

Lo-Fi Prototype

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ROADMAP

- Mission Statement
- 2 User Interface Sketches
- Selected Interface
- Lo-Fi Prototype Task Flows
- Experimental Method
- Experimental Results
- Suggested UI Changes
- Summary

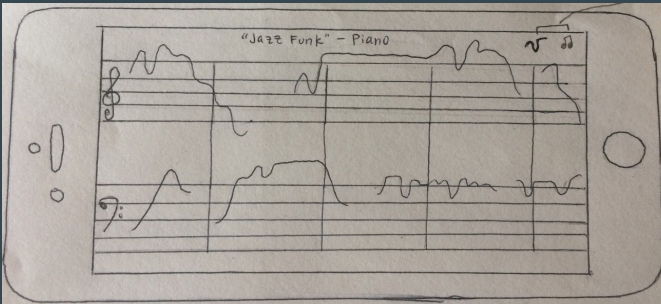
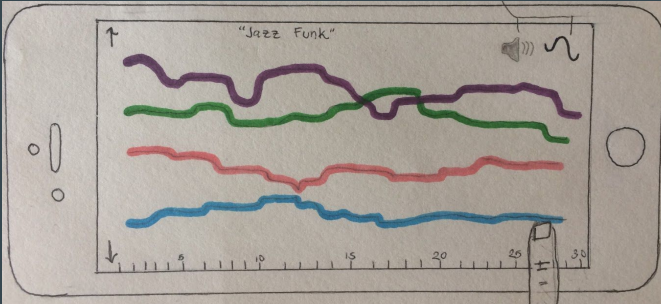
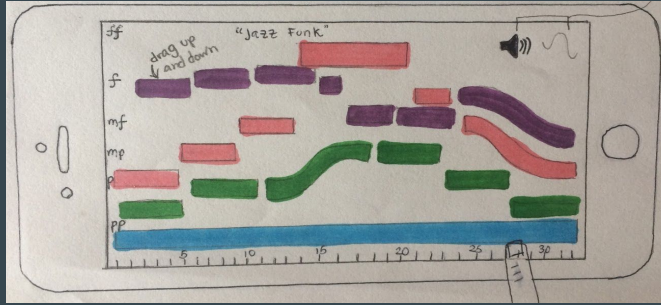
allegro

“Compose anywhere.”

Prototypes

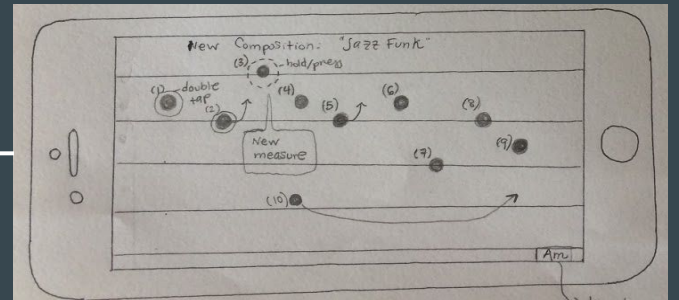
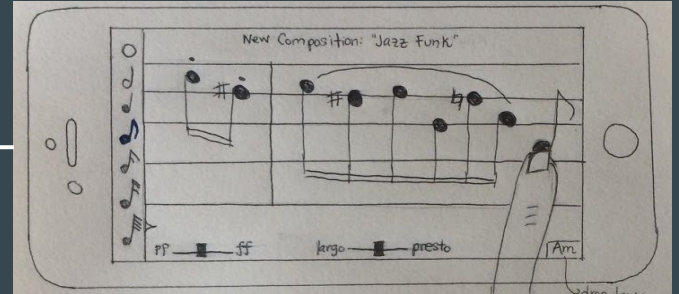
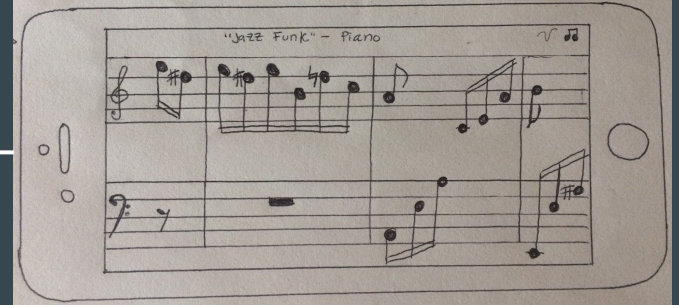
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Prototype 1: Visual-centric

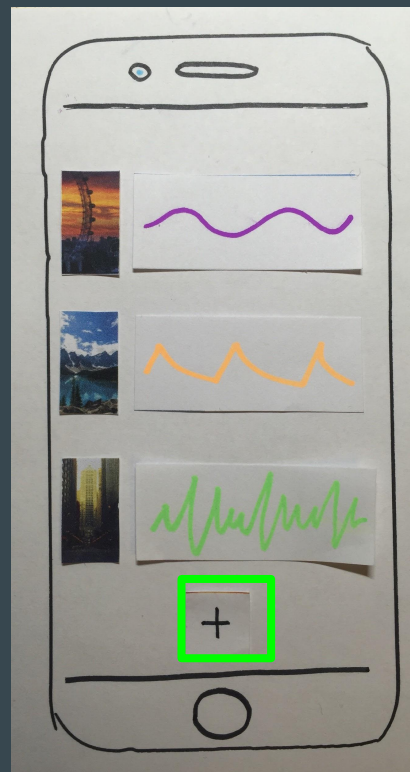
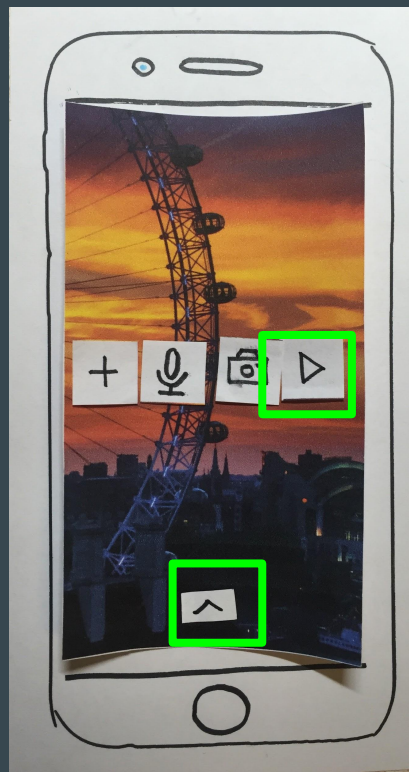
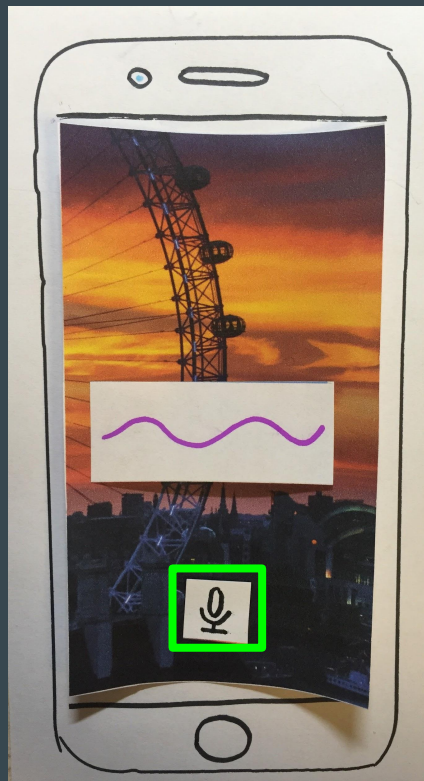
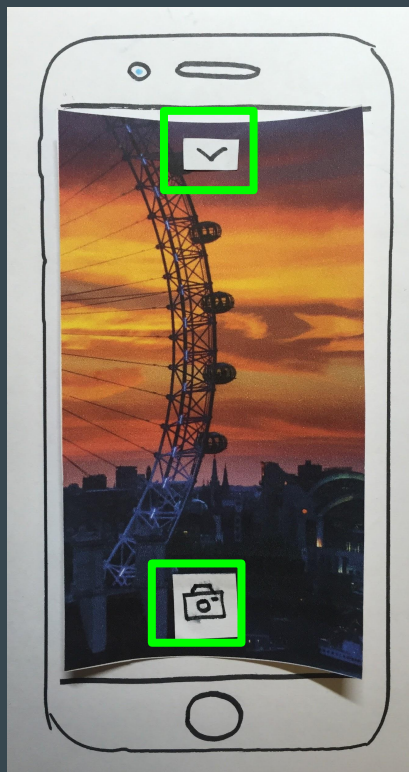


Visualizations

Gestures



Prototype 2: Audio-centric





- ✓ **Audio prototype wasn't really composing: feedback was that it seemed like an "immersive photos" app.**
- ✓ **Audio prototype didn't provide feedback and discoverability.**
- ✓ **Visual prototype, despite having simple interface, was very intuitive for professional musicians.**

Tasks

Compose: create notes and chords using simple, intuitive gestures. [*complex*]

Arrange: combine multiple ideas and instruments into a single composition. [*medium*]

Share: transcribe the composition to a PDF score to give to a musician. [*simple*]

Task 1: Compose


Create notes and chords using simple, intuitive gestures.


