

Music Manager

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Abstract

The goal of this project is to create an interface that allows a user to store and manage music on their machine. Users will be able to create play lists, favorite certain songs, and sort songs by the artist, or the song name. Our goal with this project is to make a simple version of music applications like Spotify or iTunes, for people who don't like using their current music player application.

1. Introduction

Music is an everyday part of life, and many people go everyday without even thinking about the luxury that we have in the modern era, being able to listen to what we want, wherever we want to. Following this, there are many many platforms that one can use to access music. We aim to reproduce one such platform, creating an interface that allows someone to add music of their choosing, organize it, and play it.

Providing people with more options is never a bad thing. Even if there are only a few things that differentiate one software from another, there are always going to be users looking for new experiences. We would like to be able to appeal to as wide an audience as possible, people who have problems with the existing flaws in other software, which are ignored or put off of being fixed by developers. Helping those people find a new place where they feel they can store their favorite songs can make a large difference, especially because music can be a very valuable, memorable resource for some people.

1.1. Background

Over the course of this proposal, we will use the term Metadata, and in this case, it's really just a technical term for basic music information. It pertains to things like album art, release date, track/song length, genre, artist, and the songs title.

We decided on a project like this because music is something that is easy to make connections between. Thankfully, The two of us had common ground in a genre that we used to listen to, but even if we didn't, it would be easy to come together to work on a project like this. It originally sprouted as an idea for an audio waveform visualizer, the flashing bars/lights that you'll see with music videos, that correspond to the beat of the song, or the lyrics. Neither of us have looked into what it takes to make those, and some further consideration led us to decide that it would be better to take a step back and just make a music management interface.

Andrew has run into problems with CDs on iTunes, so we hope to be able to implement a way transfer music from the manager to the CD, allowing the manager to effectively use and read CDs.

Kyle's main music application is Apple Music , and he has some issues with listening queue management, for example, shuffling a play list, and then adding it to the end of the list of what is currently being listened to, which is not possible in the application. If we could work the capability into this project, it may become an alternative listening application for him as well.

1.2. Impacts

There are many music managing systems on the internet, and we would like to see if we can create something worth telling others about, so that they can use as well. We want to add some functionality that gives us a chance to stand out, making it easier to reach even just a few people, and give them another place to handle the songs that they hold dear. It doesn't take much to brighten someone's day, and hopefully with this project we can manage to do that for a handful of people.

1.3. Challenges

Many of the troubles we were expecting to face when it came to distinguishing between files turned out to not be an issue. The file dialog that we were using came with previously implemented filtering methods, which prevented the user from choosing any files that we didn't want, and eliminated the source of our file concerns. Tying those files together so that an image file is associated with music file was also very easy to do with the arrays that we were working with, and would have been even simpler with a different storage method, like a list, which we were thankful for. Finally, unfortunately we were unable to spare the time and resources to create the waveform visualizer, but that's not really all too much to be

worried about, since it was kind of a far off goal before we even started actual programming. We also considered trying to tie the manager to a database, but we realized that it would take up a large chunk of time to get functioning properly, and may have ended up preventing the user from adding any custom songs or songs that they made themselves, which wasn't something that we wanted.

2. Scope

Our project will be completed when we have an interface that allows the user to add songs of their choosing, modify their metadata, add those songs to play lists and edit those play lists freely and easily, search for songs within their database, and sort them by given data types, like artist, genre, and song title

We have some ideas for stretch goals. One of them would be implementing the previously mentioned audio waveform visualizer. Along with this, being able to easily export your play lists or songs to various different platforms would be very handy. Lastly, we would love to be able to implement a system that allows the user to upload images for artwork that will display when a song is playing, be it album art, or an image that will act as the cover of a given play list, allowing for more user customization.

2.1. Requirements

To decide on the requirements for our project, the two of us sat down and discussed the basics of what we needed to consider the application to be acceptable. Making a play list, adding and removing songs, and implementing a listening queue are a few examples. They are signified by having a priority of 1 in the use case table (See Table 1). Afterwards, we talked about what we thought we be useful or unique features to try and include, which are signified by 2's and 3's in the table, depending on how important including them was.

