CSE 440: Context Inquiry

Project: Virtuoso

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Team Members

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Problem and Solution Overview

Musicians have been using iron sheet music stands that cannot be dissembled for a long time; there is no fun using that because musicians have to place the physical music sheets on the stand, and the pages will not flip themselves. There have been many products that try to digitize the sheet music, but few of them have a double-sized screen display or features that would allow more entertainment and flexibility. Our proposed solution is to design a virtual sheet music system, Virtuoso, which is a portable electronic device able to be unmounted. The device would have a camera for scanning the sheet music using OCR and a projector to project the interactive display on the music stand. The system will not only offer additional features to make practicing more convenient than before, it will also replace many of these tools, such as a pen, a metronome, and a tuner.

Contextual Inquiry Participants

To learn more about potential users of virtual sheet music, we met with friends that played instruments, as well as students at the music building on campus. We gained feedback on how musicians interact currently with their sheet music as well as their frustrations with the current implementation. We decided to sample users across a varying range of musical ability and involvement. Our solution targets three discrete audiences: people just starting to learn instruments, amateur musicians who play have music as a hobby, and expert musicians who are pursuing music in their studies or career.

Emily is music major at the University of Washington focusing on violin performance. She has studied violin for 14 years and has played in many groups including Bellevue Philharmonic, University Symphony, and Seattle Youth Symphony Orchestra. Besides large orchestras she sometimes gets asked to play small gigs like weddings or dinners. Like many violinists she also plays some piano on the side.

Garrett is an Electrical Engineering major at the University of Washington, and an amateur musician. He has played the piano for the last 12 years, and continues to play today. Apart from the piano, Garrett also performs in vocal choir, both in high school as well as at the UW. He is currently a member of the University Chorale and Chamber Singers group.

Rebecca is a Neurobiology and Psychology major at the University of Washington. She plays flute and piano (though currently, she doesn't play the flute), having taken lessons in both while also having played in her middle school band, done auditions, and played in

competitions. Rebecca has been playing piano about three years. Though she doesn't currently play in any professional capacity, she plays piano casually at home for a few hours every week.

Contextual Inquiry Results

The three participants we interviewed offered us a good amount of knowledge on how musicians interact with sheet music. According to our observations and analysis of the data we collected, we found our participants share some common attributes. First of all, they are all students at University of Washington. Second, they all have at least two-year experiences in practicing music, and actually two of them have been playing instruments more than a decade. The third common attribute we identified from them is they all use binders and folders to keep and organize their music sheets.

Participants also reported different difficulties in interacting with sheet music and storing them. Two more mature musicians thought page flipping is quite a pain for playing piano, and usually they made most mistakes on the page-turning section. However, violinists might rely on their memories more so that turning a page may not be an issue for them. Also, those two found it is unpleasant to have a bunch of music sheets carried out since they were heavy, and they tended to make their folders unorganized when they got more and more music pieces. Both of the experienced players travel with their sheet music binders. On the other side, the relatively new player did not find page flipping as an issue, but she would like to have a convenient way to easily go back and forth between pages. The player keeps her music pieces very organized at home and she rarely brings them outside.

It is concluded that the future design of Virtuoso should at least take three factors into account: how experienced the musician or player is, what instrument he/she plays, and how often he/she carries the sheet music around.

Participant 1: Emily

Emily carries her sheet music in her violin case, which is usually the only thing she carries with her to rehearse. She consistently rehearses with multiple groups, and plays a couple pieces at a time with each. She also has solo repertoire that she keeps. Along with her current music, Emily's case is also overflowing with music she has performed recently and will likely not touch again. She keeps an archive of old music over the years at home, and when she gets a chance, she moves all her music that she is done with to her archive. Her archive is not very organized because it would take too long to go through and order the music, but she usually does not need to go back and look at old pieces.

Page turning for Emily is usually not an issue. Solo violin music is typically performed from memory, and while practicing, she usually does not run through the entire piece. Ensemble music is played with music, but the page turns are usually placed during rests so musicians do not have to stop playing to turn the page. She did mention that playing piano is a completely different story though. Piano performers often require page turners to stand by

and turn the page when necessary.

