controlled and played with a standard QWERTY keyboard, and require no other special equipment in order to play. However if the player should choose to do so there should be in-game support for MIDI devices. Giving the user the ability to use a MIDI device will not only give the user a richer more interactive game experience but will also facilitate the user in the learning process of learning to read music.

### Database

A database is necessary to track scores and user information. This can be done with a MySQL database.

### Code

After reviewing the requirements for the game the best language available to meet the accessibility and technical requirements is Java. It has built in support for MIDI devices and built in voice synthesizing capabilities. Database connectivity to track scores is also possible with a Java applet so the game can track scores online.

Java is available for both PC and Mac and can even be ported to work on cell phones and game consoles making it very flexible in terms of platforms.

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## Music Game Concept

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## Introduction

“Music Game”(Name Pending) is an educational game that will teach players how to read music. The game should be educational and entertaining. It will be designed to be accessible to players with disabilities. The game will be developed with children in mind but should also be enjoyable for teens and adults to play.

## Game Overview

- An educational game that teaches the player to read music.
- A training level teaches the user to recognize notes both visually and auditorily.
- Several levels of difficulty allow users to advance. Levels start with training then easy, medium and hard levels. This provides an increasingly enriching game experience.
- Levels begin simply by providing one note at a time for the user to identify and then increase to asking the user to identify multiple notes and eventually entire songs.
- There is a limited amount of time for the user to identify the note, making the game more challenging to the player.
- Scores are based on the player's accuracy and speed identifying the note.
- Scores are tracked and saved online so users can compete with each other for the highest score.
- The game uses both visual and auditory feedback. This makes the game accessible to both blind and deaf players. It also makes the game more engaging for the average player.

## Goal

The player's goal in the game is to correctly identify notes as quickly as possible to increase their score. Scores will be tracked online in order to create competition and a social incentive to play the game.

## Challenges

The two primary challenges to the player will be accuracy and time efficiency. The player will be shown a music note to identify and then will have a limited amount of time to identify the note. The more quickly they identify the note the higher their score will be. If they do not identify the note correctly their score will be decreased.

## Interactions

### Controller Interactions

The player will interact with the game with a QWERTY keyboard or with a mixture of an optional MIDI Keyboard or device and a QWERTY keyboard. If using a QWERTY keyboard the user will be asked to identify the note using the letters (a,b,c,d,e,f,g). If the user is using a MIDI device they will have to hit the corresponding note on the MIDI device (c,d,e,f,g,a,b). To make the screen accessible to someone who is using a mouse all controls can also be accessed by clicking buttons on the screen with the mouse.

- Game play (a,b,c,d,e,f,g) indicates the notes the user is selecting
- “Caps Lock” pauses the game
- “Caps Lock” then navigation via arrows to the help section gives the user instructions on playing the game.
- “esc” exits the game
- “Enter” is used to make menu selections.
- “Mouse 1” is used to make user selections.
- “Space Bar” repeats audio cues in game
- “F1” Pauses game and gives directions
- “F2” Toggles voiceovers
- “F3” Toggles background music
- “F4” Toggles in-game audio feedback/audio cues
- “F5” Volume Up
- “F6” Volume Down
- “F7” Announces user’s score
- “F8” Announces high score
- “F10” Announces how many notes are correctly identified
- “F11” Credits
- “H” Gives hints in training mode

### Menus

Menus can be navigated in two ways the first is for the user to use the mouse to click on the appropriate menu option and the second is for the user to use the up and down arrow keys to navigate to their option then to hit the “enter” button to make a selection. All menus will give audio feedback on focus to allow blind players the ability to play the game.

- The main menu will give the user the option to select what level they would like to start playing at (training, easy, medium, hard), it also will give them the option to view high scores.
- If the user selects hard they will be given a choice of which song they would like to play
- The pause menu is the other menu that is available it will give the user the option to “return to the main menu”, “resume the game”, or access “directions”.