2.1.1. Functional.

- Store songs that are currently being played, and are queued to play
- Keep track of previously played songs for accessibility later
- Display current song being played, as well as associated artwork
- Hold songs that are being played for storage across listening sessions
- Give access to specific metadata, like genre or song name, allowing user to make changes
- Allow for customization of user created play lists
- Prevent duplication of music in library
- Import/export songs from CD
- Adhere to copyright laws, recognizing proper credit to musicians

2.1.2. Non-Functional.

- When user adds, removes, reorders songs, update the list and storage methods quickly and accurately
- Prevent user from selecting songs that aren't .mp3 or .wav files, and images that aren't .jpg or .png files
- Ensure that songs and data are easily accessible and understandable to the user, through effective use of application interface

2.2. Use Cases

Use Case index can be seen in Table 1.

Use Case Number: 1

Use Case Name: Add song to queue

Description: User selects a song that they wish to play next. They will click on a plus button that appears when hovering over the song. This will add the song to the bottom of the list.

- 1) User selects song that they want to play next
- 2) After selecting song, plus button appears on song bar
- 3) User presses button, adds song to queue

Termination Outcome: Selected song will be played next

(see Figure 2)

Use Case Number: 2

Use Case Name: Add music to manager

Use Case ID	Use Case Name	Primary Actor	Complexity	Priority
1	Add song to queue	Listener	Med	1
2	Add new song to manager	Listener	Hard	1
3	Add album art	Listener	Med	2
4	Play from CD	Listener	Hard	3
5	Change volume	Listener	Med	1
6	Modify data	Listener	Easy	2
7	Remove song	Listener	Med	2
8	Play play list	Listener	Easy	1
9	Save play list	Listener	Med	1
10	Edit play list	Listener	Med	1
11	Display album art	Listener	Med	1

TABLE 1. USE CASE INDEX

Description: Menu bar at top of screen will have a file button. User presses button, and asks user what they would like to add. User selects song, asks for file name of song that will be added. If file can be found, and is an accepted file type, it will be added to the manager.

- 1) User presses File button on menu bar
- 2) Drop down menu appears, allows user to click on Add Song...
- 3) User enters song file that they want to add
- 4) If file is appropriate formatting, song is added to manager

Termination Outcome: New song is present in management library

Alternatively:

- 1) User presses File button on menu bar
- 2) Drop down menu appears, allows user to click Add Song...
- 3) User enters song file that they want to add
- 4) Song is already in library
- 5) Song is prevented from being added
- 6) (OPTIONAL: Sends user to song in library once prevention occurs)

Termination Outcome: Duplication of song(s) prevented

(see Figure 3)

Use Case Number: 3

Use Case Name: Add album art

Description: When looking at an album or play list, displays a button that will allow the user to select an image to upload. Once selected, image will be used as art for the given album/play list.

- 1) User opens album or play list
- 2) User presses button at top corner of album art area
- 3) Menu appears that allows user to modify item
- 4) User selects Add Image...
- 5) User enters image name that they would like
- 6) If file is appropriate formatting, art is replaced

Termination Outcome: Previous album art is replaced with new art

(see Figure 3)

Use Case Number: 4

Use Case Name: Play from CD

Description: Menu bar at top of screen will have a device button, clicking on it allows user to select a CD to play music from, or send music to.

- 1) User presses Device button on menu bar
- 2) Drop down menu appears
- 3) User selects Import from CD
- 4) Music on CD is loaded into manager

Termination Outcome: Music present on CD is now loaded into user's library

(See Figure 4)

Use Case Number: 5

Use Case Name: Change volume

Description: Volume buttons displayed beneath play section (Possibly replace with volume slider/better display). User presses + button to increment volume up by one, and - button to decrement volume by one, to an upper and lower limit respectfully.

