trackstudio

A recording and mixing web application

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GUI Programming II
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Goal statement

Our goal is to create a simplified sound recording application that works in modern web browsers through the Web Audio API. We will differentiate our application by presenting the user with "creative constraints". This will help them focus on their music rather than the technicalities associated with other sound recording applications. We will achieve this by not including visual waveforms and limiting the amount of recordable tracks to four, reducing the interface and indirectly setting a goal for the artist.

Target audience

Our target audience consists of musicians and songwriters, of both genders ages 13 and older, who like to record demos or music without having to download software. The user must have access to a modern web browser and a microphone. Our target audience is able to navigate a website and is familiar with how knobs, buttons, and sliders function. Users do not necessarily have prior sound recording experience, as a tutorial is provided.

Commented [CDL1]: The user must have access to a modern web browser, a microphone, be able to navigate a website, is familiar with knobs, buttons, and sliders. Users do not necessarily have need prior sound recording experience, as a tutorial is provided.

Features

Not-logged-in and logged-in users

The application will be able to manage two levels of users: not-logged-in and logged-in. The application user types are described in Table 1.

Table 1: User account differences

User type	Description	Functionality
Not-logged-in	A user is by default a not-logged-in user. A not-logged-in user is unknown to the application and in turn will receive a limited set of functionality.	• Able to register • Sign in • Mixer access • Create new work
Logged-in	A logged-in user is known to the application. They will have the functionality of a not-logged-in user plus seven additional functionalities. To become a logged-in user, a not- logged-in user will need to register once with the application or log in if they have registered in the past.	• Functionality of an not- logged-in user • Storage space • Save new work • Clone saved work • Open saved work • Export saved work • Inspect saved work

Commented [CDL2]: Ability

Tutorial

Due to the inexperience a user might have with technology found in our application, a user will have the option of going through a tutorial. This tutorial will be accessible to all users at any time from the menu. This menu option, though initially hidden, will be presented to a logged-in user through their first logged-in session. A logged-in user will experience a greeting during this session that will give them an option to run the tutorial. If a user chooses to not participate, they will exit and they will not be prompted again during future sessions. The tutorials scope will be the interface, application usage, and how to manage work.

Recorder/mixer

The recorder/mixer is the heart of the application, containing the four mono tracks and one stereo master track that a user will be interacting with. A proposed recorder/mixer layout is presented in Figure 1.

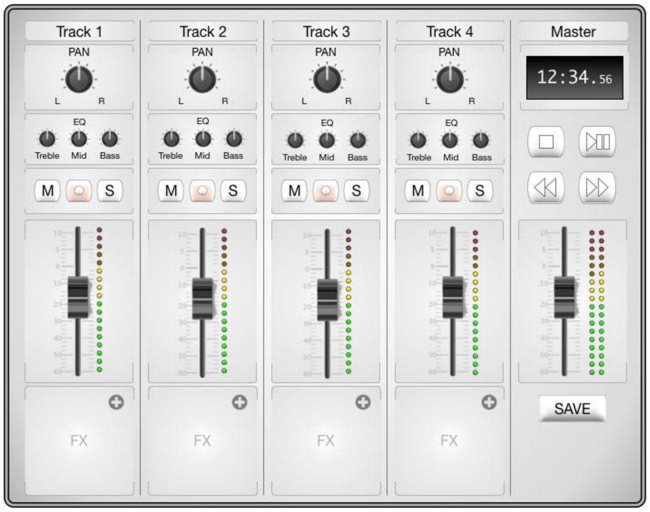


Figure 1: Proposed recorder/mixer layout

Each mono track, labeled as Tracks 1 - 4 in Figure 1, contain components described in

Table 2.

