

The Sound of Code

Group 5



Cleaning up the UI/UX

- Picture dimensions were inconsistent and often too large for the page
- Some tabs needed to be separated as they had different purposes
- Cleaned up outdated links/information
- Clarified how to use the application and certain features

Old About Section

Developers



Collin Victor

Product Manager

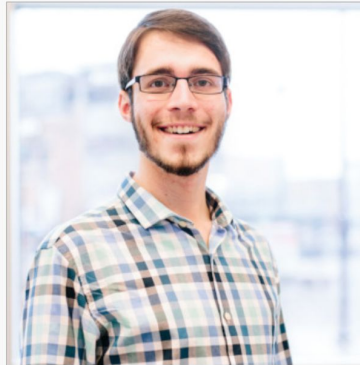
Math & Computer Science



Mark Hernandez

Development Manager

Computer Science



Justin Sleep

Developer

Computer Science

Mock Up

About

Paragraph summarizing what the Sound of Code is and its purpose

Project Leaders

Myra
picture

Myra
Info

James
picture

James
Info

ISU 2023 developers

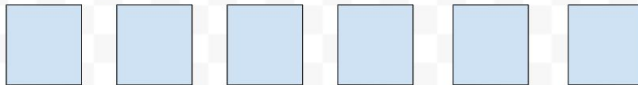
Short paragraph about the ISU team's contributions



Name and major of each developer under their picture

UNL 17-18 developers

Short paragraph about the UNL team's contributions



Name and major of each developer under their picture

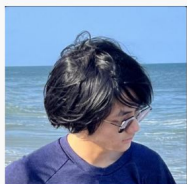
UNL 17-18 managers



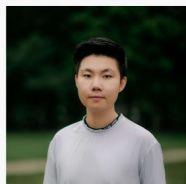
Name and role of each manager under their picture

Updated About

ISU 2023 Developers



Alex Yang



Shuwei Chang



Gavin Hyde



Chichang Lin



Yunjie Li

UNL 2017-2018 Developers



Mark Hernandez



Justin Sleep



Phuc Trinh



Derek Waskel



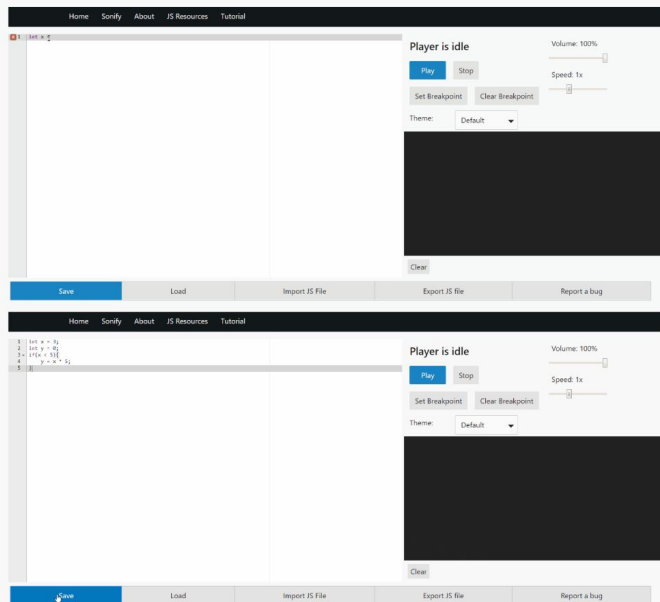
Kenny Waskel

Tutorial Section

Tutorial

1. Start typing your code in the editor section and click 'Play' to sonify your code.

2. Click 'Save' to store your code in the browser's localStorage and click 'Load' to reload them back at anytime.



Tutorial Section

1. Start typing your code in the editor section and click 'Play' to sonify your code.

The screenshot shows a web application interface for sonifying code. At the top, there is a navigation bar with links: Home, Sonify, About, JS Resources, and Tutorial. Below this is a code editor with two lines of code: `1 let x = 3;` and `2`. To the right of the code editor is a control panel. The control panel has a status indicator that says "Player is idle". Below this are two buttons: "Play" (highlighted in blue) and "Stop". There are also two sliders: "Volume: 100%" and "Speed: 1x". Below the sliders are two buttons: "Set Breakpoint" and "Clear Breakpoint". At the bottom of the control panel is a "Theme:" dropdown menu set to "Default". Below the control panel is a large black rectangular area, likely a visualizer or audio player. At the bottom of the interface is a footer bar with five buttons: "Save" (highlighted in blue), "Load", "Import JS File", "Export JS file", and "Report a bug".