1) User presses plus button next to speaker image
Termination Outcome: Volume increases by one increment
Alternatively:
1) User presses minus button next to speaker image
Termination Outcome: Volume decreases by one increment
(See Figure 5)

Use Case Number: 6
Use Case Name: Modify Data
Description: Allows user to change metadata tied to the selected song, giving the ability to change things like song genre or song name
1) User right clicks song that they would like to modify
2) Information about song is displayed in boxes
3) User can manually enter information that would not affect copyright
4) User can then save changes to song
Termination Outcome: Song information is changed to what the user would like

Use Case Number: 7
Use Case Name: Remove Song
Description: Allows user to remove a song from the manager, and updates the manager accordingly
1) User selects song that they would like to delete
2) User clicks the delete button
3) Song is removed from song list
4) Display is updated so that the song no longer appears
Termination Outcome: Song is removed from list and song display

Use Case Number: 8
Use Case Name: Play play list
Description: User selects the play list that that they would like to play. The songs are then loaded and played
1) User clicks load play list
2) User selects play all
3) Manager will play all songs in play list, transitioning between songs automatically
Termination Outcome: Play list is loaded, and user can play the songs in it

Use Case Number: 9
Use Case Name: Save play list
Description: Allows user to save songs in list as a play list, which can be loaded and played later
1) User loads songs into song list, in order they want in the play list
2) User clicks Save Playlist
Termination Outcome: Songs loaded are saved as a play list for later listening

Use Case Number: 10
Use Case Name: Edit play list
Description: User can change the order of songs, add songs, or remove songs to the selected play list
1) User selects play list to load
2) Play list is loaded
3) User presses edit play list button
4) User can then change song order, remove songs, or add songs
Termination Outcome: Play list is updated with the user's changes

Use Case Number: 11
Use Case Name: Display Album Art
Description: Songs that have corresponding art will display the art when played
1) User selects song to be played
2) User presses play button
3) Art tied to song is displayed while song is selected
Termination Outcome: Art for chosen song is displayed on screen

2.3. Interface Mockups

Included below are some basic ideas for what the user will see in the program. Starting off, we have how the current interface looks, with theme options on the right, a section in the middle containing the song art, progress bar, labels for

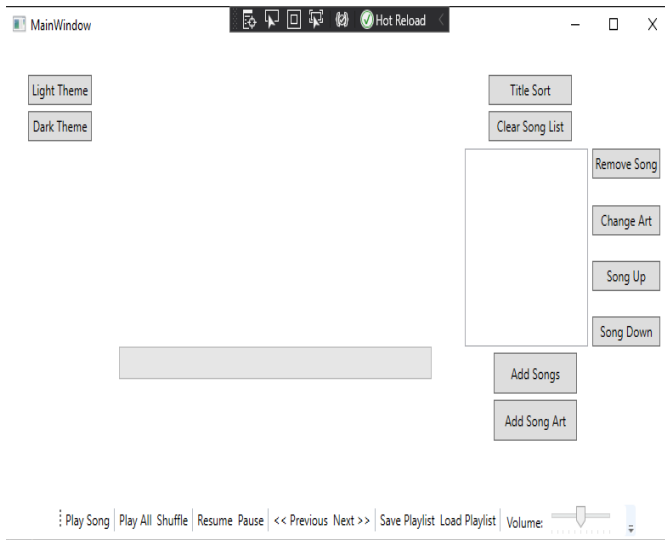


Figure 1. Current interface, themes on one side, song list and buttons on the other, with toolbar at the bottom

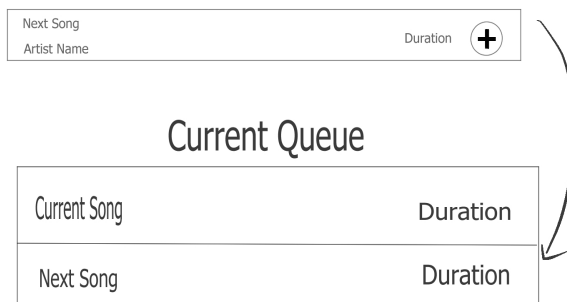


Figure 2. Use Case 1, Adding song to queue, When hovering over a song, a plus button appears, pressing the button will add the song to the top of the song list, to be played next

the current and total play times, a toolbar at the bottom, and the song list with some accompanying buttons on the right side. (See Figure 1). Following those are plans for how certain user interaction will look. First is adding a song to the song queue (See Figure 2 which would be accessed by hovering over a song. Next, we have a mock up of how the user would add a song to the manager (See Figure 3), by pressing a file button, giving the user the choice to add songs. The next figure is an idea of what it may look like when the user wants to tie an image to a song (See Figure 3), a small button will appear that will open the file explorer when clicked, where the user can select an image to link to a song. After, we have a mock up of what the menu for interacting with a CD or other outside device may look like (See Figure 4), which would function in a similar manner to the file drop down box, but with options specific to outside devices. The last figure shows an option for volume control (See Figure 5), where there will be simple plus and minus buttons that would adjust the volume by specific increments until a minimum or maximum is reached.