Emily does not usually carry a music stand with her. Most rehearsal facilities have music stands prepared, and the music halls where she performs are also equipped with stands. Sometimes when she plays wedding, she must bring her own stand. The weight of all the music she carries around definitely makes her case heavier, but she says she has gotten used to it. She mentions the device could be very useful for traveling or freelance musicians.

When getting a new piece, Emily tends not to listen to a recording of it beforehand. It is more useful to play through a piece first before listening to it to understand how the piece is structured. Soloists can usually figure out how the piece sounds by themselves. Music playback is useful mostly for ensemble work because ensembles can have trouble fitting their pieces together.

Participant 2: Garrett

Garrett carries all his sheet music in a binder, which he takes with him to chorale practice and also while playing the piano. He goes through a large amount of sheet music every quarter and has to reorganize his binder constantly. Garrett doesn't collect all his sheet music; instead he selects only a few to keep. He would like to keep all his music, but doesn't have the space to keep it nor the time to organize a collection.

Page turning is the main source of frustration for Garrett when he plays the piano. He does admit that this could be remedied through hours of practice, but doesn't have the time. The main issue stems from the fact that one hand needs to be used to turn a page, while playing the piano requires two hands. An experienced piano player will be able to do this quickly and seamlessly, but for intermediate players this is troublesome. More often than not, mistakes are made in the page turn sections.

Participant 3: Rebecca

Like Garrett, Rebecca also stores the majority of her sheet music in binders or folders, except for the occasional printed copies of music she has (either from band or a collection of music). Most of hers are printed from online sources and stored in these binders, and well-organized in categories so that she can search through fairly easily. Because she plays at home, however, she doesn't transport these outside her house, instead keeping some near the piano.

For Rebecca, page turning isn't much of an issue--usually, she simply stops for a few seconds while turning the page, then continues (unless she's memorized the song, in which case she doesn't use the sheet music). However, for her, being able to manually turn the page to easily go back and forth in a piece is important.

With regards to the idea of electronic sheet music, she notes that it would save a lot on printing, though it would have to be able to be placed on a music stand. When asked about

having a feature for playing back a particular song, she says that since the music she plays is mostly popular (recent, or well-known classics) it should be easy to find and helpful, though she also mentions that because recordings are usually a performer's interpretation of the piece, it would be difficult to know what the 'standard' recording should be. Rebecca also adds that being able to search a database for sheet music would be great.

Existing and New tasks

Major Features of Virtuoso

- Scan in physical music sheets and store them as digitized sheets
- Automatic page flipping, and if the feature is turned off, users can tab to flip
- Quick page selecting (e.g., a slider, thumbnails, etc.)
- Play-back feature
- Synchronization with other Virtuoso devices
- Database of and store for electronic sheet music

Tasks

Task One (Easy)

Eric (the persona) is a student at the University of Washington, and he has just started learning the piano. He is currently trying to learn a new piece, Ode to Joy, by Beethoven. Since he doesn't have much experience, his practice sessions consist of reading the sheet music a few notes at a time, then hitting the correct keys on the piano. He starts off by starting his virtual sheet music device, and selecting the Beethoven piece. The first two pages have gone well, and now it's time to flip. He plays the last few notes on page two, and then quickly flips the page on the device. The flow continues, uninterrupted by the need to turn the page.

This scenario is common to most people learning how to play an instrument. There are numerous things to keep track of while playing an instrument and it can be daunting to the inexperienced. The hassle of turning the page along with trying to remember which notes to play can be overwhelming and frustrating. The last thing a novice wants is to manipulate the sheet music while learning the instrument.

Task Two (Moderate)

Heather (the persona) has a physical music piece on paper, but it is not reserved in online library. So she would have to scan it and practice. Heather wants to hear a specific part of the music, so she highlights the specific part of the music and uses "play-back" feature.

Heather is an intermediate violin player at the University of Washington. She pursues the

violin in her free time, and also a member of the UW Symphony Orchestra. She is learning a new piece, which her orchestra will be playing as part of a concert, and she needs to practice her sections. The sheet music is in the form of physical paper, but she wants to access it both at the music building and at home without having to carry it around. Heather is able to accomplish this by putting the sheets on the virtual sheet music device, which then scans it and saves a digital copy.