Prev

Next

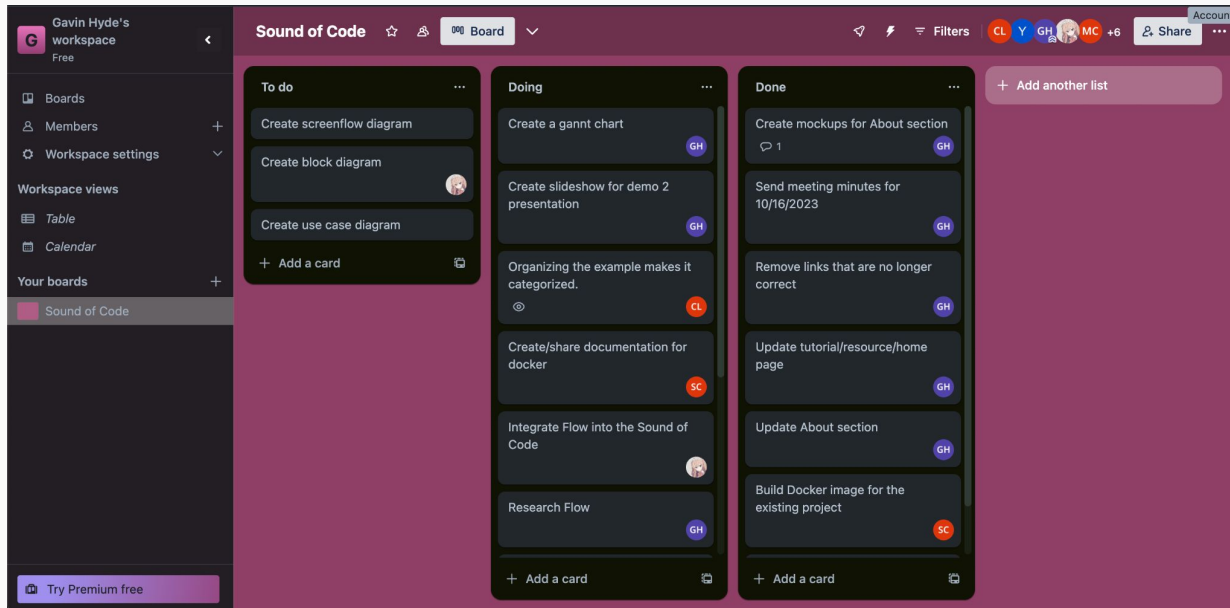
Facebook's Flow Software

A static type checker for Javascript

The goal is to implement Flow to a console on the webpage so users can see when they have a type mismatch



Trello



- Use Trello to coordinate
- Organizing the Task
- Straightforward for the current work

Code Example

- Since Education purpose, provide some fundamental data structure will be great idea.
- Organize the example into different categories.
- Adding support for class declaration AST node support.

Docker

Dependency Upgrade: Upgraded container-related dependencies for projects.

Docker Mastery:

1. Enables any team member to efficiently set up and run the project
2. Built a docker image from scratch.
3. Created two version comprehensive documentation with step-by-step instructions and visual aids.

2. Build the Docker Image

Replace `[image_name]` with a name for your Docker image.

```
bashCopy code
docker build -t [image_name] .
// tips: the common name is [accountName/image_name] (shuweic/soc_test)
// don't forget the . after image_name
```

3. Run the Docker

1. Run with port 5173

Docker is gonna create a container for you when you are not run with concrete container

```
bashCopy code
docker run -p 5173:5173 -d [image_name]
```

1. Run with container (Optional)

Replace `[container_name]` with a name for your Docker container

```
bashCopy code
docker run -d --name [container_name] [image_name]
```