3. Project Timeline

Below is a projected time line of when we would like to have features implemented into the program, sticking to this should keep us working effectively, with enough time for any difficulties we may run into.

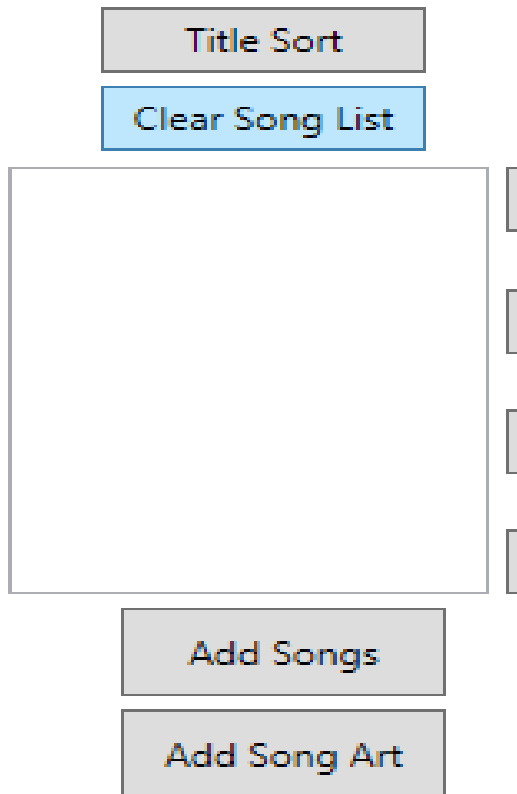


Figure 3. Use Case 2, Use Case 3, Two buttons, one allows user to select songs to add, the other to select art for the songs

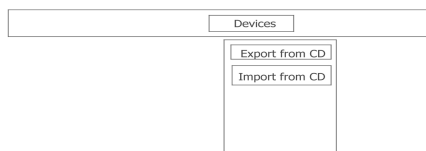


Figure 4. Use Case 4, Interacting with CD, Device button on menu bar, clicking it opens drop down menu with 2 buttons, one for importing songs into the library from a CD, and the other for exporting songs to the CD from the library

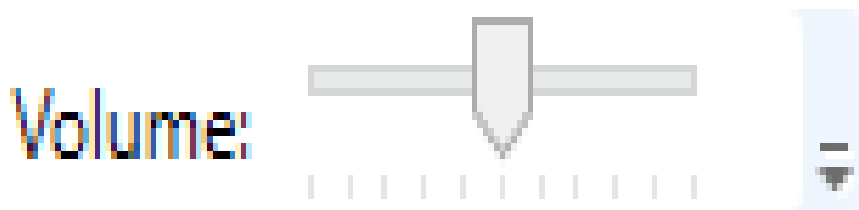


Figure 5. Use Case 5, Volume slider allows user to change volume in a quick and easy manner

- 1) Project topic decided - January 30, 2021
- 2) Project proposal draft due - February 1, 2021
- 3) First project proposal update due - February 12, 2021
- 4) UML of project created - March 10, 2021
- 5) Second project proposal update due - March 19, 2021
- 6) Create usable song class - March 25, 2021
- 7) test song class - March 30, 2021
- 8) Create working album class - April 4, 2021
- 9) Create working play list class - April 9, 2021
- 10) Create and test file, volume, pause/play buttons - April 14, 2021
- 11) Create working queue class - April 19, 2021
- 12) Create and test navigation and skip buttons - April 24, 2021
- 13) Project ready to be demonstrated - April 29, 2021

4. Project Structure

The manager will be designed to keep things as simple as possible, which is both useful for the users, and easier on us for programming.