Heather wants to refine her technique in a couple particular sections of the piece. One of the best ways to practice is to observe the best and try to emulate them. Heather simply highlights the sections she wants to practice, and chooses the playback feature. The notes are played back with the correct pitch and rhythm, allowing Heather to understand how she is supposed to play the sections.

Musicians like Heather benefit from an efficient way to practice their instrument. Many people play the instrument as part of a school group or just as an extracurricular activity, so they don't have all day to devote to practice. The ability to listen to the way a section of music is supposed to sound allows the musician to quickly hone their skills in a reasonable amount of time.

Task Three (Difficult)

Steve (the persona) plays in a Beatles Revival band, and he needs to sync his device with his three other band members so that he can hear what his music would sound like with the others. Steve and his high school friends recently started jamming on the weekends. None of the band members have been playing music for long, but their love of The Beatles keeps them together. Steve, the back vocalist of the group, is perplexed about one particular section of the song "Eight Days a Week." He is not sure how to sing his harmony with the lead vocalist. He has heard his part before but is never able to sing it when listening to the full recording. The band decides to use the Virtual Sheet Music System to solve this problem.
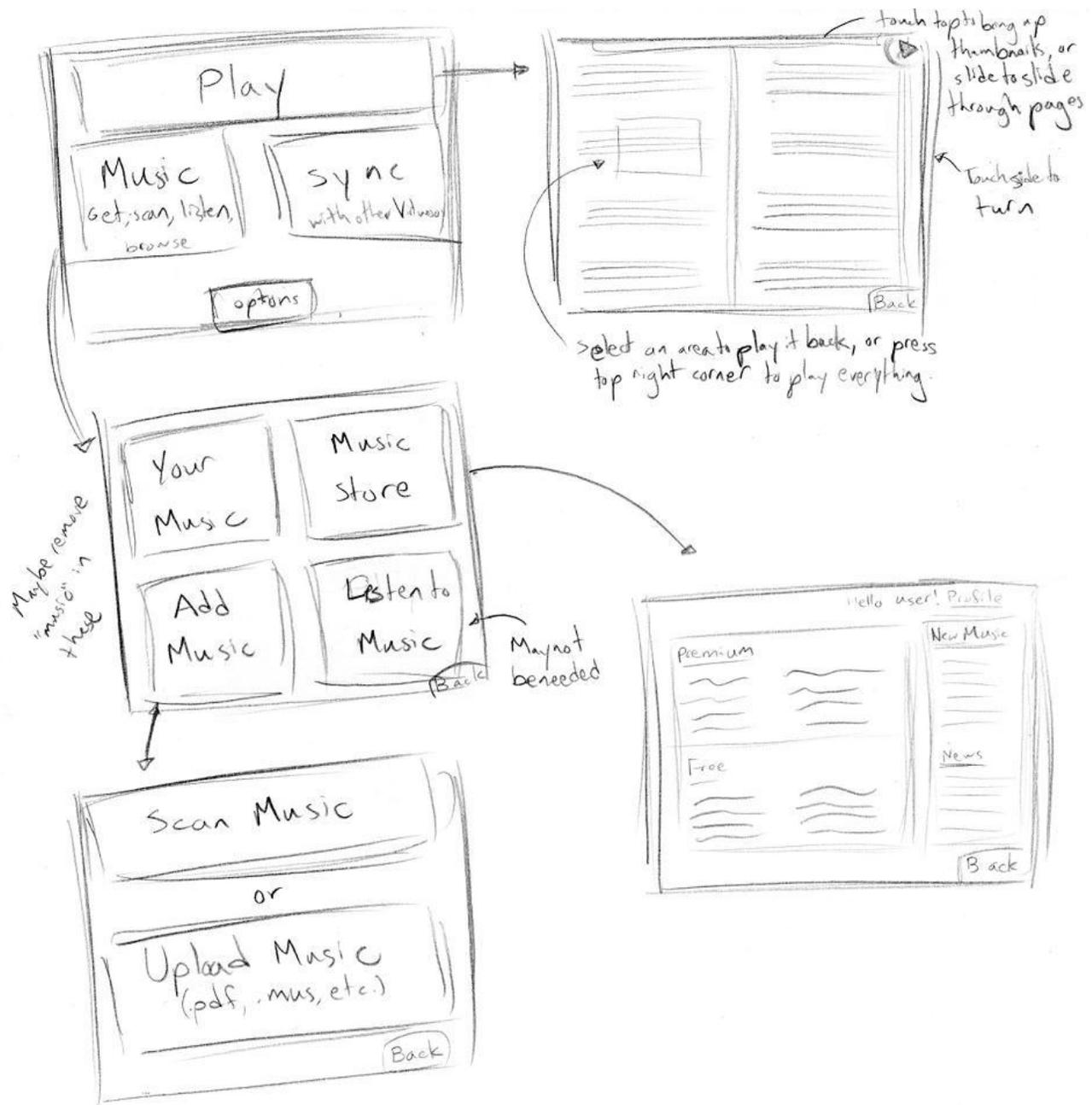
All band members start up their Virtual Sheet Music stands, sync their devices, and pull up the "Eight Days a Week" song. Steve taps the corresponding part in the song, mutes all the non-vocal parts, and hits play. After one listening, Steve is still not confident, so he taps the beginning of that phrase and hits play again. After listening a couple times, Steve understands how the part should sound.