- If the user asks to return to the main menu or hits “esc” to exit the game they will be prompted to save their score if they are logged in their score will save automatically.

### Cues/Feedback

When given the note to identify users will be given cues in two ways both by visual and audio feedback. This not only provides a richer experience but it also gives users who are blind the ability to play the game.

When the user is given feedback on how well they did identifying the note they will be given both visual and audio feedback indicating if they identified the correct note in the time available.

Because the levels are timed users will have visual feedback on how much time is left to identify the note(s) as well as audio feedback. The visual feedback will be a count down for example “5, 4, 3, 2, 1”. For audio feedback a clock tick will play that ticks faster as time runs out.

## Levels

### Training

The training level is available in order to help new users play the game. It will show a note to the user and identify which note it is. It will then ask the user to hit the coordinating button on the input device and move on to the next note until it has went through all possible notes. Then it will show the user one random note at a time and ask them to identify it until the game has cycled through all of the notes. If the user fails to correctly identify the note correctly the training level will tell them what the correct note is.

- Will cover both treble and bass letter names.
- Is not timed.
- Does not track scores.

### Level 1 – 5 (easy)

Levels 1-6 ask used to identify one note at a time within the time period provided the time period changes as the user progresses through the game. Each level consists of 10 notes.

- Level 1 - 10 seconds (treble)
- Level 2 - 5 seconds (treble)
- Level 3 –10 seconds(bass)
- Level 4 - 5 seconds (bass)
- Level 5 - 10 seconds (treble & bass)



### Level 6 – 9 (medium)

In Levels 6 – 9 the way the game is played changes slightly. Players are asked to identify as many notes as possible during the provided time frame. The more notes they identify correctly the higher their score is.

- Level 6 - 30 seconds, (treble)
- Level 7 - 20 seconds, (treble)
- Level 8 - 30 seconds, (bass)
- Level 9 - 20 seconds, (bass)

### Level 10 (hard)

The game play for level 10 changes. The user will be shown all the notes for an entire song. There will be an indicator of some sort that tells the user when to hit the note, the user will be scored on their timing accuracy and the accuracy of identifying the correct note. If the user is more than a second late hitting the appropriate note then they will have points deducted from their score as if they entered the incorrect letter for that note. Multiple songs are available at level 10 and can be unlocked as the user reaches achievements such as high scores and beaten songs.

### Saving and Loading

Users will be given the option to signup/login to save their progress in the game (unlocked songs and scores). However login is not necessary to play if the user is not logged in when they are finished playing the game they will be asked to enter an alias name to save their score with, however they will not be able to access unlocked songs.