[Complex]

Task 1: Compose

- change time signature
- change key signature
- add single notes
- add accidental
- erase notes
- create chords

•
Note

b • 
Flat

• 
Sharp

♮ • L
Natural

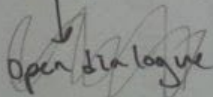
||
Edit time /
key signature

/ •
rest

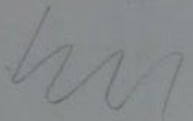
• •
Dot

• • •
Double Dot

↑
Chord Dialogue

↓

Open dialogue

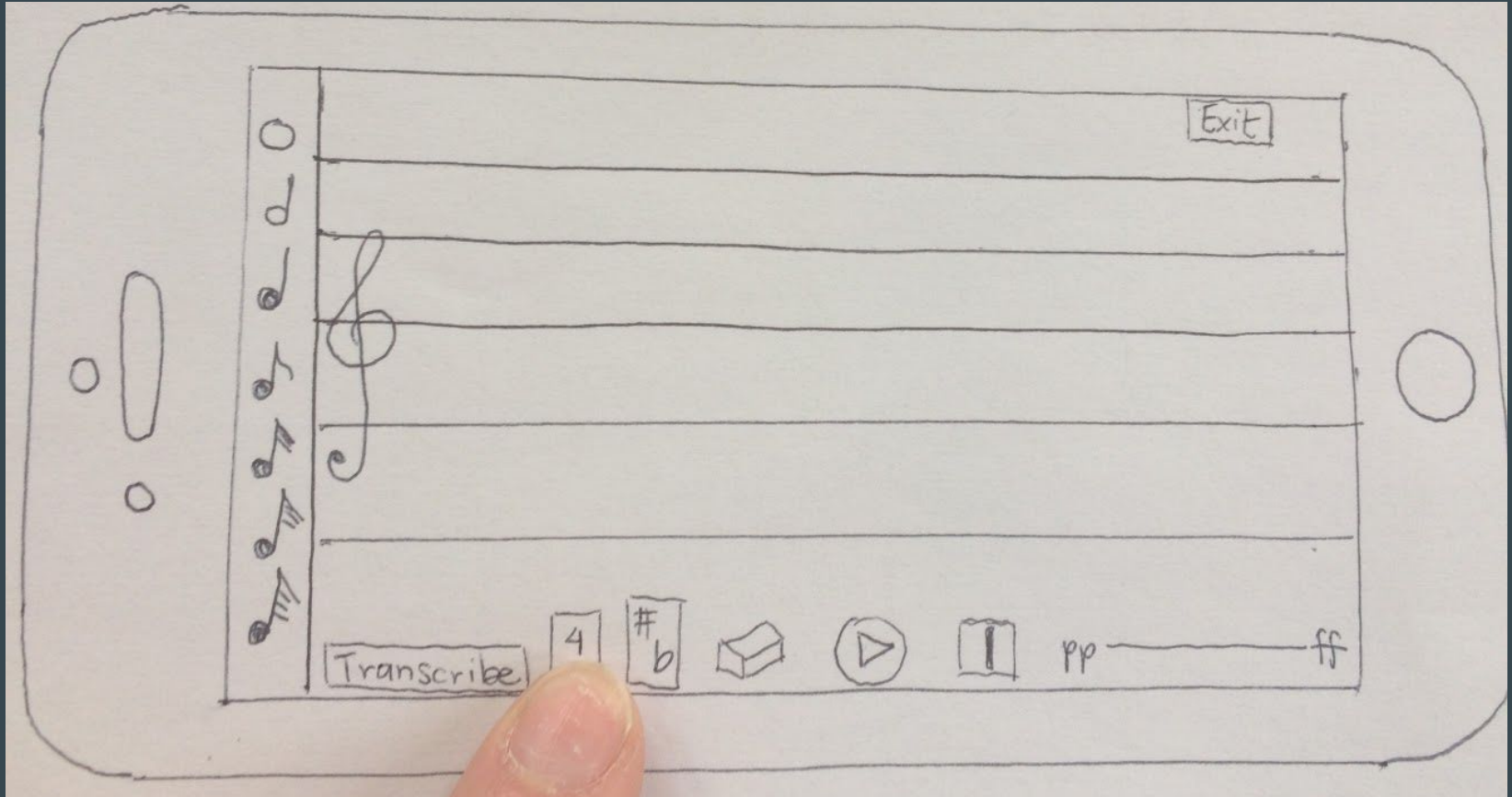
↓
Edit/draw
note

 Erase

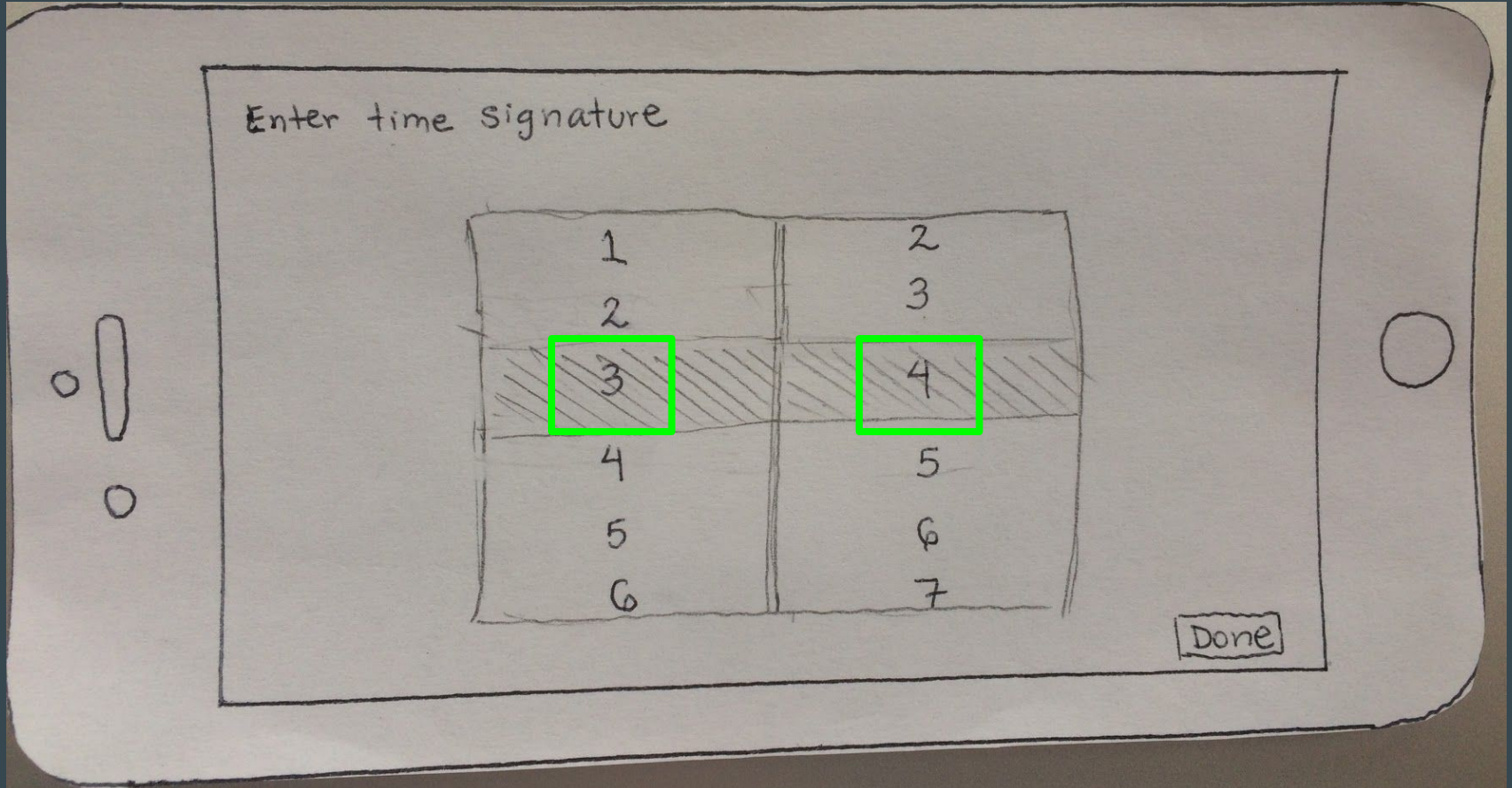
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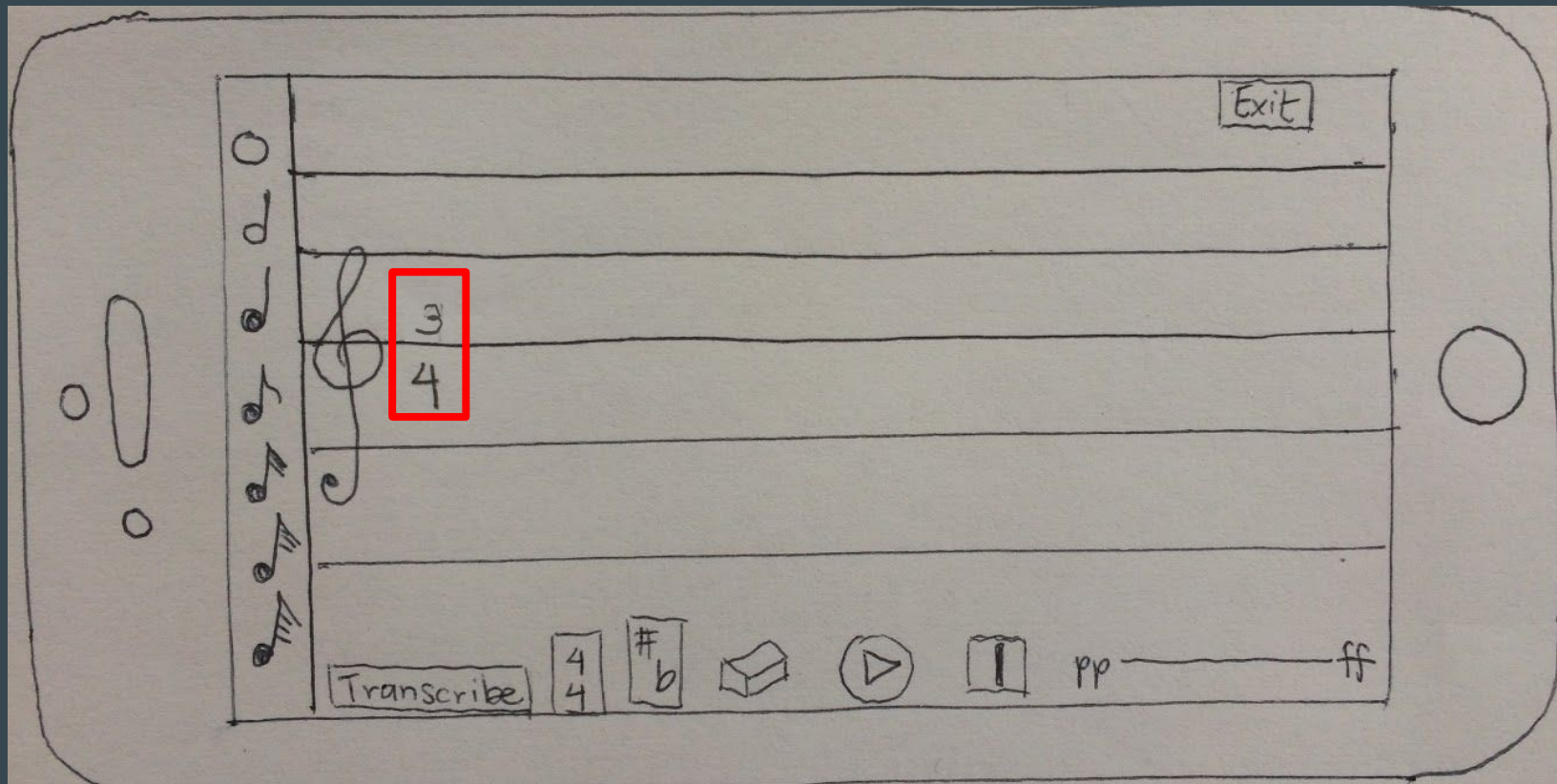
Task 1 (change time signature)