Group playback is useful for ensembles. Ensembles can usually figure out how the complex parts interweave with each other, but everyone occasionally needs to look closely at tricky sections. Group playback allows nearby synced devices to play at the same time, allowing musicians to easily figure out how the piece fits together. Parts can be muted during playback to allow the more important parts to be focused on.

Additional Sketches of Design

This design involves a traditional music stand, except there is a touchscreen display where you would normally keep the physical sheet music. Interaction would be more streamlined with a touchscreen and there would be a wealth of features allowed by the embedded system.

Play

Music
Get, scan, listen, browse

Sync
with other Virtuosos

options

touch top to bring up thumbnails, or slide to slide through pages

Touch side to turn

Back

select an area to play it back, or press top right corner to play everything.

Your Music

Music Store

Add Music

Listen to Music

Back

Maybe remove "music" in these

May not be needed

Scan Music

or

Upload Music (pdf, .mus, etc.)

Back

Hello user! Profile

Premium

New Music

Free

News

Back

This design involves having a touchscreen on a device, like others. (Hopefully with small additions for a USB cord/charger, a textured/grip back so it won't slip on a piano or music stand, etc.) It focuses on making playing sheet music a focal point and extremely easy, while making other tasks as painless as possible. Ideally, this would be a fairly simple interface, with a minimalist but pleasing look to it, fitting for the visual style of sheet music.