1. Other common command (Optional)

- Override the default command

```
bashCopy code
docker run [image_name] [CMD]
```

```
FROM node:alpine
```

```
WORKDIR /app
```

```
COPY package.json ./
```

```
RUN npm install
```

```
COPY ./ ./
```

```
# Expose port
```

```
EXPOSE 3000
```

```
EXPOSE 5173
```

```
CMD ["npm", "run", "dev"]
```

Developer Doc

1. Run with port 5173

Docker is gonna create a container for you when you are not run with concrete container

```
>> docker run -p 5173:5173 -d [image_name]
```

1. Run with container (Optional)

Replace `[container_name]` with a name for your Docker container.

```
>> bashCopy code
docker run -d --name [container_name] [image_name]
```

1. Other common command (Optional)

- Override the default command

```
>> docker run [image_name] [CMD]
```

- print out the information about all the running docker image

```
>> docker ps
```

- print out information about given container

```
>> docker logs [container_id]
```

- Override the default command

Using Docker Compose (Optional)

If the project includes a `docker-compose.yml` file, you can use Docker Compose to manage multi-container applications.

1. Start Services

```
bashCopy code
docker-compose up -d
```

2. Stop Services

```
bashCopy code
docker-compose down
```

Common Docker Commands

- View running containers: `docker ps`
- Stop a container: `docker stop [container_name or container_id]`
- Remove a container: `docker rm [container_name or container_id]`
- View local images: `docker images`
- Remove an image: `docker rmi [image_name or image_id]`

Troubleshooting

```
docker build -t shuweic227/soc .
```

(Note: Common format is `[accountName/image_name]`)

- Standard Run (Port 5173):

```
docker run -p 5173:5173 -d shuweic227/soc client
```

```
→ sound_of_code_2.0 git:(master) docker run -p 5173:5173 -d shuweic227/soc_client
074a27c61b0785c74620594ce6fbd2fa631ab177f195ace9890571a98403bc53
→ sound_of_code_2.0 git:(master)
```

a. Print out all container info

Docker ps

```

+ sound effect_code 2 g it (showel_detec Dec) docker ps
CONTAINER ID   IMAGE                                COMMAND                  CREATED        STATUS        PORTS        NAMES
676225ba3f60   61f2af1ba843                       "docker-entrypoint.s..." 2 weeks ago    Up 2 weeks    3000/tcp, 0.0.0.0:5173->5173/tcp  vigorous_gaur
b0bdeeb88bbe   b0bdeeb88bbe@Client                "docker-entrypoint.s..." 2 weeks ago    Up 2 weeks    K8s_client_client-depl-...
t_6vcd0473-ec6f-4693-8e7f-43ed3eb088102.2
b32a1e3c6e95   registry_k8s.io/pause:3.1         "/pause"                2 weeks ago    Up 2 weeks    K8s_POD_client_client-depl-7fde...
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.0
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.1
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.2
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.3
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.4
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.5
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.6
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.7
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.8
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.9
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.10
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.11
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.12
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.13
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.14
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.15
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.16
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.17
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.18
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.19
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.20
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.21
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.22
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.23
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.24
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.25
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.26
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.27
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.28
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.29
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.30
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.31
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.32
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.33
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.34
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.35
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.36
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.37
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.38
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.39
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.40
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.41
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.42
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.43
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.44
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.45
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.46
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.47
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.48
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.49
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.50
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.51
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.52
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.53
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.54
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.55
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.56
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.57
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.58
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.59
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.60
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.61
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.62
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.63
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.64
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.65
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.66
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.67
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.68
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.69
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.70
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.71
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.72
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.73
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.74
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.75
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.76
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.77
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.78
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.79
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.80
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.81
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.82
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.83
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.84
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.85
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.86
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.87
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.88
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.89
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.90
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.91
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.92
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.93
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.94
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.95
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.96
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.97
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.98
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.99
9c0d0473-ec6f-4693-8e7f-43ed3eb088102.100
9c0d0473-ec6f-4693-
```

b. Find the **CONTAINER ID** that our project is using

Docker stop [ContainerID]

```
→ sound_of_code_2.0 git:(master) docker stop 67b225ba3f60
67b225ba3f60
→ sound_of_code_2.0 git:(master) docker stop b6bddee68bbe
b6bddee68bbe
```

It should return the id itself which means successfully stopped.