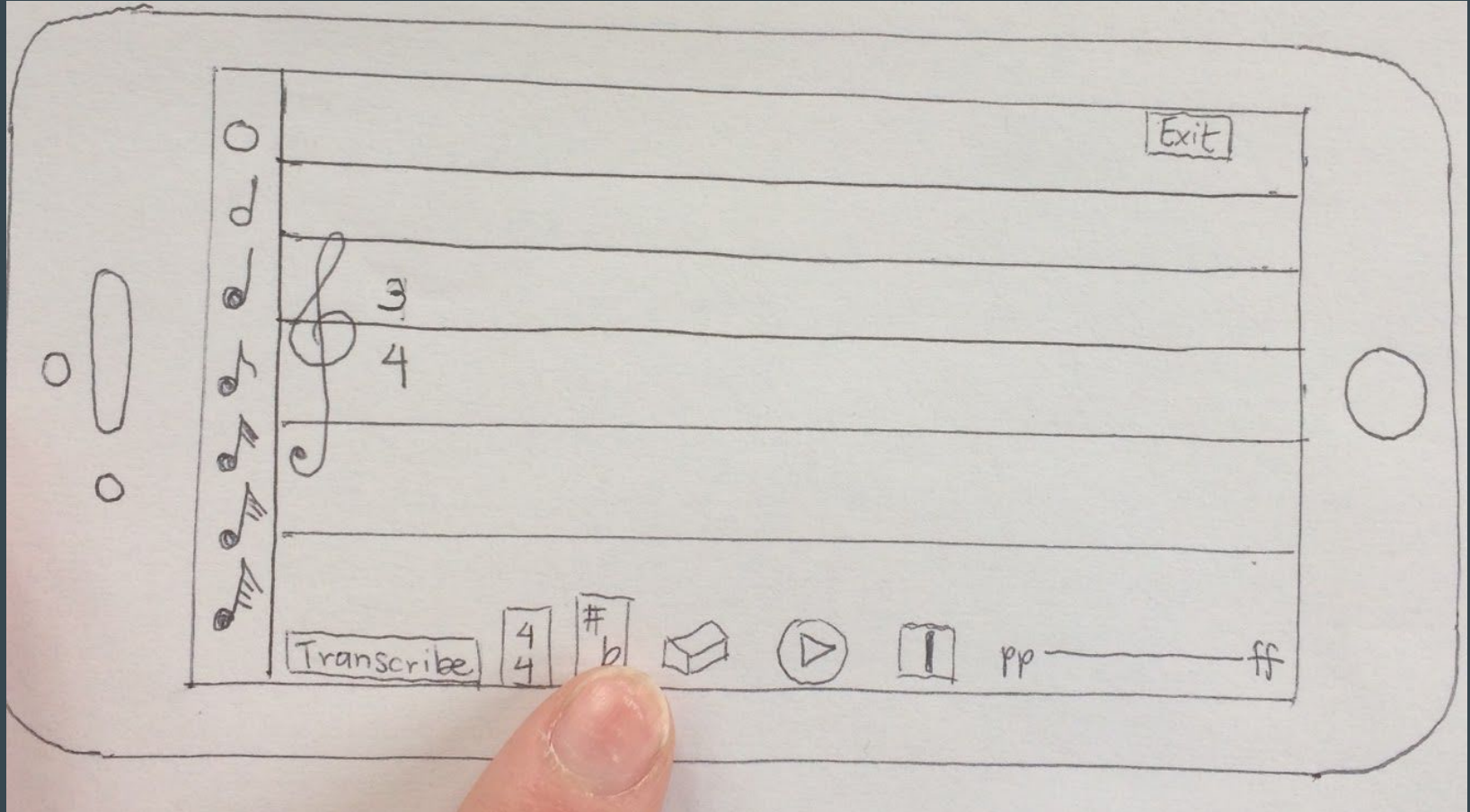
Task 1 (change time signature)



Task 1 (change time signature)



Task 1 (change key signature)



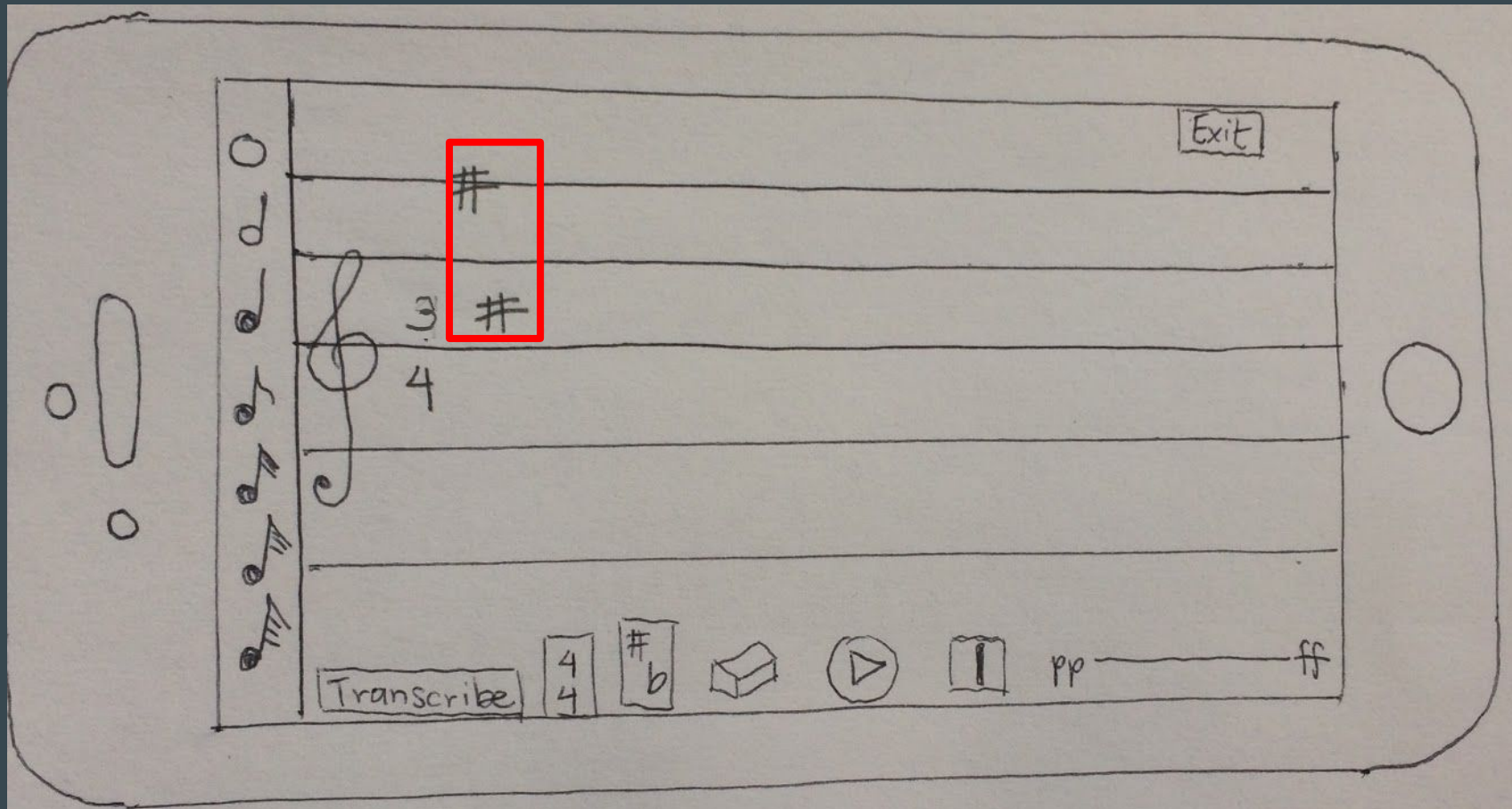
Task 1 (change key signature)

Enter key signature

CM	GM	DM	AM	EM	BM	F#M	C#M
Am	Em	Bm	F#m	C#m	G#m	D#m	A#m
	FM	BbM	EbM	AbM	DbM	GbM	cbM
	Dm	Gm	Cm	Fm	Bbm	Ebm	Abm

Done

Task 1 (change key signature)



Task 1 (add single notes)

The image shows a hand-drawn musical notation interface on a tablet screen. The interface is contained within a rounded rectangular border. At the top right, there is a button labeled "Exit". The main area consists of a five-line staff with a treble clef on the left. The key signature is one sharp (F#), and the time signature is 4/4. A single note on the first line (F4) is highlighted with a green box. To the left of the staff, there are some vertical lines and a finger pointing at the highlighted note. Below the staff, there is a control bar with several elements: a "Transcribe" button, a 4/4 time signature box, a key signature box with F# and b, a 3D box icon, a play button icon, a volume icon, and dynamic markings "pp" and "ff".