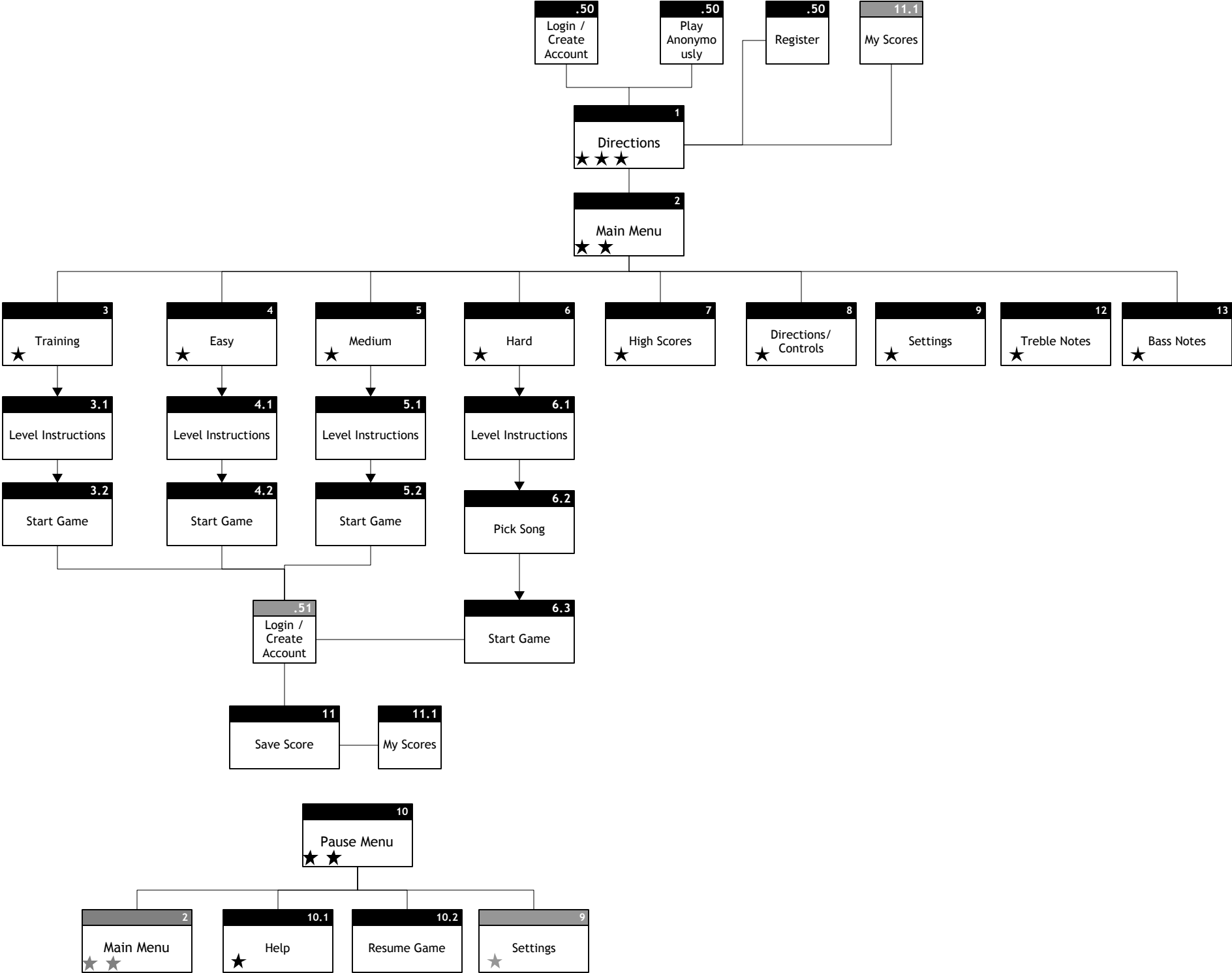
### Educational Value

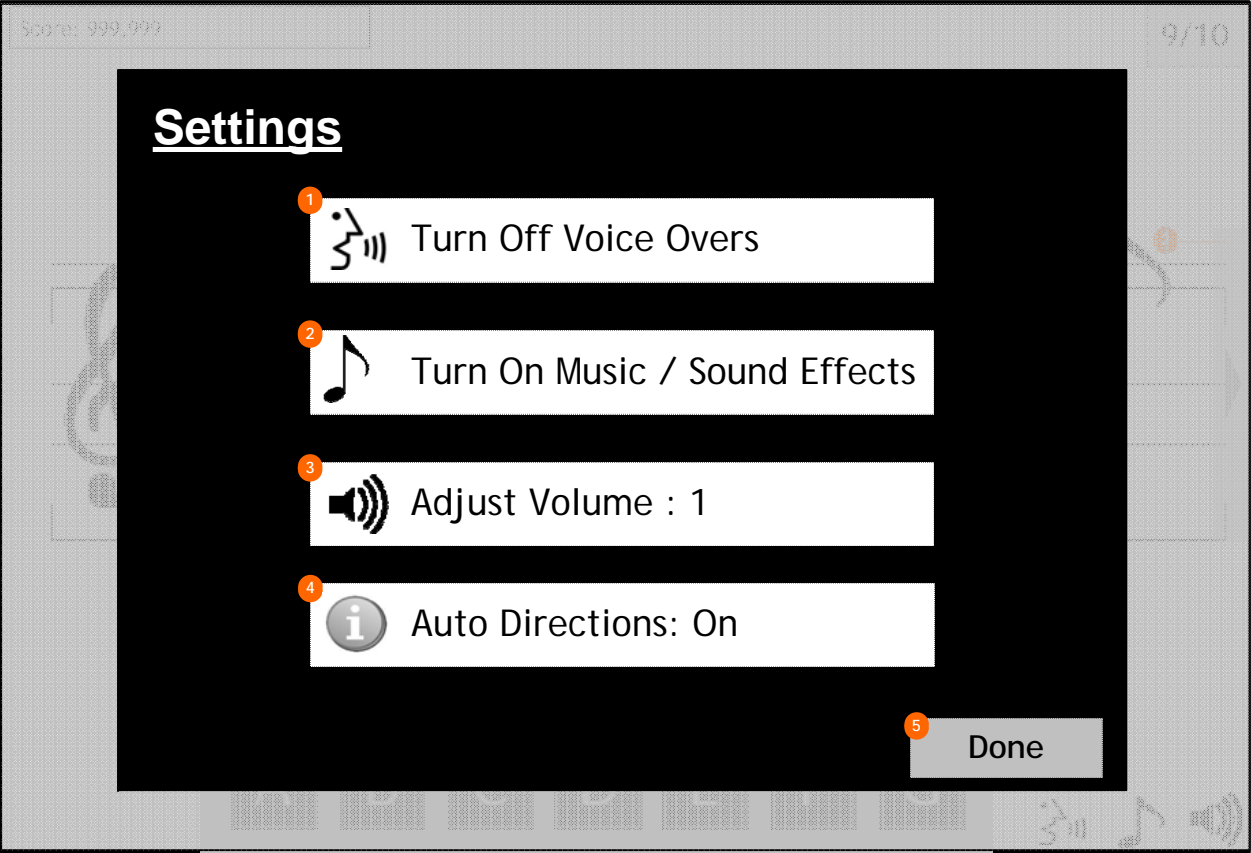
One of the best ways to learn something as complex as reading music is repetition. This game will give players an enjoyable way of repeatedly reading music in order to memorize music notes. Because it gives both visual and audio feedback it will also help someone learning music to fine tune their ear, and learn how notes sound.

### Target Audience

The target audience for the game is primarily children ages 8 – 12 who are interested in learning music. However a secondary audience can be someone of any age who wants to learn to read music. The game is accessible to users who are blind or deaf however the use of the game is not limited to users with disabilities.

# “Music Game” Menu Map





**Notes**

- \* All buttons listed in tab order
1. Allows users to turn off voice overs  
(audio feedback: “Turn off voiceovers” or “Turn on voiceovers”)
  2. Allows users to toggle music and sound effects.  
(audio feedback: “Turn on Music and sound effects” or “Turn off Music and Sound Effects”)
  3. Allows users to adjust volume  
(audio feedback: “Adjust volume: current volume”)
  4. This button lets the user change the settings so that directions are not automatically shown. (audio feedback: “Auto Directions:On”)
  5. Saves the settings and takes the user back to the previous screen  
(audio feedback: “Done”)

DATE	02.16.2011	AUTHOR	NP	VERSION	1.0	DWG NO.  <b>9</b>
TITLE	<b>Settings</b>					

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## Branding and Design

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## Introduction

This document contains Music Master branding, design comps and evaluations of the designs for color blind users.

## Logo Design





## Color blindness

To make sure Music Master is accessible to color blind users the design compositions have to be checked for their readability to color blind users to assure the game is functional for someone who is color blind. Below is a description of the three most prominent forms of colorblindness.