For example, we ended up opting for always having the song list displayed, instead of only having it displayed when a certain button is pressed. This makes things easier for the user to keep track of, and for us to keep track of when testing.

Along with that, all of the control still comes through the use of buttons, but not everything comes from buttons, like getting a progress bar for the song that is currently playing, with the current play time and total song length displayed on opposite sides, and changing volume using a slider.

We removed the song list, album, and play lists classes, because there wasn't enough of a difference between the three to justify having them. Instead, the song names, locations, and user selected album art are all stored in their own arrays. This keeps things simple, and prevents unnecessary work. Now, When the user wants to create a play list, the current song list is saved to a selected location, and can be loaded later.

The database idea was put aside, mostly because the database we were planning on using is very large, which would prove inconvenient for users with storage space issues, and likely take a toll on operation time. On top of that, querying the database for songs whenever they are added means that any songs that the user themselves has made, are more than likely not going to be found within the data base, which would lead to some conflicts with sorting methods. To get around this, we have allowed the user to sort the song list by titles, and also have provided buttons to manually move the songs around the list, which makes the application more accessible.

4.1. UML Outline

The UML for the music manager turned out to present a decent number of challenges. Since the program ended up being primarily controlled by buttons and built in functionality, it was kind of difficult to effectively translate into a UML diagram. Below, the UML is split into 3 figures, (see Figures 6, 7, 8). Starting out is the button outline, which describes the main functions of the program, controlled by buttons. We were nervous about the outcome of this UML, since it is not like any other UMLs that we've made, with no special classes or implementations, just button functions. As a result, it looks different from any previous outlines, which took some time to come to terms with.

4.2. Design Patterns Used

We decided to utilize two simple design patterns: and abstract factory pattern, and a decorator pattern (See Figures 7, and 8, respectively). It would have been nice to try and use some more specific patterns, or ones that we had not practiced much, but it was difficult to work them into our project in a way that was useful, and couldn't just be implemented in a different, easier way. Even then, there were definitely other ways we could have gone about achieving the results of the patterns we used.

The abstract factory pattern (See Figure 7) provides basic light and dark themes, creating the grid background, toolbar, and song label items in the respective theme forms. We chose to use this pattern to make themes because it makes sense to have some theme options with an application like this. There are many more theme options that we could have made, or can still add later, but we settled on light and dark themes for the time being to prevent the GUI from getting too crowded.

The second pattern we used was a decorator pattern (see Figure 8), which adds some more capability to the label that displays the name of the currently playing song. Normally the label would just show the user the name of the song, and updates as songs are changed. Using the decorator pattern, we added the ability to click the song label, which would change