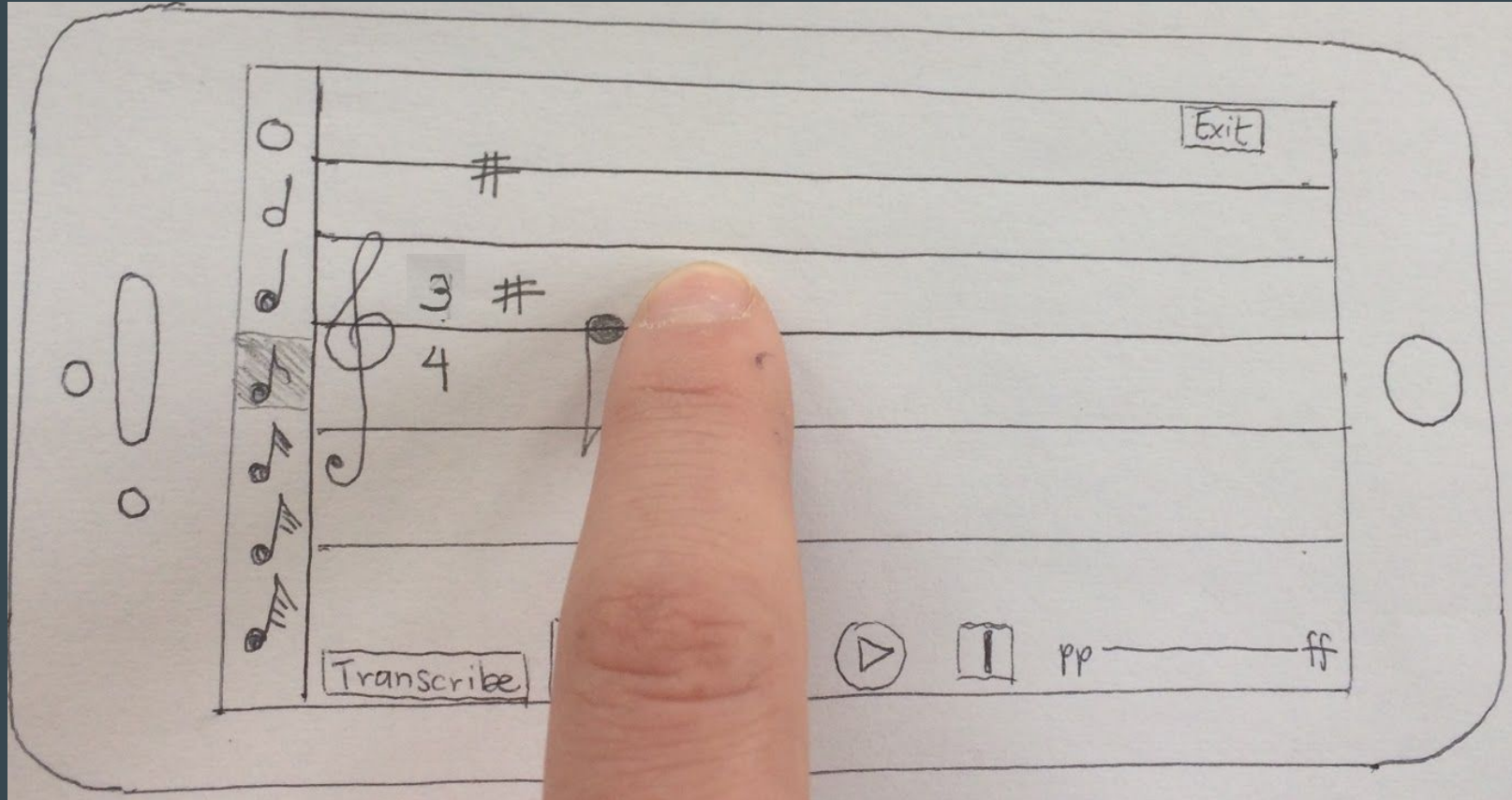
Task 1 (add single notes)

The image shows a hand-drawn musical notation interface on a tablet screen. The screen displays a five-line staff with a treble clef. The first line has a sharp sign (#). The second line has a '3' and a sharp sign (#). The third line has a '4'. A finger is pointing at the third line. On the left side of the screen, there are three vertical buttons: a circle, a pill-shaped oval, and another circle. On the right side, there is a circle. At the bottom, there is a control bar with several icons: a box with 'rife', a box with '4' over '4', a box with '#' over 'b', a 3D box icon, a play button, a vertical bar icon, 'pp' (pianissimo), and 'ff' (fortissimo). An 'Exit' button is in the top right corner.

Task 1 (add single notes)

A hand-drawn sketch of a tablet interface for musical notation. The interface is contained within a rounded rectangular frame. On the left side, there are three small circles and a vertical oval shape. The main area features a five-line musical staff. The top line has a sharp sign (#). The second line has a treble clef, a sharp sign (#), and the number 3. The third line has the number 4 and a single note with a stem and a black dot, which is highlighted by a red rectangular box. The bottom line is empty. At the top right of the staff area, there is a small box labeled "Exit". Below the staff, there is a control bar with several elements: a box labeled "Transcribe", a box containing the number 4 over 4, a box containing a sharp sign (#) over a flat sign (b), a 3D rectangular prism icon, a play button icon (a triangle inside a circle), a vertical bar icon, and a dynamic range indicator showing "pp" (pianissimo) on the left and "ff" (fortissimo) on the right, connected by a horizontal line.

Task 1 (add single notes)



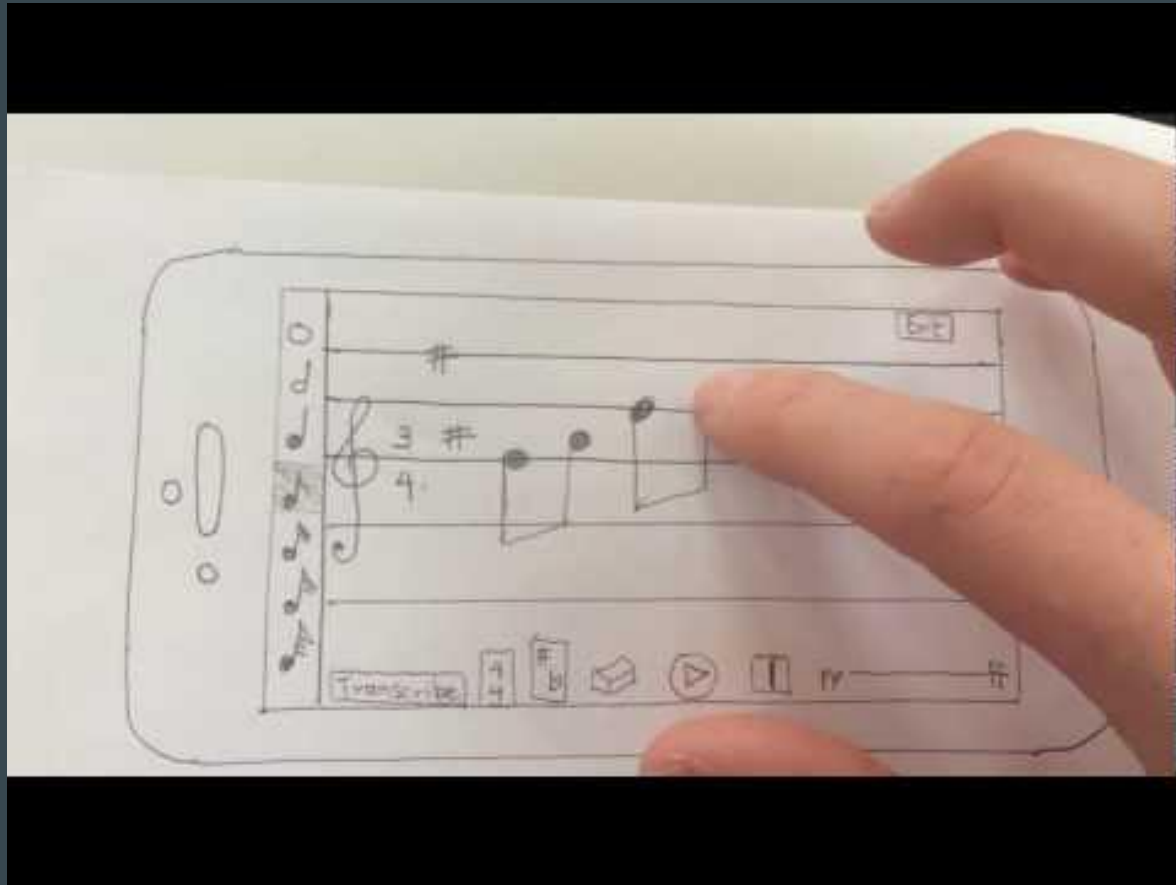
Task 1 (add single notes)

A hand-drawn musical notation interface on a tablet screen. The interface features a five-line staff with a treble clef. The top line has a sharp sign (#). The second line has a treble clef, a sharp sign (#), and a circled note on the second space. The third line has a circled note on the second space. A red square highlights the circled note on the second space of the second line. To the left of the staff, there are several musical symbols: a circle, a vertical oval, and another circle. Below the staff, there is a control bar with the following elements from left to right: a box labeled "Transcribe", a box with "4" over "4", a box with "#" over "b", a 3D box icon, a play button icon, a pause button icon, and a dynamic range from "pp" to "ff". In the top right corner of the staff area, there is a box labeled "Exit".

Task 1 (add accidental)

A hand-drawn musical score is displayed on a tablet screen. The score is written on a five-line staff with a treble clef. The notes are: a quarter note on the first line (F4), a quarter note on the second line (G4), a quarter note on the second space (A4), and a quarter note on the third line (B4). A sharp sign (#) is placed above the first line. To the left of the staff, the numbers '3' and '4' are written. A finger is pointing to the B4 note. At the bottom of the screen, there are several UI elements: a box labeled 'Transcribe', a box containing the number '4', a box containing a sharp sign (#) and a flat sign (b), a 3D box icon, and a dynamic marking 'p' followed by a horizontal line and a fortissimo marking 'ff'. In the top right corner of the screen, there is a box labeled 'Exit'. On the left side of the screen, there are two small circles and a vertical oval shape. On the right side, there is a single circle.