### Deuteranopia

Deuteranopia is a form of color blindness that presents in 1% of males. It is a rare form of color blindness. Someone who has Deuteranopia has trouble telling the difference between yellow, green and red.

[Source: Wikipedia](#)

### Protanope

Someone with protanope type color blindness cannot distinguish between colors in the green, yellow, and red spectrum and violets are indistinguishable from blues. Red, yellow and orange are not as bright to someone with protanope color blindness.

[Source: Wikipedia](#)

### Tritanopia

Tritanopia occurs in less than 1% of the population. Someone who has Tritanopia will not be able to distinguish between colors in the blue – yellow range.

[Source: Wikipedia](#)



## Design Comp: 2.0 Main Menu



## Deuteranope



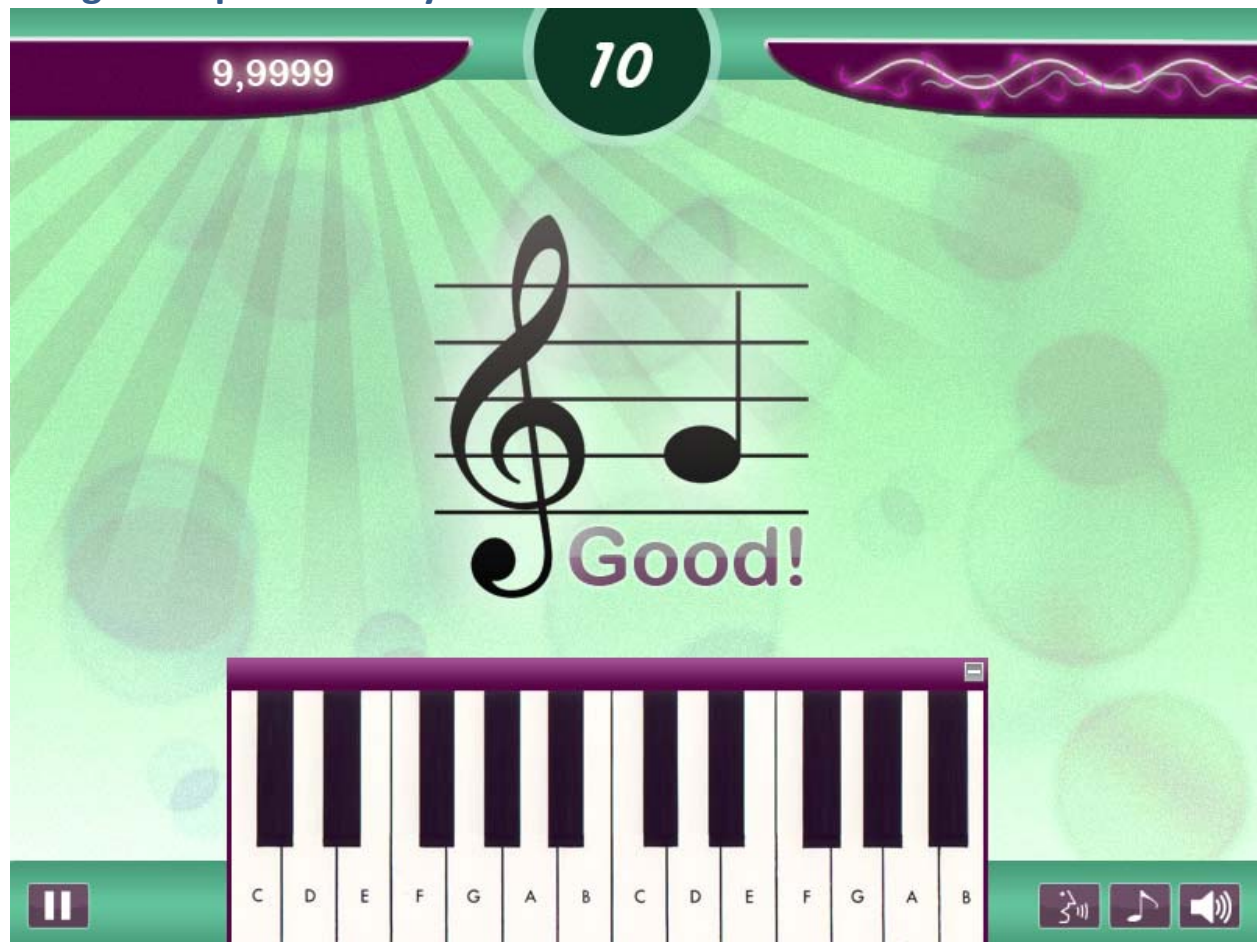
## Protanope



## Tritanope



## Design Comp: 4 & 5 Easy and Medium





## Deuteranope



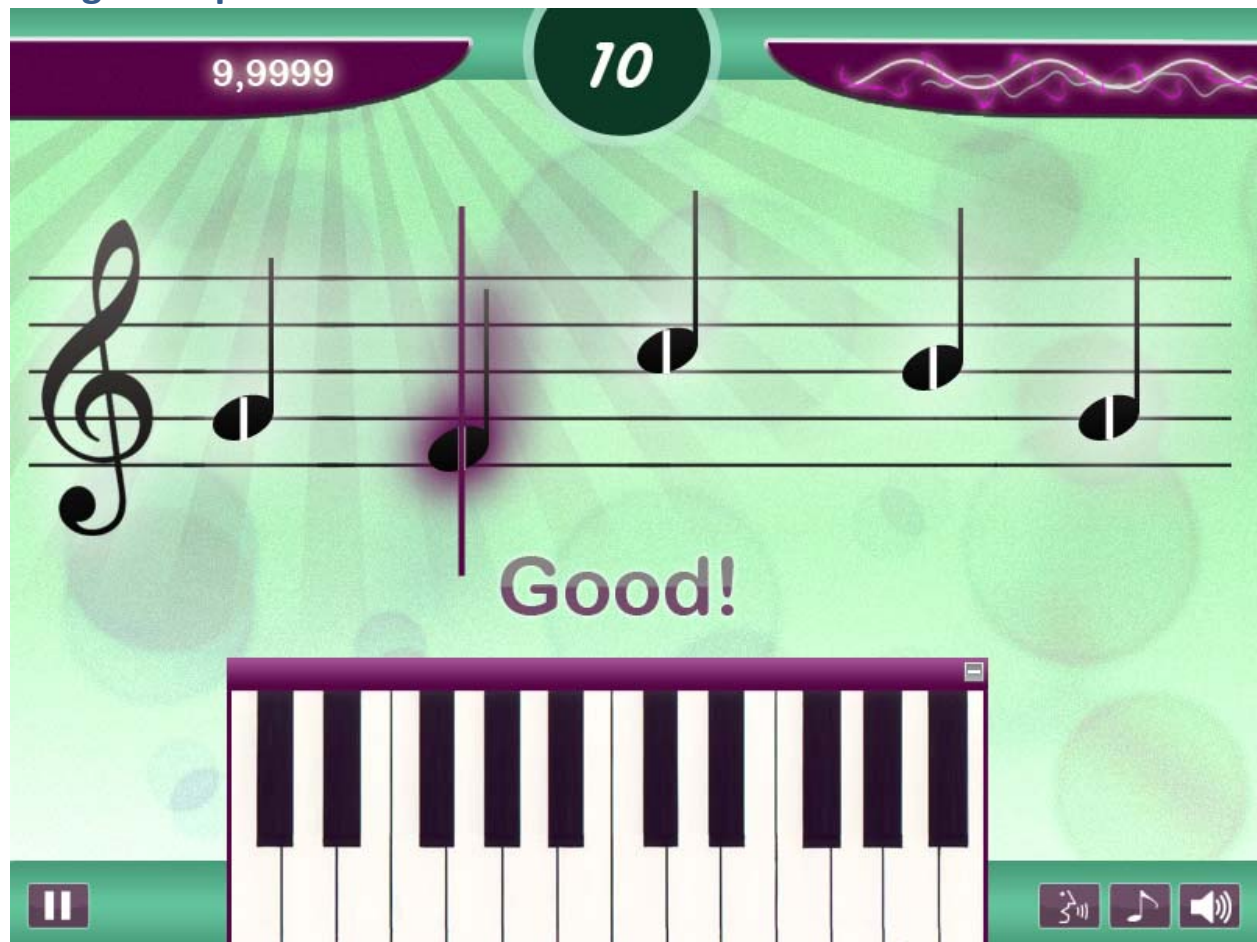