Table 2: Mono track components

Table 2: Mono track ***components*** *(continued)*

Component name	Label	Quantity	Description
Track title	Track #	1	Can be modified by the user
Panning knob	PAN	1	Adjusts the stereo location of the track
Equalization knobs	EQ	3	Adjusts the amplitude of treble, mid, and bass frequency ranges
Mute button	M	1	Silences the track
Record button	○	1	Engages the recording sequence on the track
Solo button	S	1	Silences all other tracks
Fader slider		1	Adjusts the volume of the track
Volume indicator		1	Audio peak indicator
Effects Slot	FX	1	Container that can be occupied by an effect from the FX catalog

The stereo master track, labeled as Master in Figure 1, contains the components described in

Table 3.

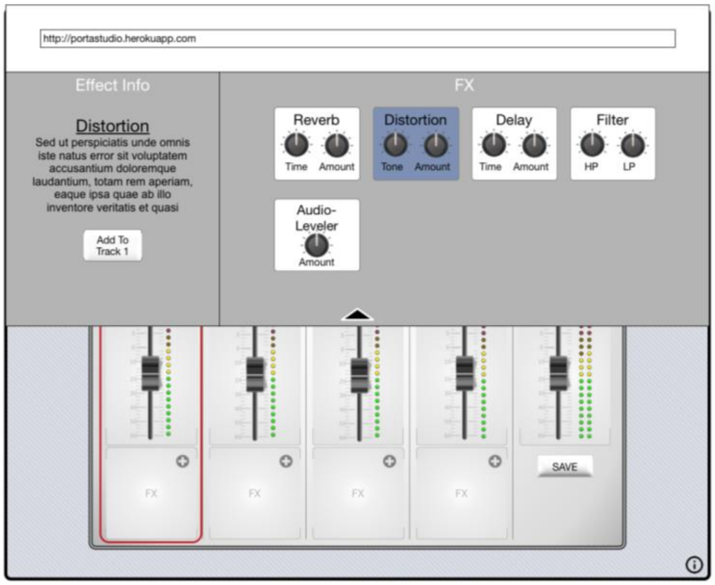
Table 3: Stereo master track components

Table 3: Stereo master track ***components*** *(continued)*

Component name	Label	Quantity	Description
Master title	Master	1	Cannot be modified by the user
Location indicator		1	Indicates position in song using the format: Minutes: Seconds. Milliseconds
Stop button	■	1	Stops the selected track
Play/pause button	►‖	1	Plays the selected track
Rewind button	◄◄	1	Rewinds the selected track
Fast forward button	►►	1	Fast forwards the selected track
Fader slider		1	Controls the sum of all four mono tracks
Volume indicator		2	Audio peak indicator. There is one each for the left and right audio channels.
Save button	SAVE	1	Allows a user to save their mix

FX catalog

The user will be able to use an effects catalog, named FX catalog, to choose effects for each of their tracks. These effects will be self-contained modules, as all controls that are needed to modify the effect will be present on the module's graphical interface. The proposed FX catalog is presented in Figure 2.



http://portastudio.herokuapp.com

Distortion

Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam rem aperiam, eaque ipsa quae ab illo inventore veritatis et quasi

Figure 2: FX catalog

The user interface for the effects catalog is split into two panes. The left pane will hold the description of that effect as well as a selection button. The right pane will hold a list of effects, described in

Table 4.