Task 1 (add accidental)



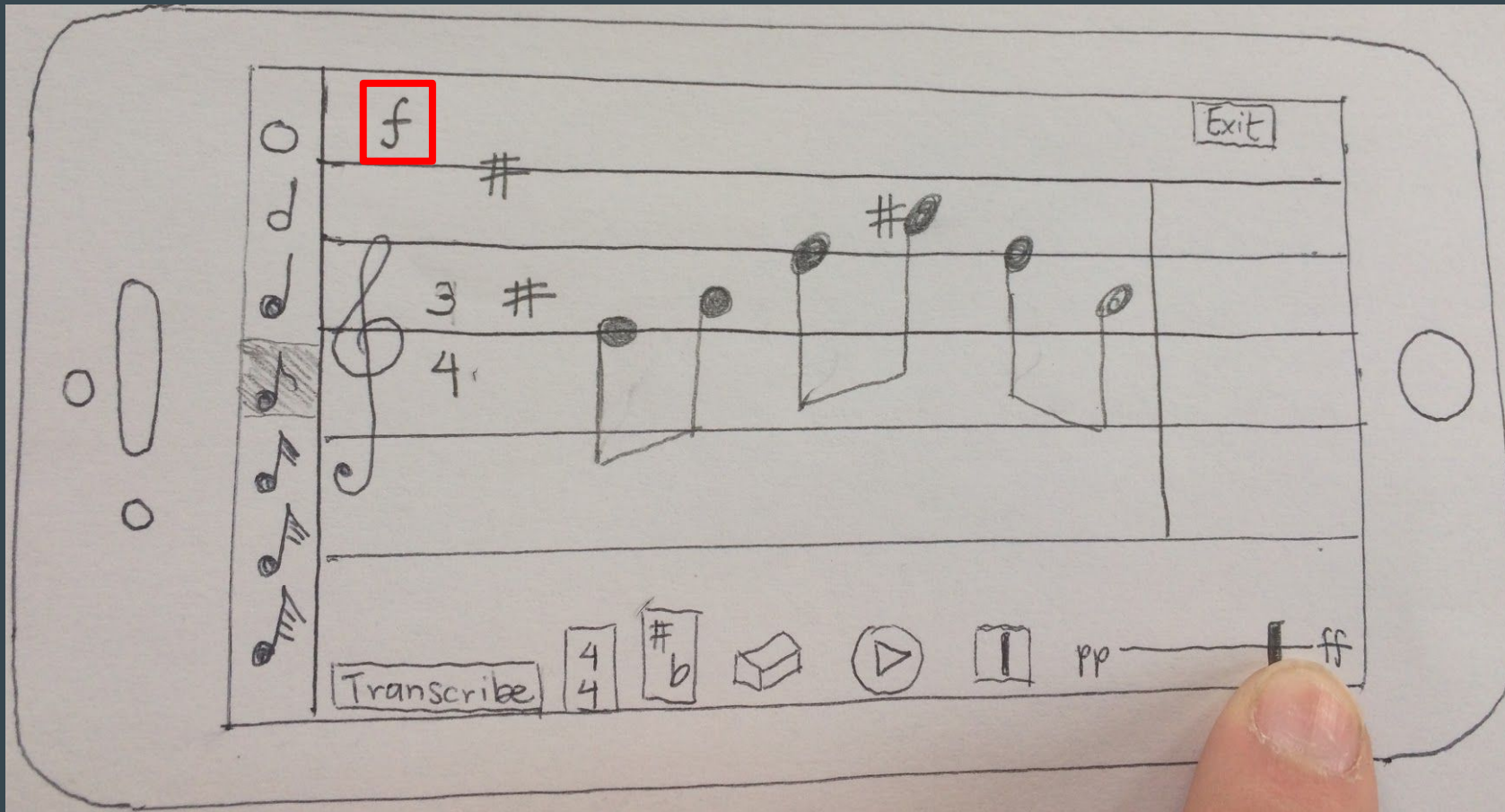
Task 1 (add accidental)

A hand-drawn musical notation interface on a tablet screen. The interface features a five-line staff with a treble clef. The first line has a sharp sign (#) above it. The second line has a sharp sign (#) above it, which is highlighted with a red box. The third line has a sharp sign (#) above it. The fourth line has a sharp sign (#) above it. The fifth line has a sharp sign (#) above it. The interface includes a 'Transcribe' button, a '4/4' time signature box, a sharp sign (#) above a flat sign (b), a play button, a volume icon, and dynamic markings 'pp' and 'ff'. A box labeled 'Exit' is located in the top right corner. The interface is surrounded by a rounded rectangular border with two circular buttons on the left and right sides.

Task 1 (automatically add bar line)

The image shows a hand-drawn musical score on a tablet screen. The score is written on a five-line staff in treble clef. The key signature is one sharp (F#), and the time signature is 3/4. The melody consists of the following notes: G4 (quarter), A4 (quarter), B4 (quarter), C5 (quarter), B4 (quarter), A4 (quarter), G4 (quarter). A bar line is drawn after the second measure. The word "Exit" is written in a box at the end of the staff. On the left side of the staff, there are four musical symbols: a treble clef, a sharp sign, a 3/4 time signature, and a shaded rectangular area. At the bottom of the screen, there is a control bar with the following elements from left to right: a "Transcribe" button, a 4/4 time signature box, a sharp/b flat box, a 3D cube icon, a play button icon, a vertical bar icon, a dynamic marking "pp" (pianissimo) with a line extending to "ff" (fortissimo).

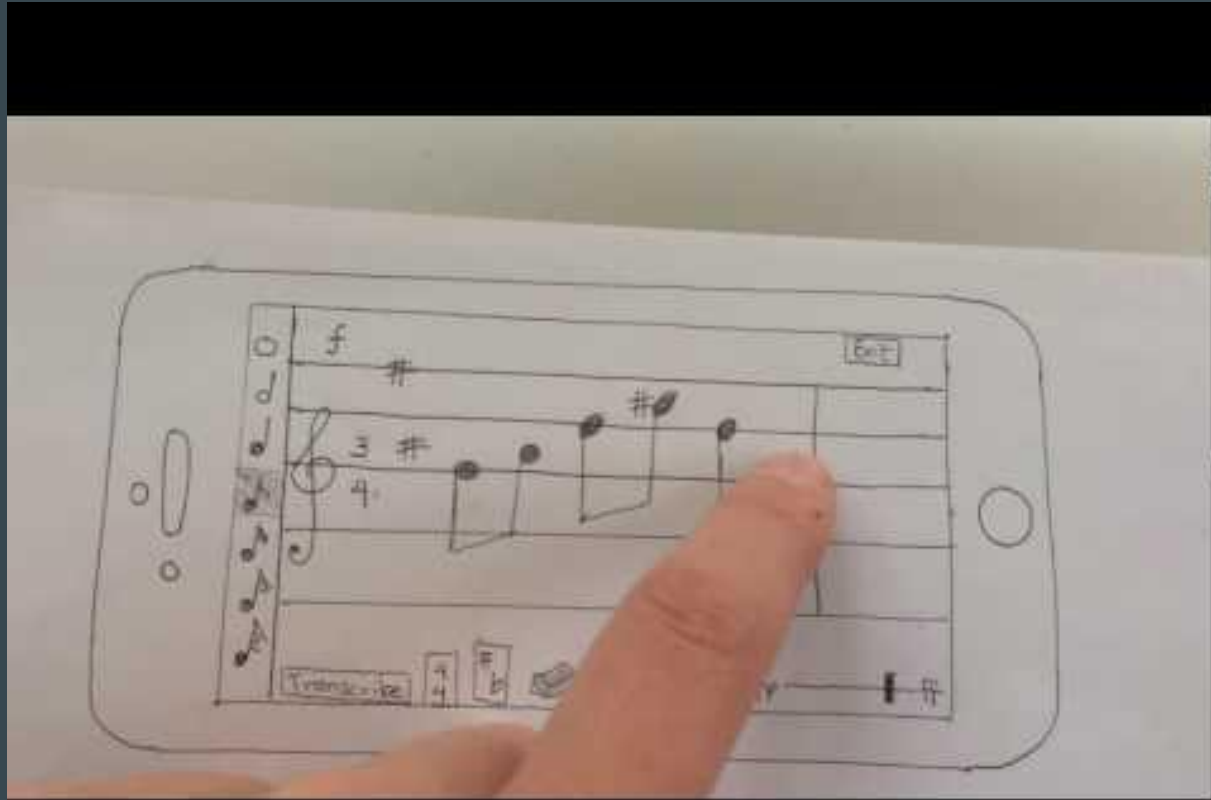
Task 1 (change volume)