## Protanope



## Tritanope



## Design Comp: 6 Hard



## Deuteranope



## Protanope

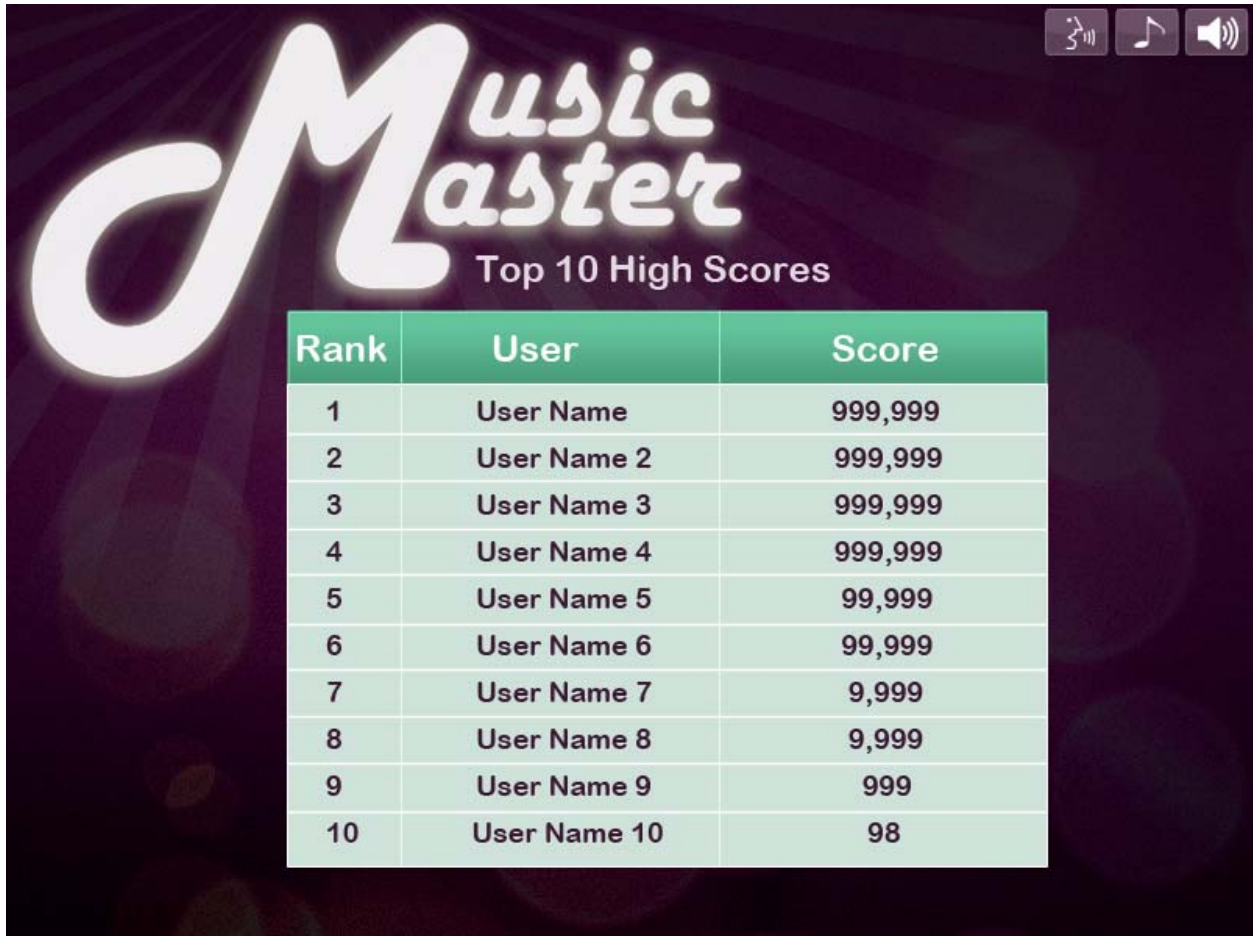




## Tritanope



## Design Comp: 7 High Scores



The image shows a game interface for "Music Master". The title "Music Master" is displayed in a large, stylized font, with the "M" being a large musical note. Below the title, the text "Top 10 High Scores" is visible. In the top right corner, there are three icons: a list icon, a musical note icon, and a speaker icon. The main content is a table showing the top 10 high scores.

Rank	User	Score
1	User Name	999,999
2	User Name 2	999,999
3	User Name 3	999,999
4	User Name 4	999,999
5	User Name 5	99,999
6	User Name 6	99,999
7	User Name 7	9,999
8	User Name 8	9,999
9	User Name 9	999
10	User Name 10	98