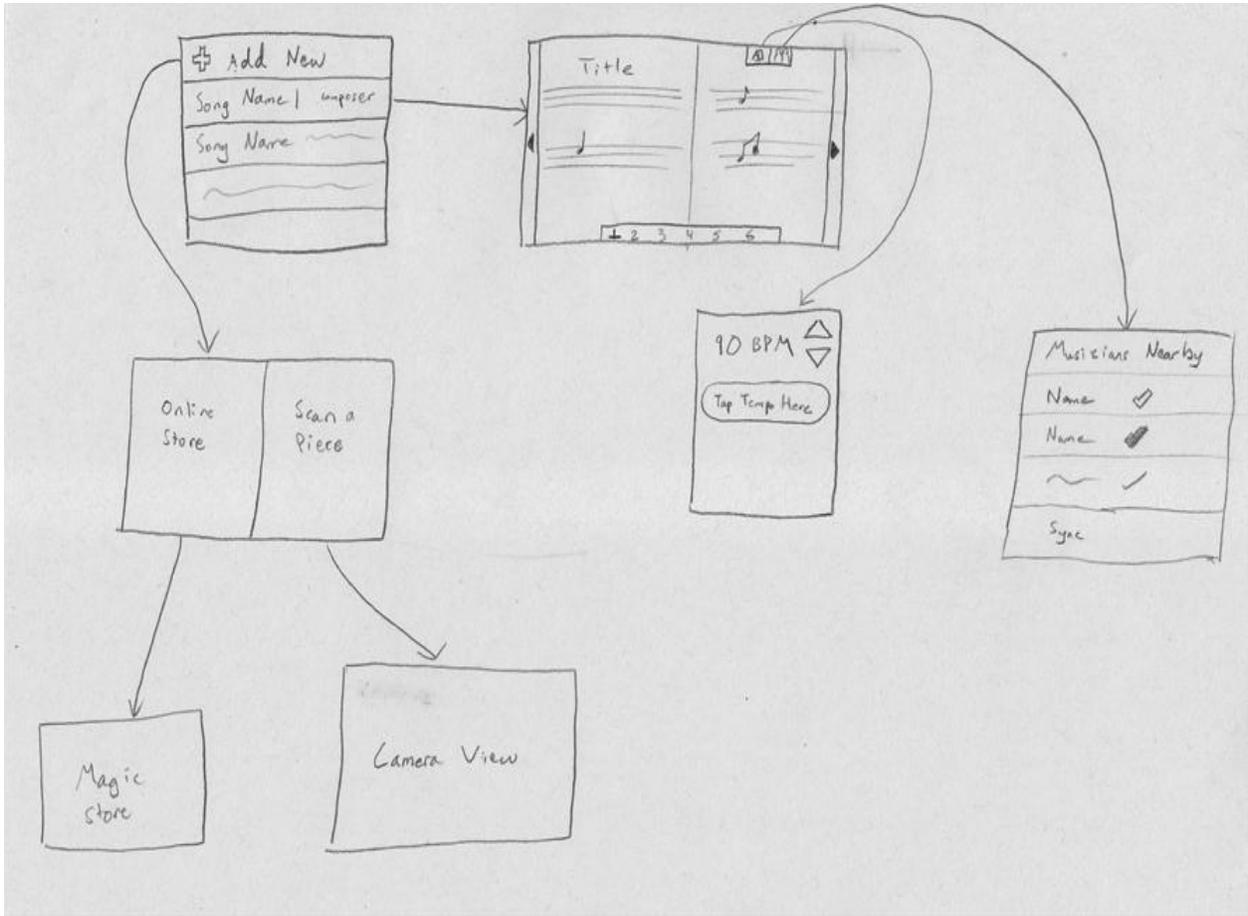
This sketch starts the user in the music library and makes going to an existing piece very easy. Tapping a song goes straight to the sheet music view. In this view, tapping anywhere on the page brings up a playback mini-menu asks if the user wants to hear how the part goes (either by himself or with other nearby users). Any dragging on the page assumes the user is writing notes. With the included stylus, the thin end represents writing and the thick end represents erasing. Tapping on the left or right side of the music turns the page forward or backward. The options for metronome or syncing are located at the top right of the music - these lead to submenus that overlay on top of the sheet music. Adding new music is a separate option in the music menu which leads to a separate screen allowing users to choose whether to browse online or scan a piece themselves.

1.

Welcome to Virtuoso

- SOLO.
- DUET
- BAND
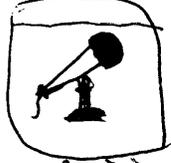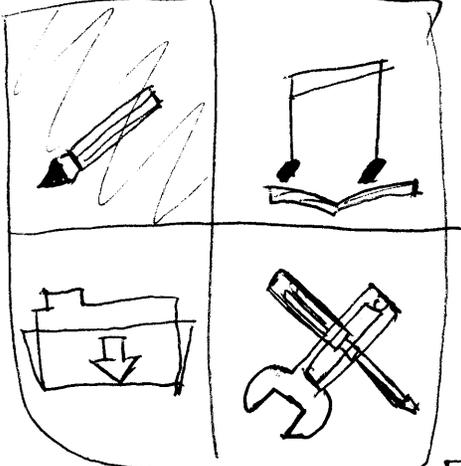- ORCHESTRA

2.

My Band

Hi, Kelly!

? Sync
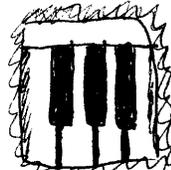
- Kelly
- Steve
- Alex
- Nathan
- Darivanh
- Aijia

◀▶

3.

Compose   Library

?

Downloads Settings

◀ ▶

4.

Compose

?

- By Myself
- Multiple Composers

◀▶

5.