For more detail instruction or other condition not list above please check the **dockerInstruction.md** under **docs** folder. Feel free to email Shuwei: cuicoms@iastate.edu

Containerization (k8s)

Kubernetes from Scratch:

1. Learned and built Kubernetes setups for both development and services.
2. Drafted YAML scripts for streamlined deployment.
3. This offers scalable, resilient, and manageable application deployment.

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: client-depl
spec:
  replicas: 1
  selector:
    matchLabels:
      app: client
  template:
    metadata:
      labels:
        app: client
    spec:
      containers:
        - name: client
          image: shuweic227/client:latest
```

```
apiVersion: v1
kind: Service
metadata:
  name: client-srv
spec:
  selector:
    app: client
  ports:
    - name: client
      protocol: TCP
      port: 5173
      targetPort: 5173
```

Apply k8s script

```
→ sound_of_code_2.0 git:(shuwei/HandOnDoc) cd infra
→ infra git:(shuwei/HandOnDoc) cd k8s
→ k8s git:(shuwei/HandOnDoc) kubectl apply -f client-depl.yaml
deployment.apps/client-depl unchanged
service/client-srv configured
→ k8s git:(shuwei/HandOnDoc)
```

```
// step 1: build infra/k8s/posts.yaml
// we should put all configuration file in this infra folder
```

```
kubectl apply -f [fileName].yaml
// process a config file "pod/[fileName] created"
```

```
kubectl get pods
// list info of pods
```

```
apiVersion: v1
kind: Pod
metadata:
  name: posts
spec:
  containers:
    - name: posts
      image: shuweic227/posts:0.0.1
```

Updating the Image Used By a Deployment

1. the deployment must be using the 'latest' tag in the pod spec section
2. make an update to your code
3. build the image
4. push the image to docker hub
5. run the command

3. docker build -t [dockerName/serviceName]
4. docker push [tagName]
5. kubectl rollout restart deployment [depl_name]

```
kubectl get deployments
// check the age
```

```
kubectl get pods
// check the name of the new pods
```

```
kubectl logs [name of pod]
// print out the service detail
```

What's next

Deployment:

- Exploring AWS free tier deployment as per client's request.
- Objective: Cost-efficient, scalable, and reliable service

Kubernetes Clustering:

- Ensure compatibility of our Docker image with a Kubernetes cluster.
- Provide in-depth, user-friendly documentation to assist those unfamiliar with containerization.

New Features:

- Add Skaffold (k8s runner)
- Collaborate with the client to understand and prioritize upcoming feature developments based on given assignments.

```
apiVersion: skaffold/v2alpha3
kind: Config
deploy:
  kubectl:
    manifests:
      - ./infra/k8s/*
build:
  local:
    push: false
artifacts:|  shuwei, 10/9/23, 2
  - image: shuweic227/client
    context: client
    docker:
      dockerfile: Dockerfile
    sync:
      manual:
        - src: 'src/**/*.*'
          dest: .
```


TypeScript Refactor

Previously use JSDoc, you have to write the type manually and won't throw error in the building time.

Now we use typescript, it can check the code if error when development and building time.

```
export type StructureTypes<T> = {  
  BinaryExpression: T;  
  BreakStatement: T;  
  ContinueStatement: T;  
  DoWhileStatement: T;  
  ForInStatement: T;  
  ForStatement: T;  
  IfStatement: T;  
  SwitchCase: T;  
  SwitchStatement: T;  
  TernaryStatement: T;  
  WhileStatement: T;  
};  
  
export type DebugTypes<T> = {  
  BadStatement: T;  
  default: T;  
  Ending: T;  
  RuntimeError: T;  
  TypeChange: T;  
};
```

Build tools speedup

22s -> 3s!