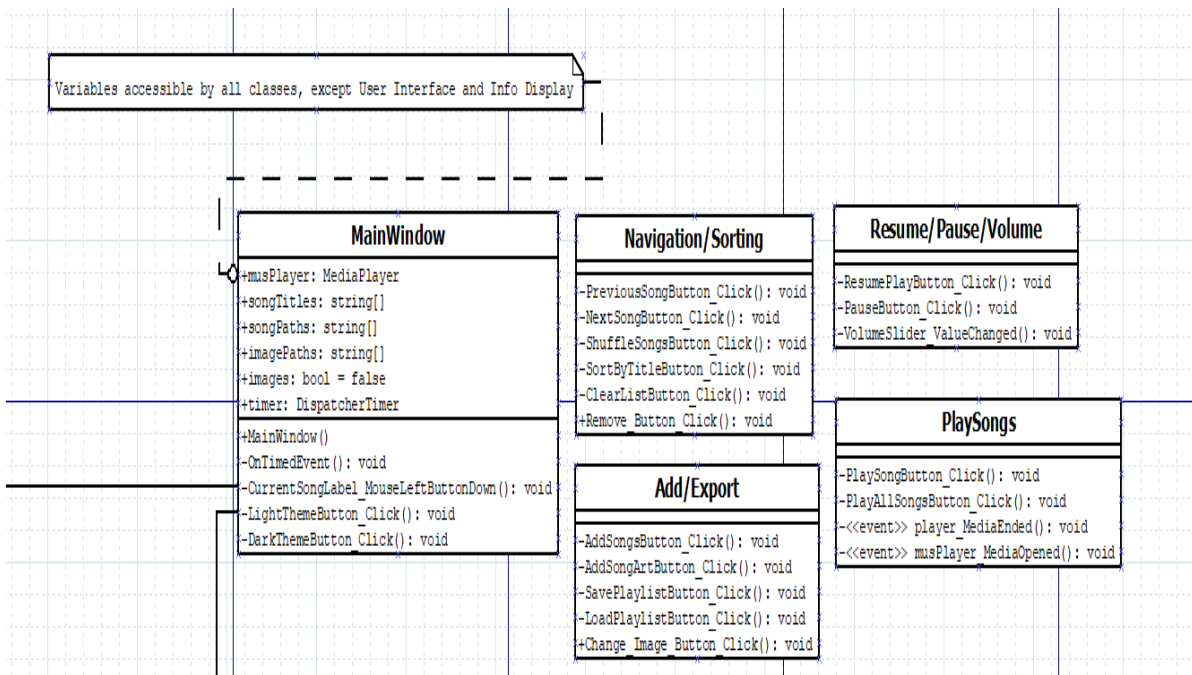


Figure 6. UML outline of button implementations in project

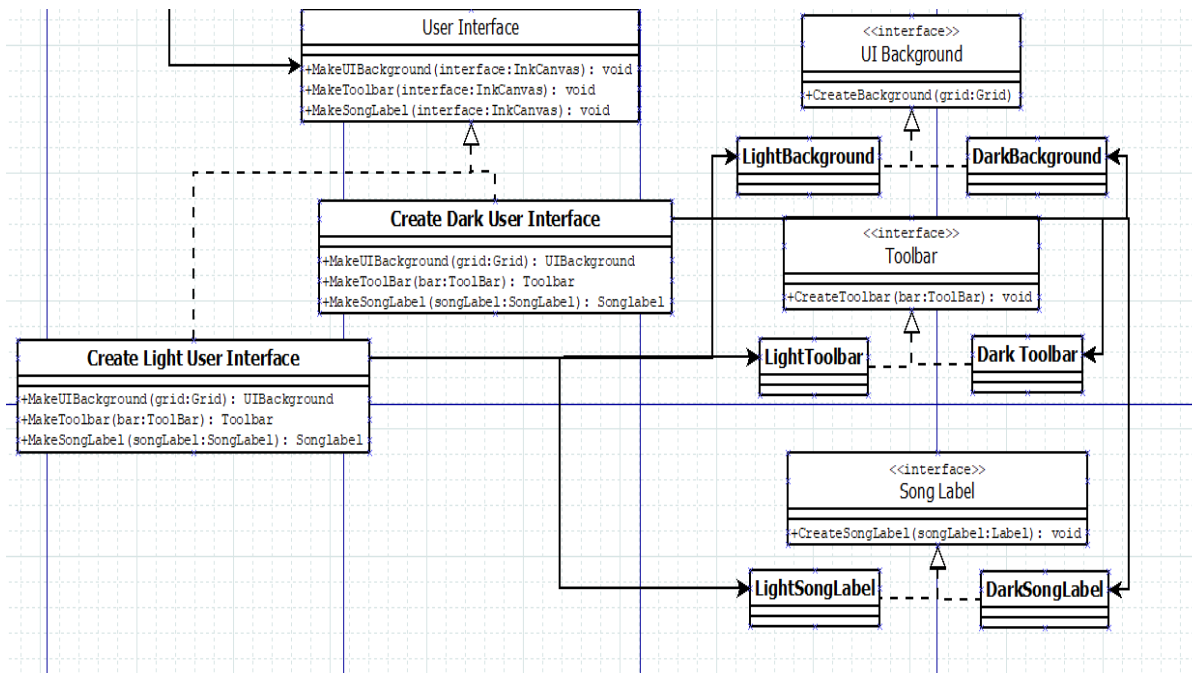


Figure 7. UML outline of the abstract factory pattern used for light and dark themes