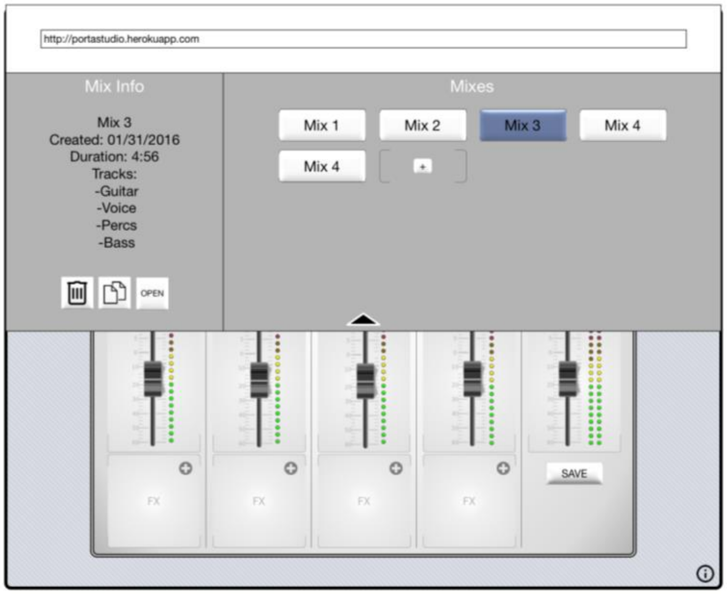
Table 4: List of effects

Table 4: List of ***effects*** *(continued)*

Effect name	**Description**	**Example usage**
Reverb	Reflects the input signal until it decays	To simulate space or room
Distortion	Alters the input signal in the harmonic (tone, timbre) domain	Simulate the sound of a rock guitar
Delay	Holds an input signal to an audio storage medium, and then plays it back after a period of time	To create the sound of a repeating, decaying echo
Filter	Remove sections of the audio frequency spectrum	To muffle sounds
Audio-Leveler	Reduces the volume level of an input signal if it exceeds a certain value	Automatic volume control

Mix menu

A logged-in-user user who would like to manage their work will do so in the Mix menu. This menu will be their storage space interface and will allow an logged-in user to inspect, create, delete, clone, open, and export work. The layout of the Mix menu as depicted in Figure 3 will be similar to that of the FX catalog in Figure 2. The Mix menu will be split into two panes, the left pane will display information about the selected work and have buttons for the actions that can be performed on them. The right pane will hold a list of all saved work, as well as a create button for new work.



http://portastudio.herokuapp.com

Mix Info

Mix 3
Created: 01/31/2016
Duration: 4:56
Tracks:
-Guitar
-Voice
-Percs
-Bass

Figure 3: Mix menu

Future features

If the application is complete and time allows, we will implement the additional features listed in Table 5.

Table 5: Future features list

Feature title	Description
Export	Will allow logged-in users to export saved or ongoing work directly to music sharing applications, such as SoundCloud
Sign up expansion	Will allow not-logged-in and logged-in users to register and sign in respectively with external website OAuth methods, such as those provided by Twitter, Facebook, and Google

Components

Most of the components that we will implement exist in some form and will be developed using the external component dependency list found in Table 6 that will be integrated into our project.

Table 6: Dependency list

Name	**Usage**
AngularJS	JavaScript client side framework
Bootstrap	CSS framework, to keep our project responsive across devices
Express	Server framework
jQuery	Keeps our work clean and readable
MongoDB	User account data storage
NodeJS	Server side JavaScript engine
Web Audio API	Handles sound processing

Foreseeable issues

Development

Experience

Not everyone has experience with music recording equipment and this became apparent during our first scrum meeting. Inexperienced developers will therefore need to put more effort in to learn about the application concepts, such as signal flow, before actually integrating components.

MEAN Stack

From the default Jade examples given in the textbook, we have learned how to extend templates with partial templates, but we have not learned how to include partials as sub-components of larger templates. This is crucial in developing our larger components without having to include redundant files and code.

Web Audio API

Experience

Web Audio API is new to all of the developers and getting started with the API is going to be a challenge. Thankfully there are tutorials (http://code.tutsplus.com/tutorials/the-web-audio-api-what-is-it--cms-23735) and documentation available (https://developer.mozilla.org/en-US/docs/Web/API/Web_Audio_API).

Browser compatibility

The API will also give us difficulty due to its browser compatibility, due specifically to microphone access. Users will only be able to use one of the browsers listed in Table 7.

Table 7: Compatible browsers

Browser	**Compatible version**
Edge	All
Chrome	48+
Opera	34+
Firefox	44+

SSL certification

To use a microphone on a non-localhost such as Heroku, we will need SSL certification. This can be done through Heroku (https://devcenter.heroku.com/articles/ssl-endpoint#acquire-ssl-certificate). Another option is to go through the Computer Science department specifically Ken Kleiner, who has requested SSL certificates for other projects in the past such as Dr. Yu Cao’s CSR project that was hosted on Amazon Web Services through https://csr.cs.uml.edu.