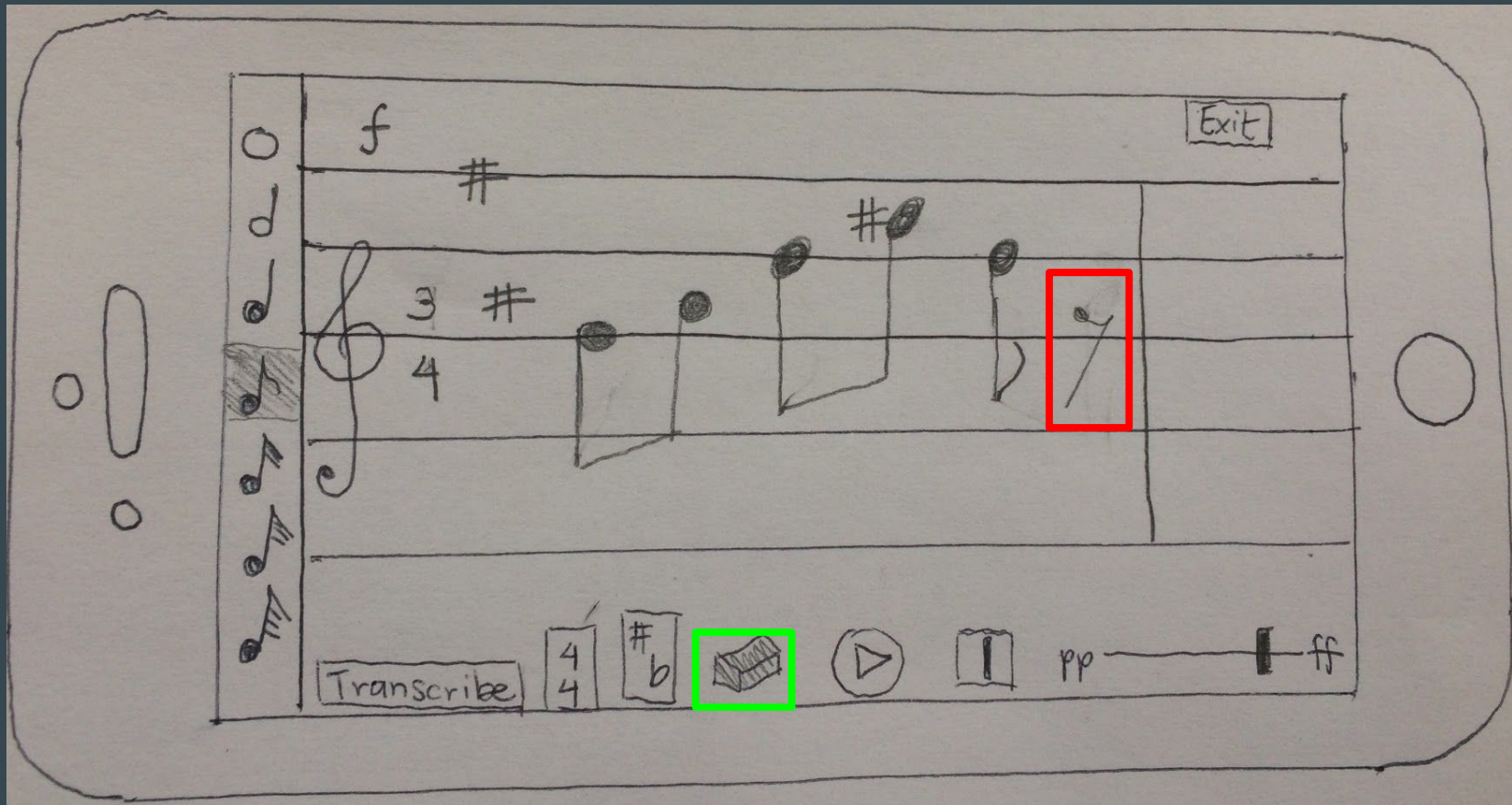
Task 1 (erase notes)

A hand-drawn sketch of a tablet interface for musical notation. The interface is contained within a rounded rectangular border. On the left side, there are two small circles and a vertical oval shape. The main area features a five-line staff with a treble clef. The first measure contains a dynamic marking 'f' and a sharp sign '#'. The second measure contains a '3' and a sharp sign '#', with a note on the second line. The third measure contains a '4' and a sharp sign '#', with a note on the third line. The fourth measure contains a sharp sign '#', with a note on the fourth line. The fifth measure contains a note on the second line. A vertical line separates the first four measures from the fifth. In the top right corner, there is a box labeled 'Exit'. On the left side of the staff, there are several musical symbols: a circle, a note with a stem, a note with a stem and a sharp sign, and a note with a stem and a sharp sign. At the bottom, there is a control bar with several icons: a box labeled 'Transcribe', a box with '4' over '4', a box with a sharp sign over a flat sign, a play button, a box with a vertical line, 'pp', a horizontal line, and 'ff'. A finger is pointing at the '4' over '4' box.

Task 1 (erase notes)



Task 1 (erase notes, automatically add rest)



Task 1 (create chord)

Enter chord			Alterations
A		Δ	
B	#	-	
C	4	+	
D		o	
E	b	ø	
F		7	
G		SUS	

o | o

o

o

o

Draw chord

Done

Task 1 (create chord)

The image shows a handwritten musical score on a tablet interface. The score is titled "New Composition - piano" and includes a dynamic marking "p". The notation is written on a five-line staff with a treble clef. The key signature is one sharp (F#) and the time signature is 4/4. The score consists of three measures of music. The first measure contains a whole note chord with notes G4, B4, and D5. The second measure contains a whole note chord with notes G4, B4, and D5. The third measure contains a whole note chord with notes G4, B4, and D5. The interface includes a "Transcribe" button, a "4/4" time signature box, a "#b" key signature box, a play button, a stop button, and a volume control slider. The volume control slider is set to "pp" (pianissimo) and has a range from "pp" to "ff" (fortissimo). There is also an "Exit" button in the top right corner.

Task 2: Arrange

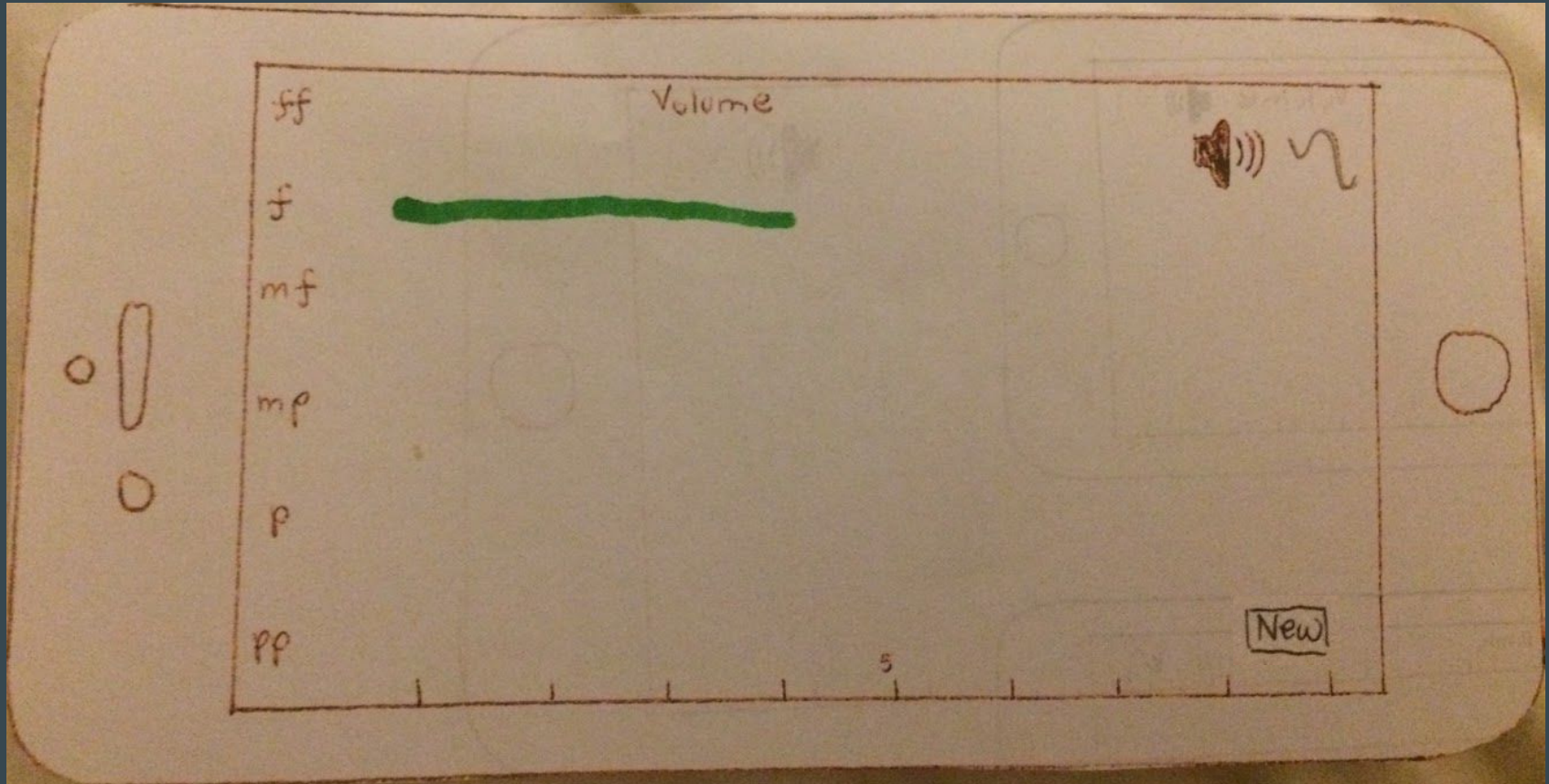
Combine multiple ideas and instruments into a single composition.

[Moderate]