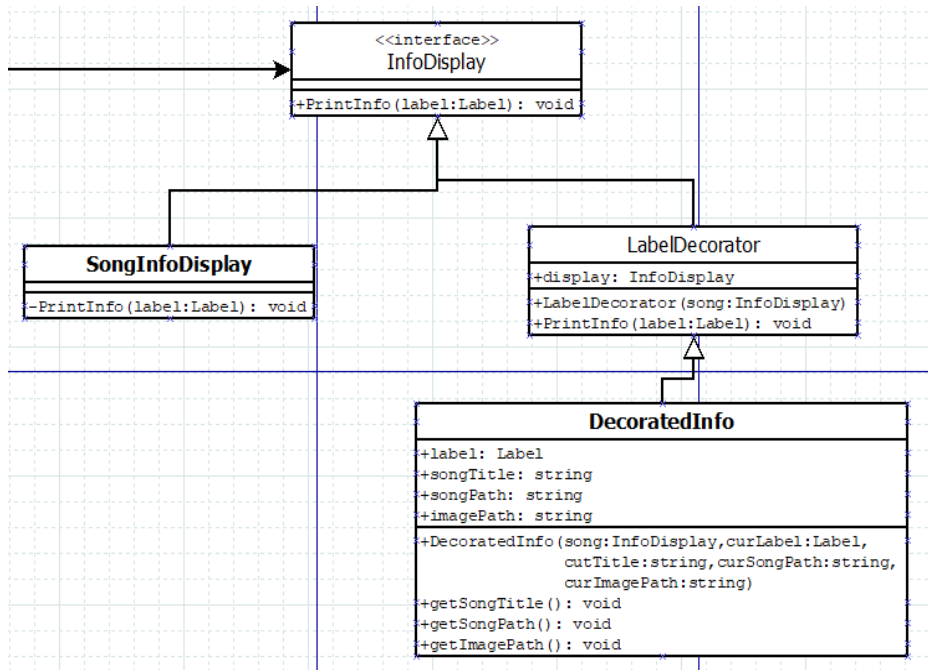


Figure 8. UML outline of decorator pattern used to give song label more properties

it from displaying the current song name, to displaying the song name, song path, and corresponding image path on the user's device. We thought this would be a useful way to implement the pattern, and it took the place of our original idea of playing a snippet of the song when the user selected it in the list. When trying to implement the original idea, we could not get the song to play for a set amount of time in an efficient manner. Along with this, after selecting a song and playing the snippet, the program would prevent the user from pressing any other buttons, which effectively rendered the application useless, so we chose to opt for the new label decorator instead.

5. Results

Looking back on our ideas for the project when we were first brainstorming, we made some pretty lofty goals, and some of them were out of the scope of the time that we had, and the capabilities of Visual Studio. For example, we wanted to be able to save the last song listened to, and the time that was left in the song, so that the user could pick back up at the same place after closing the application, but this didn't seem easily accomplished within our work space, so we had to give up on the idea. Similarly, exporting music to a CD would require burning the CD, which ends up being a large stretch for the bounds of this project. All things considered, however, we did manage to get a lot of our use cases functioning, and meet most of our goals. We gave the user the ability to load multiple songs into the manager, save them out as a play list. Then can then load in those play lists, make changes and save it again. The user can tie images to the songs all at one time, or change individual song images. They can then select a song and remove it, or move it up or down in the song list until they're satisfied. They can move to the next song or previous song, shuffle them, remove one song at a time, or clear the whole song list. Lastly, any art chosen for a song will always be displayed when the song is playing, which makes things less cluttered on the user interface, compared to the user selecting a song and choosing if they want to display the art.

5.1. Future Work

Unfortunately, the project will most likely not be making it's way out into the world, at least not anymore than it already is. It was a great way to practice what we've learned this semester, and to learn more about the capabilities of Visual Studio and WPF, but the project really doesn't put our best foot forward at this point, and doesn't have enough functionality that sets it apart from anything else that is already available. The manager may look good on a resume if either of us takes it further, and continues to work on it, but with the problems that we had finding time to work on it within the scope of this class, which gave us ample opportunity, it's unlikely that we'll have the free time to see it through to what we originally had hoped.