```
~/Code/sound_of_code_2.0 git:(master) ±1 (3.813s)
```

```
npm run build
```

```
> sound-of-code@1.5.0 build
```

```
> vite build
```

```
vite v4.4.9 building for production...
```

```
node_modules/babel-standalone/babel.js (61389:2) Use of eval in "node_modules/babel-standalone/babel.js" is strongly discouraged.
```

```
✓ 205 modules transformed.
```

```
dist/index.html
```

```
dist/assets/question-ef00ef34.css
```

```
dist/assets/index-f3673ae5.css
```

```
dist/assets/question-11834b5.js
```

```
dist/assets/preferences-a29f54f6.js
```

```
dist/assets/index-e9913287.js
```

```
dist/assets/eclipse-15da5e45.js
```

```
dist/assets/resources-17bc7bb7.js
```

```
dist/assets/about-cf15dba1.js
```

```
dist/assets/PlaybackControls-d6098651.js
```

```
dist/assets/index-c00ad038.js
```

```
dist/assets/howler-765893e3.js
```

```
dist/assets/sonify-697fdb71.js
```

```
dist/assets/index-ce5eddfb.js
```

```
dist/assets/javascript-37e88b50.js
```

```
dist/assets/index-c0714c4f.js
```

```
dist/assets/babel-0e2aade0.js
```

```
✓ built in 2.64s
```

0.39 kB	gzip: 0.27 kB
0.41 kB	gzip: 0.24 kB
47.60 kB	gzip: 8.51 kB
0.77 kB	gzip: 0.50 kB
1.42 kB	gzip: 0.63 kB
1.66 kB	gzip: 0.74 kB
2.11 kB	gzip: 0.79 kB
3.94 kB	gzip: 1.04 kB
5.56 kB	gzip: 1.04 kB
5.89 kB	gzip: 2.10 kB
29.88 kB	gzip: 11.94 kB
35.44 kB	gzip: 9.70 kB
125.54 kB	gzip: 38.23 kB
237.33 kB	gzip: 76.62 kB
243.55 kB	gzip: 63.84 kB
369.28 kB	gzip: 105.93 kB
787.06 kB	gzip: 232.03 kB

```
~/Code/sound_of_code_2.0 git:(yunjie) ±4 (24.436s)
```

```
npm run build
```

```
> sound-of-code@1.5.0 build /Users/himself65/Code/sound_of_code_2.0
> webpack --config webpack.prod.js
```

```
Hash: c27e01f1d5c26511634a
```

```
Version: webpack 4.41.2
```

```
Time: 22479ms
```

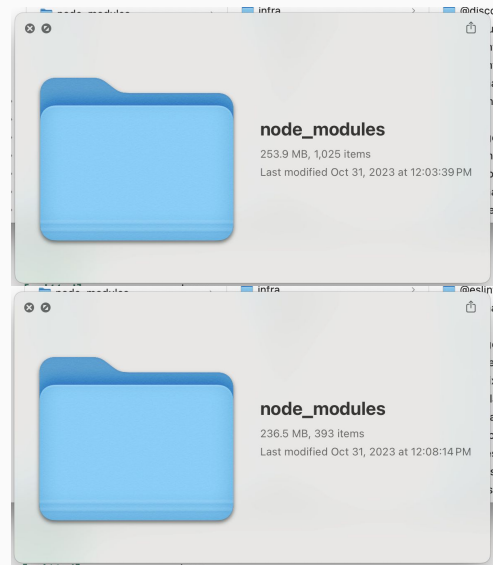
```
Built at: 2023-10-31 12:04:31
```

Asset	Size	Chunks	Chunk Names
about.js	6.86 KiB	1 [emitted]	about
about.js.map	9.87 KiB	1 [emitted] [dev]	about
about/index.html	369 bytes	2 [emitted]	
app.css	38.2 KiB	2 [emitted]	app
app.css.map	56.4 KiB	2 [emitted] [dev]	app
app.js	243 KiB	2 [emitted]	app
app.js.map	722 KiB	2 [emitted] [dev]	app
brace-theme-eclipse.js	2.19 KiB	3 [emitted]	brace-theme-eclipse
brace-theme-eclipse.js.map	2.96 KiB	3 [emitted] [dev]	brace-theme-eclipse
examples/About.js	159 bytes	[emitted]	
examples/Basic.js	159 bytes	[emitted]	
examples/Bubblesort.js	331 bytes	[emitted]	
examples/Change.js	31 bytes	[emitted]	
examples/DuplicateDeclaration.js	163 bytes	[emitted]	
examples/ElseCondition.js	118 bytes	[emitted]	
examples/ForMultiplication.js	85 bytes	[emitted]	
examples/ForSubtraction.js	82 bytes	[emitted]	
examples/Functions.js	176 bytes	[emitted]	
examples/HelloWorld.js	128 bytes	[emitted]	
examples/Mergesort.js	1.27 KiB	[emitted]	
examples/NoStructure.js	88 bytes	[emitted]	
examples/StringTest.js	83 bytes	[emitted]	
examples/SwitchNoCascade.js	245 bytes	[emitted]	
examples/WhileAddition.js	98 bytes	[emitted]	
home.js	1.82 KiB	4 [emitted]	home
home.js.map	2.56 KiB	4 [emitted] [dev]	home
img/about/christy.jpg	242 KiB	[emitted]	
img/about/collin.jpg	65.9 KiB	[emitted]	
img/about/derek.jpg	1.88 KiB	[emitted]	[big]
img/about/justin.jpg	36.4 KiB	[emitted]	
img/about/kenny.jpg	1.89 KiB	[emitted]	[big]
img/about/mark.jpg	822 KiB	[emitted]	[big]
img/about/myra.jpg	71.1 KiB	[emitted]	
img/about/nathan.jpg	884 KiB	[emitted]	[big]
img/about/rhuc.jpg	444 KiB	[emitted]	
img/about/pterobon.jpg	35.3 KiB	[emitted]	
img/tutorial/1.gif	254 KiB	[emitted]	[big]
img/tutorial/2.gif	481 KiB	[emitted]	[big]

Codespace improvement

1. Remove 20 unused dev dependencies.
2. Test case coverage