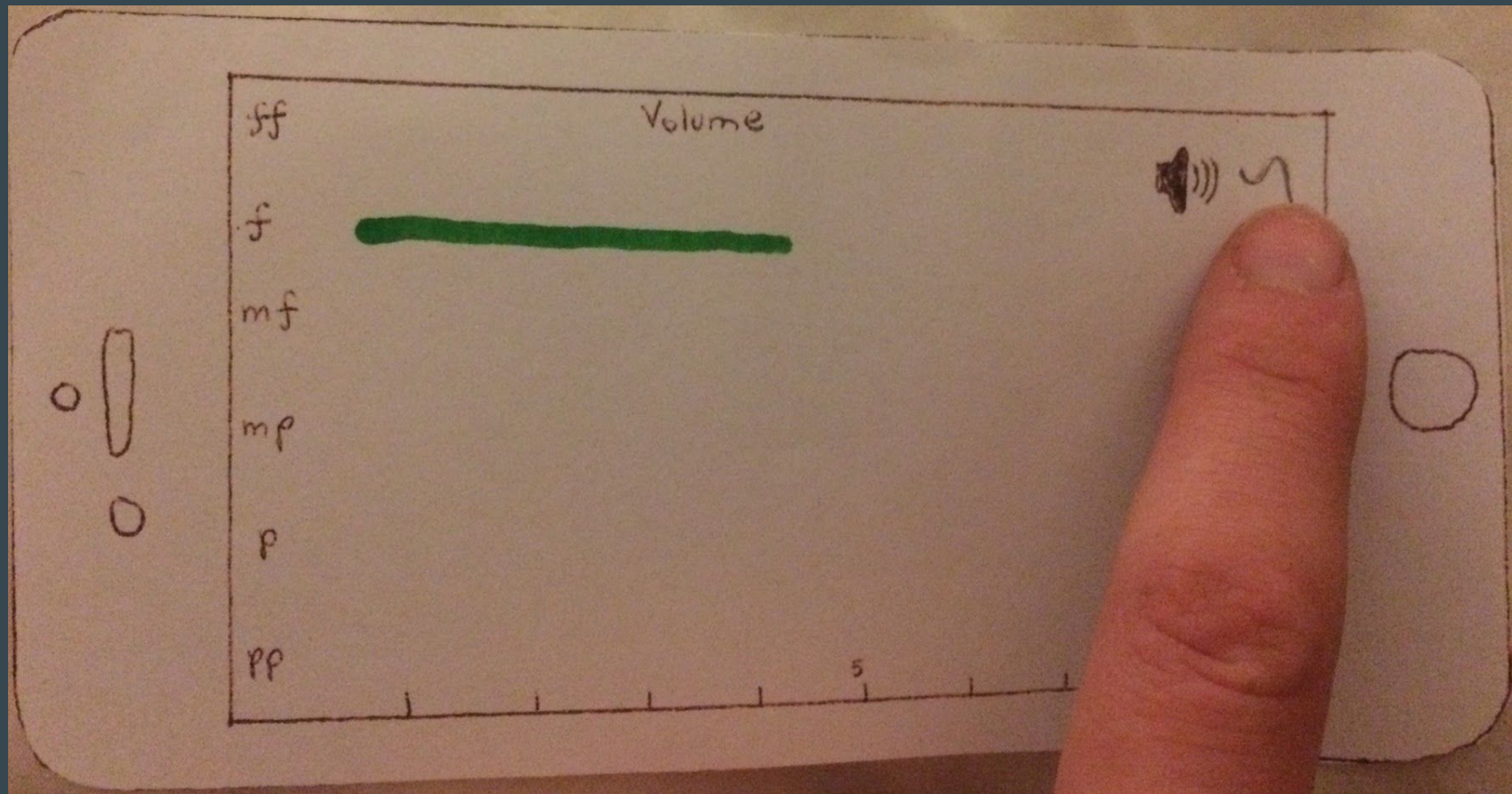
Task 2

A hand-drawn musical score is displayed on a tablet screen. The score is written on a five-line staff with a treble clef. The first measure contains a dynamic marking 'f' and a sharp sign '#'. The second measure contains a sharp sign '#', a '3' above the staff, and a '4' below the staff. The melody consists of five notes: a quarter note on the second line (F#), a quarter note on the third line (G#), a quarter note on the fourth line (A#), a quarter note on the fourth space (B), and a quarter note on the first line (C). A finger is pointing to a button labeled 'Exit' in the top right corner of the score area. At the bottom of the screen, there is a control bar with several icons: a 'Transcribe' button, a '4/4' time signature icon, a sharp sign above a flat sign, a 3D box icon, a play button icon, a stop button icon, and a 'pp' dynamic marking.

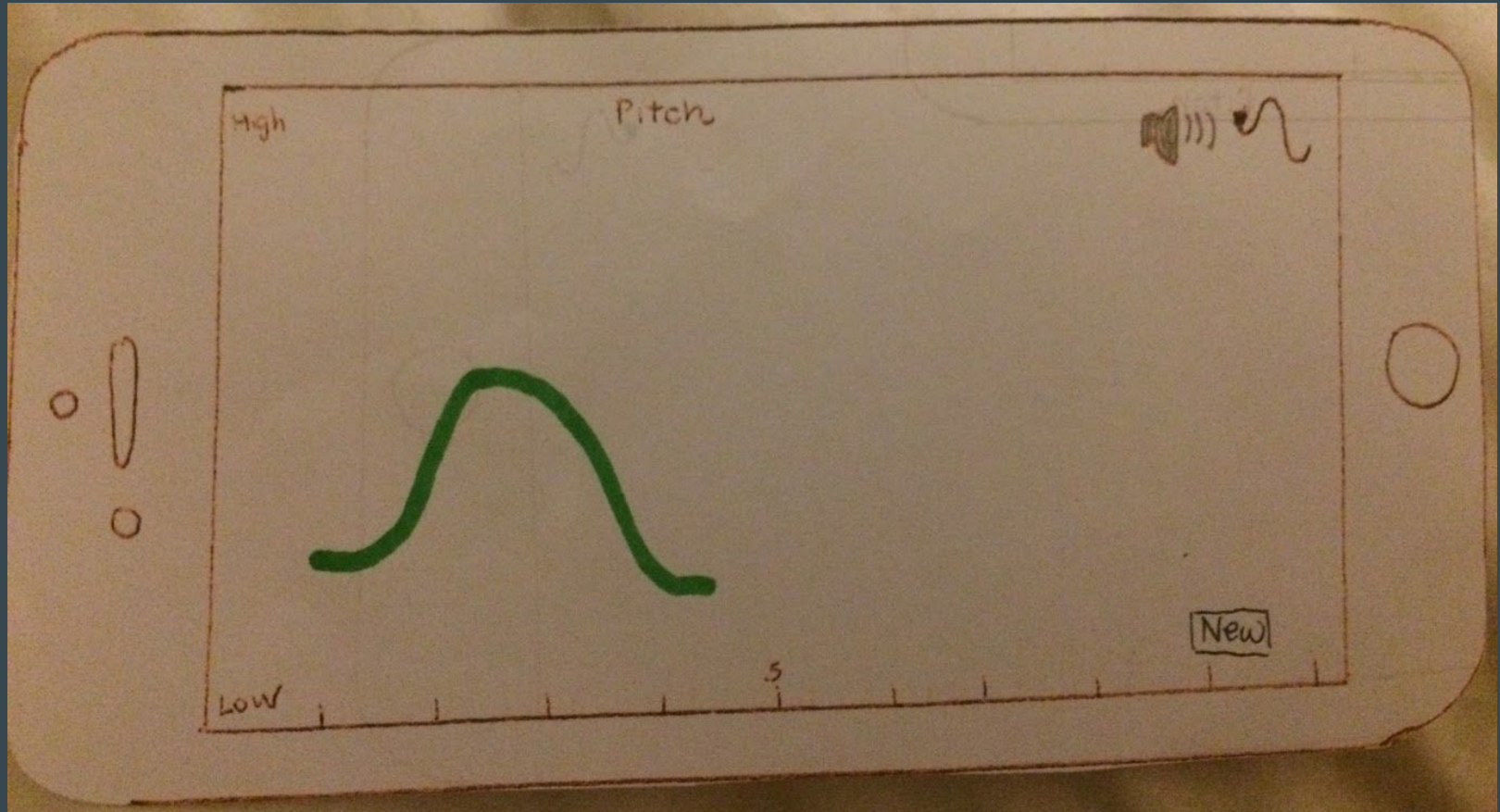
Task 2 (volume view)



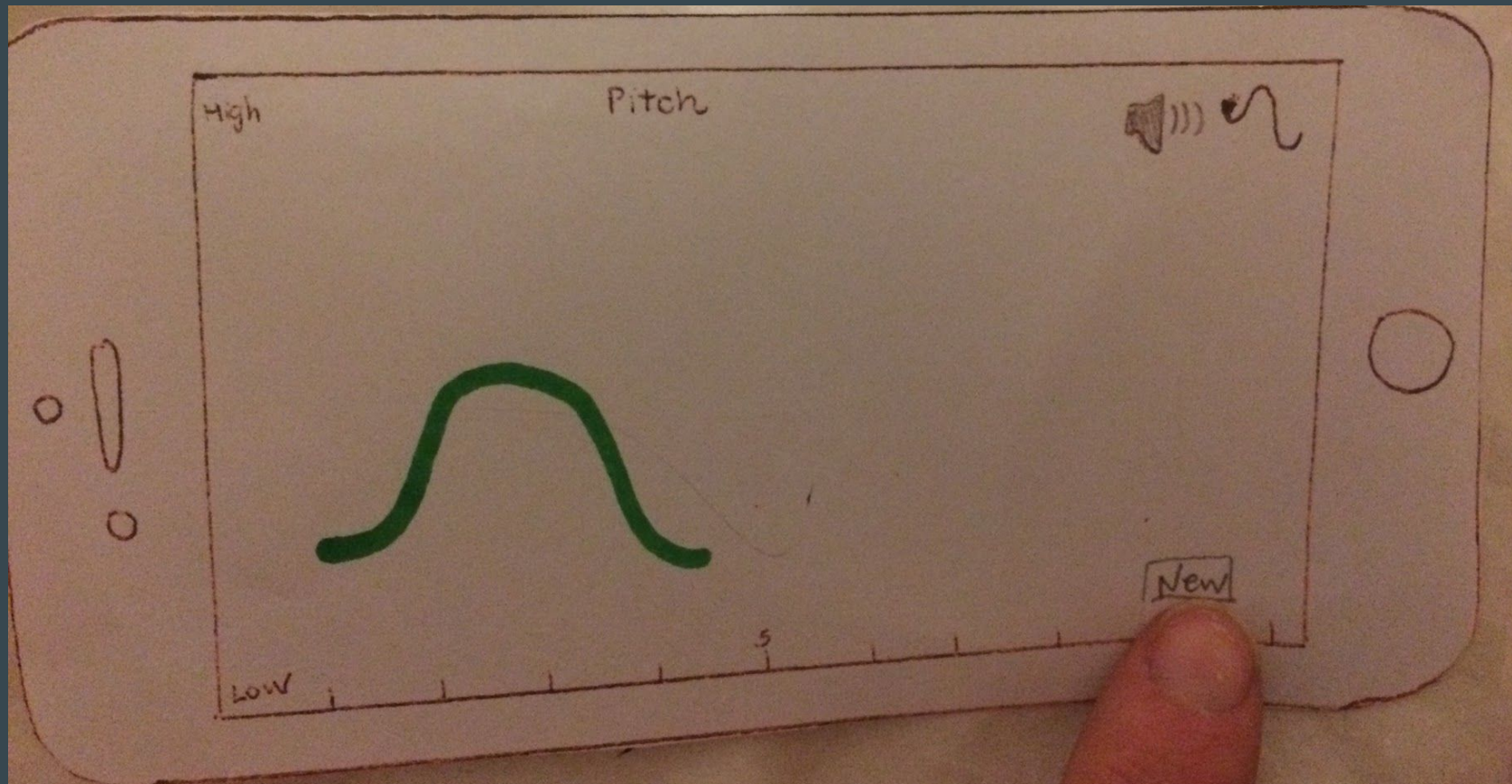
Task 2 (volume view)