Chat

- Steve
- Aijia
- Nathan
- Alex

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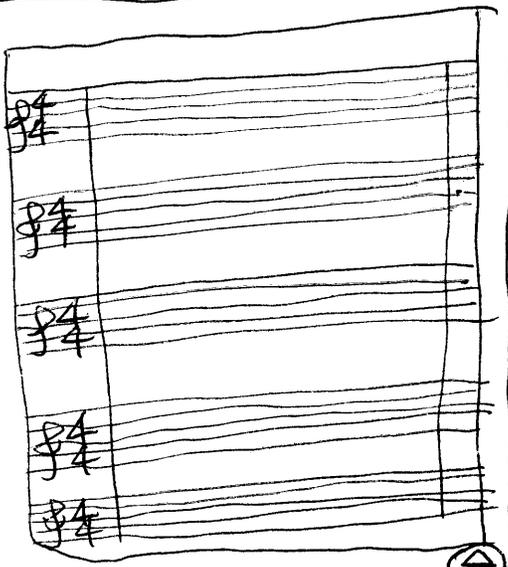
1 — Welcome to Virtuoso

- SOLO
- DUET
- BAND
- ORCHESTRA

2 — Compose Library
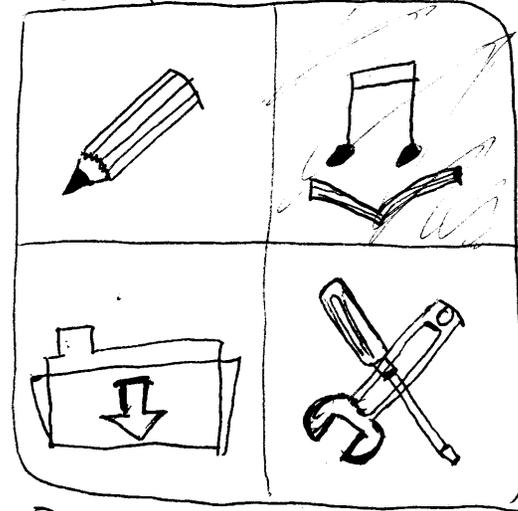
Downloads Settings

[?]

3 — Your Library

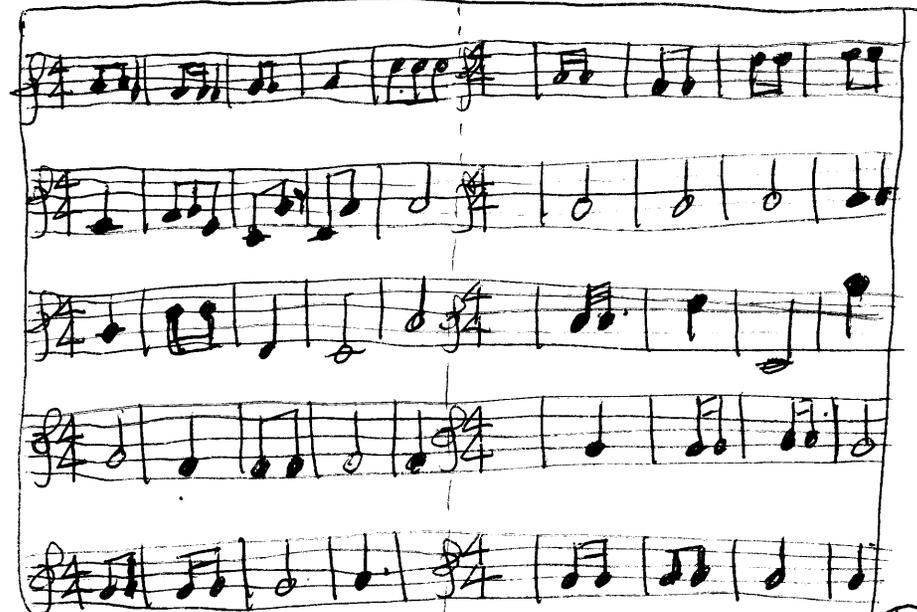| Musian	Music
1	My Love. pdf
2	Fall. pdf
3	Cherry Blossms pdf
4	No. 2. pdf
5	1812. pdf

Upload

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4

Those two sketches are based on the idea that users of Virtuoso would have four modes to select: Solo, Duet, Band, and Orchestra. Based on the different mode, different features will be available. For example, if a user selects "Band," the features of "Sync" with your band and compose/correct music together would be available. The user can also chat with the members of the band online.