```
21 // eslint-disable no-magic-num
22 Preview Tab - Code/round_of_code_2.0/test/weaver.test.js
23
24 ▶ describes('weaver', () void => {
25   ▶ test('alters "Bad.js"', async () : Promise<void> => {
26     const userInput = await readExample(filename: "Bad.js");
27     await alterProgram(userInput, settings: { debug: false });
28   });
29   ▶ test('alters "Basic.js"', async () : Promise<void> => {
30     const userInput = await readExample(filename: "Basic.js");
31     await alterProgram(userInput, settings: { debug: false });
32   });
33   ▶ test('throws error for "DuplicateDeclaration.js"', async () : Promise<void> => {
34     const userInput = await readExample(filename: "DuplicateDeclaration.js");
35     await expect(alterProgram(userInput, settings: { debug: false })).rejects.toThrow();
36   });
37   ▶ test('alters "ElseCondition.js"', async () : Promise<void> => {
38     const userInput = await readExample(filename: "ElseCondition.js");
39     await alterProgram(userInput, settings: { debug: false });
40   });
41   ▶ test('alters "ForMultiplication.js"', async () : Promise<void> => {
42     const userInput = await readExample(filename: "ForMultiplication.js");
43   });
44 }
```



What's the next?

1. Improve UI in the project like skeleton in the loading.
2. Improve the sound of code parser to support class syntax and more.
3. Add E2E test case using playwright.

New Function

Code Question Page

I created a question interface. Users can ask questions by sending emails to our email addresses through the question interface.

Code Question Page

[HOME](#) [SONIFY](#) [PREFERENCES](#) [ABOUT](#) [TUTORIAL & JS RESOURCES](#) [QUESTION](#)

Do you have a coding question to ask?

Please enter your code issue here...

Submit a question

Unfinished New Features

"Sonify" interface:

- Code Breakpoints and Sounds: Allows users to set breakpoints in code and pause sounds there so they can focus on a specific part of the sound.
- Syntax highlighting: Although the current interface already has syntax highlighting, it can further provide the function of customizing colors to help users better distinguish different parts of the code.
- Error and suggestion pop-up windows: When an error occurs in the code, or the system has suggestions, a pop-up window can be used to prompt the user, so that the user can know more clearly what happened.

Unfinished New Features

"Preferences" interface:

- Custom Sounds: Allows users to upload their own sound effects or choose a different sound theme to customize the code's sounds.
- Night mode: Considering that many developers like to code at night, providing a night mode might be a good option.

Unfinished New Features

maybe new page:

- Newbie Wizard: For first-time users of the software, a short novice wizard can be provided to guide them on how to use the tool.
- Interactive community: Consider adding a community or discussion section where users can share their code, sound experiences, and suggestions.