## Deuteranope



The image shows a 'Music Master' game interface for a Deuteranope. The title 'Music Master' is in a large, stylized font. Below it, the text 'Top 10 High Scores' is displayed. A table lists the top 10 scores. The table has three columns: Rank, User, and Score. The scores are: 1. User Name (999,999), 2. User Name 2 (999,999), 3. User Name 3 (999,999), 4. User Name 4 (999,999), 5. User Name 5 (99,999), 6. User Name 6 (99,999), 7. User Name 7 (9,999), 8. User Name 8 (9,999), 9. User Name 9 (999), 10. User Name 10 (98). The background is dark with a faint musical note pattern.

Rank	User	Score
1	User Name	999,999
2	User Name 2	999,999
3	User Name 3	999,999
4	User Name 4	999,999
5	User Name 5	99,999
6	User Name 6	99,999
7	User Name 7	9,999
8	User Name 8	9,999
9	User Name 9	999
10	User Name 10	98

## Protanope



The image shows a 'Music Master' game interface for a Protanope. The title 'Music Master' is in a large, stylized font. Below it, the text 'Top 10 High Scores' is displayed. A table lists the top 10 scores. The table has three columns: Rank, User, and Score. The scores are: 1. User Name (999,999), 2. User Name 2 (999,999), 3. User Name 3 (999,999), 4. User Name 4 (999,999), 5. User Name 5 (99,999), 6. User Name 6 (99,999), 7. User Name 7 (9,999), 8. User Name 8 (9,999), 9. User Name 9 (999), 10. User Name 10 (98). The background is dark with a faint musical note pattern.

Rank	User	Score
1	User Name	999,999
2	User Name 2	999,999
3	User Name 3	999,999
4	User Name 4	999,999
5	User Name 5	99,999
6	User Name 6	99,999
7	User Name 7	9,999
8	User Name 8	9,999
9	User Name 9	999
10	User Name 10	98

## Tritanope



**Music Master**  
Top 10 High Scores

Rank	User	Score
1	User Name	999,999
2	User Name 2	999,999
3	User Name 3	999,999
4	User Name 4	999,999
5	User Name 5	99,999
6	User Name 6	99,999
7	User Name 7	9,999
8	User Name 8	9,999
9	User Name 9	999
10	User Name 10	98