Microphone Access

For a browser to capture audio from the user, access must be granted. In most cases when the user will first reach the site they will be prompted with the option to either “Allow” or “Block”. It is important that the user selects “Allow” to access the full functionality of our application. Our first attempt to ensure this will be to have a modal appear that will explain to the user why to allow access to their microphone, when they are prompted to do so. Our second attempt, in case the user has blocked access, will be to re-direct the user to a different page with step-by-step instructions on how to allow microphone access to our site.

Release functionality requirements

The following list specifies the minimum required functionality for a success release of trackstudio.

- Mixer
    - Recording
    - Volume control (each track and master)
    - Transport functionality
        - Play/Pause
        - Stop
        - Forward
        - Reverse
        - Time Indicator
    - Track Panning
    - Track Equalization
    - Track Muting and Soloing
    - FX Slots for each track
- FX Catalog
    - Effect Information
    - Effects
        - Reverb
        - Delay

Project management

We’ve decided to take an Agile approach to developing our application. We believe daily communication, weekly meetings, and an integrated work management system will allow us to work together efficiently. Our management tools are listed in Table 8 and our schedule in Table 9.

Table 8: Project management tools

Name	**Description**
Heroku	Our deployment server, set to deploy when our *heroku* GitHub branch is pushed to
GitHub	Our source control
Slack	Used for daily team communication and application status updates
Trello	Our task board, all tasks and milestones are being tracked here

Table 9: Development schedule

Table 9: Development ***schedule*** *(continued)*

Commented [CDL3]: This needs to be “Table 9”

Milestone	Story	Date	Task description	Owner
Project setup	Slack	01/31	Setup Account	Cabral
		01/31	Integrate Heroku	Flores
		01/31	Integrate GitHub	
		01/31	Integrate Trello	
	Heroku	01/31	Setup domain	
		03/08	Process CSR for SSL certification	
	GitHub	01/31	Setup organization	
		01/31	Make *master* branch	
		01/31	Make *heroku* branch	
	Trello	01/31	Setup deadlines board	
Alpha	Recorder/mixer	02/19	Editable track labels	Meza
		02/19	Knobs	
		02/19	Buttons	
		02/26	Fader slider	
		02/26	Volume indicator	
		02/26	Effects slot	
		03/04	Location indicator	
		03/04	Component frame	
	Web Audio API	02/19	Mute	Anderson
		02/19	Solo	
		02/26	Pan	

Table 9: Development ***schedule*** *(continued)*

Commented [CDL3]: This needs to be “Table 9”

Milestone	Story	Date	Task description	Owner
		03/04	EQ	
		02/19	Record	Flores
		02/19	Volume, mono and stereo	
		02/26	Location indicator	
		03/04	Peak visualizer	
		02/19	Input and output processing	Cabral
		02/19	Effects	
		02/26	Playback	
		03/04	Exporting	
	Graphics	02/19	Recorder/mixer	All
		03/04	Dropdown partials	
Beta	Tutorial	03/18	Tooltip	Meza
		03/25	Overlay	
		04/01	Script	
	Dropdown	03/18	Sign in/ sign up	Anderson
		03/25	About	
		04/01	Account info	
		03/18	FX catalog	Cabral
		03/25	FX modules	
		04/01	FX info	
		03/18	Mixes	Flores
		03/25	Mix info	

Table 9: Development ***schedule*** *(continued)*

Commented [CDL3]: This needs to be “Table 9”

Milestone	Story	Date	Task description	Owner
		04/01	Mix modules	
Usability Test and Feedback Review	Test	04/05	Questionnaire	All
		04/05	Task list	
		04/05	Feedback survey	
	Feedback	04/14	Bug fixes	All
		04/14	Usability fixes	
Class presentation	Presentation	04/19	Presentation slides	All
		04/19	Live demo	
Final submission	Submission	04/28	Bug fixes	All
		04/28	Future feature implementations	