Task 2 (pitch view)



Task 2 (pitch view)



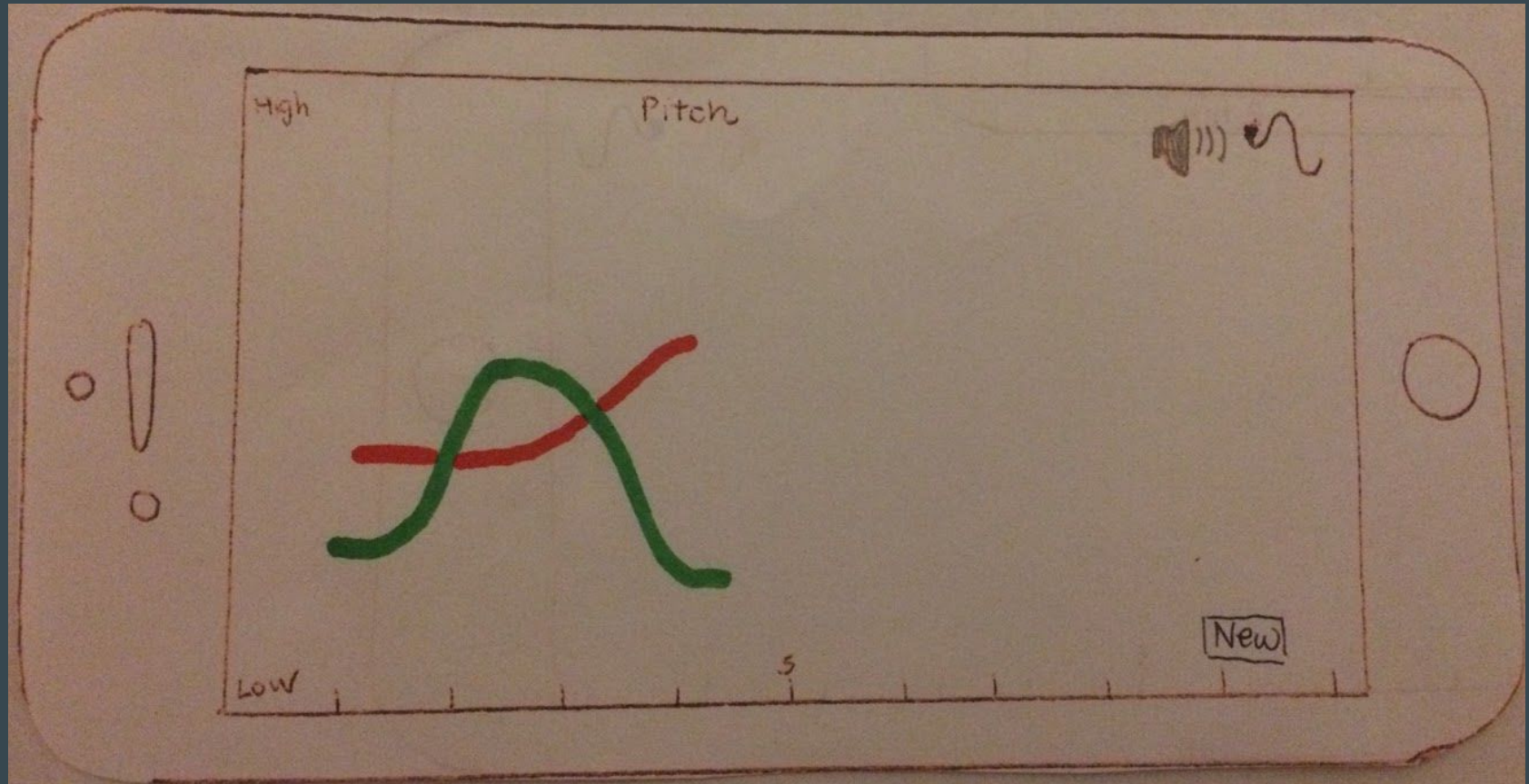
Task 2 (compose new part)

A hand-drawn musical score on a tablet screen. The score is written on a single staff with a treble clef. The notes are: a quarter note G4 (with a sharp sign #), a quarter note A4, a quarter note B4, a quarter note C5, and a quarter note D5. The first note is shaded. Above the staff, the dynamic marking 'mp' is written. A sharp sign # is written above the first note. A box labeled 'Exit' is in the top right corner. To the left of the staff, there are three vertical lines with circles at the top and bottom, and a vertical oval shape. Below the staff, there are several control elements: a box labeled 'Transcribe', a box with '4' over '4', a box with a sharp sign # over a flat sign b, a 3D rectangular block, a play button icon, a vertical bar icon, the dynamic marking 'pp', a vertical bar icon, and the dynamic marking 'ff'.

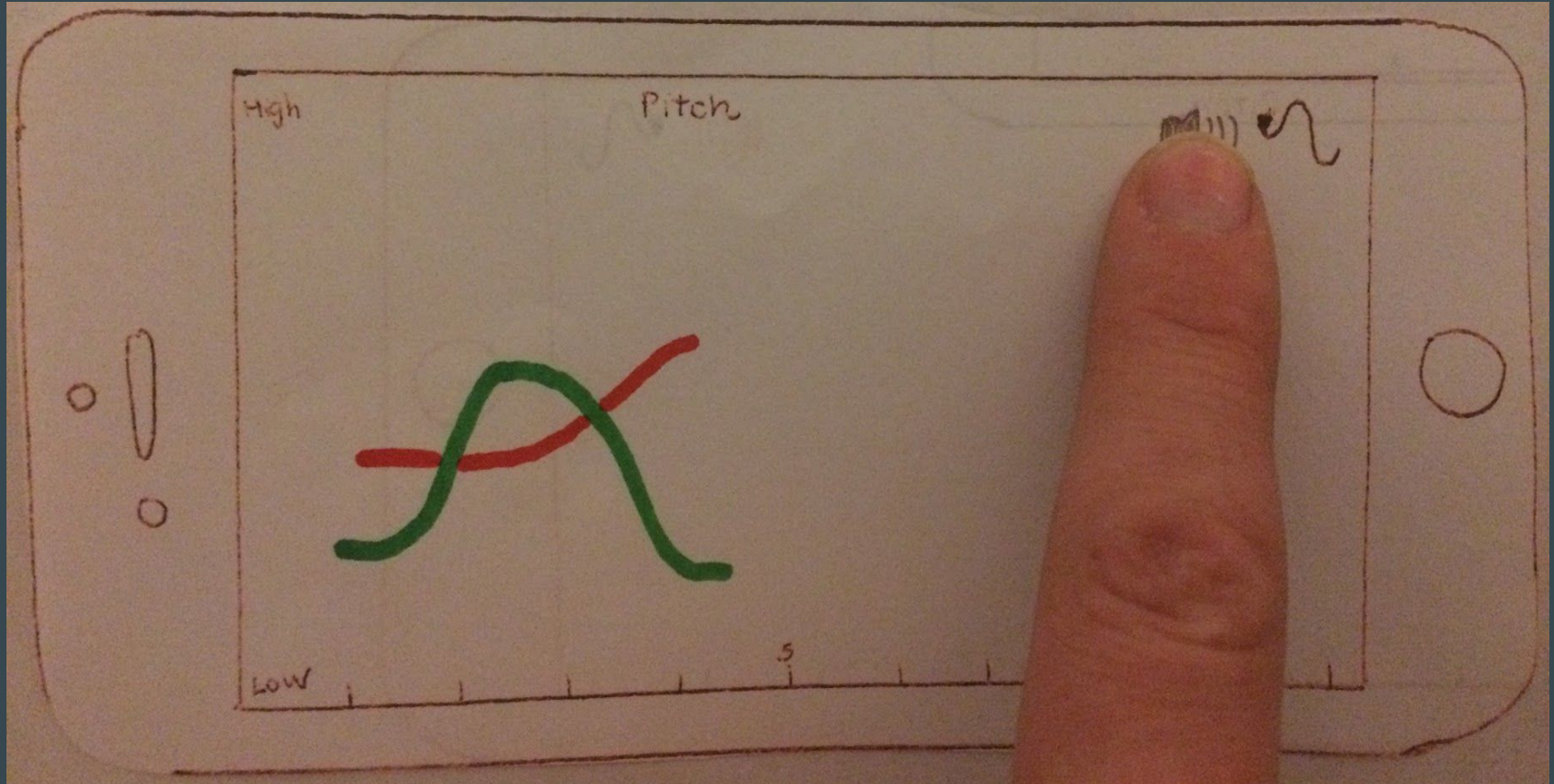
Task 2 (compose new part)

A hand-drawn musical score on a tablet interface. The score is written on a five-line staff in treble clef. It begins with a dynamic marking of *mp* (mezzo-piano) and a key signature of one sharp (F#). The first measure contains a quarter note on the second line (D4) and a quarter note on the third line (E4). The second measure contains a quarter note on the second line (D4) and a quarter note on the second space (F#4). The third measure contains a quarter note on the second space (F#4) and a quarter note on the third line (E4). The fourth measure contains a quarter note on the second space (F#4) and a quarter note on the fourth line (G4). The fifth measure contains a quarter note on the second space (F#4) and a quarter note on the fifth line (A4). The sixth measure contains a quarter note on the second space (F#4) and a quarter note on the fifth line (A4). The score ends with a boxed "Exit" button. To the left of the staff, there are several hand-drawn symbols: a vertical oval, a circle, and a circle. Below the staff, there are several control elements: a "Transcribe" button, a 4/4 time signature box, a key signature box with F# and b, a 3D box icon, a play button icon, a volume icon, and a dynamic marking of *pp* (pianissimo) with a vertical bar. A finger is pointing to the "Exit" button.

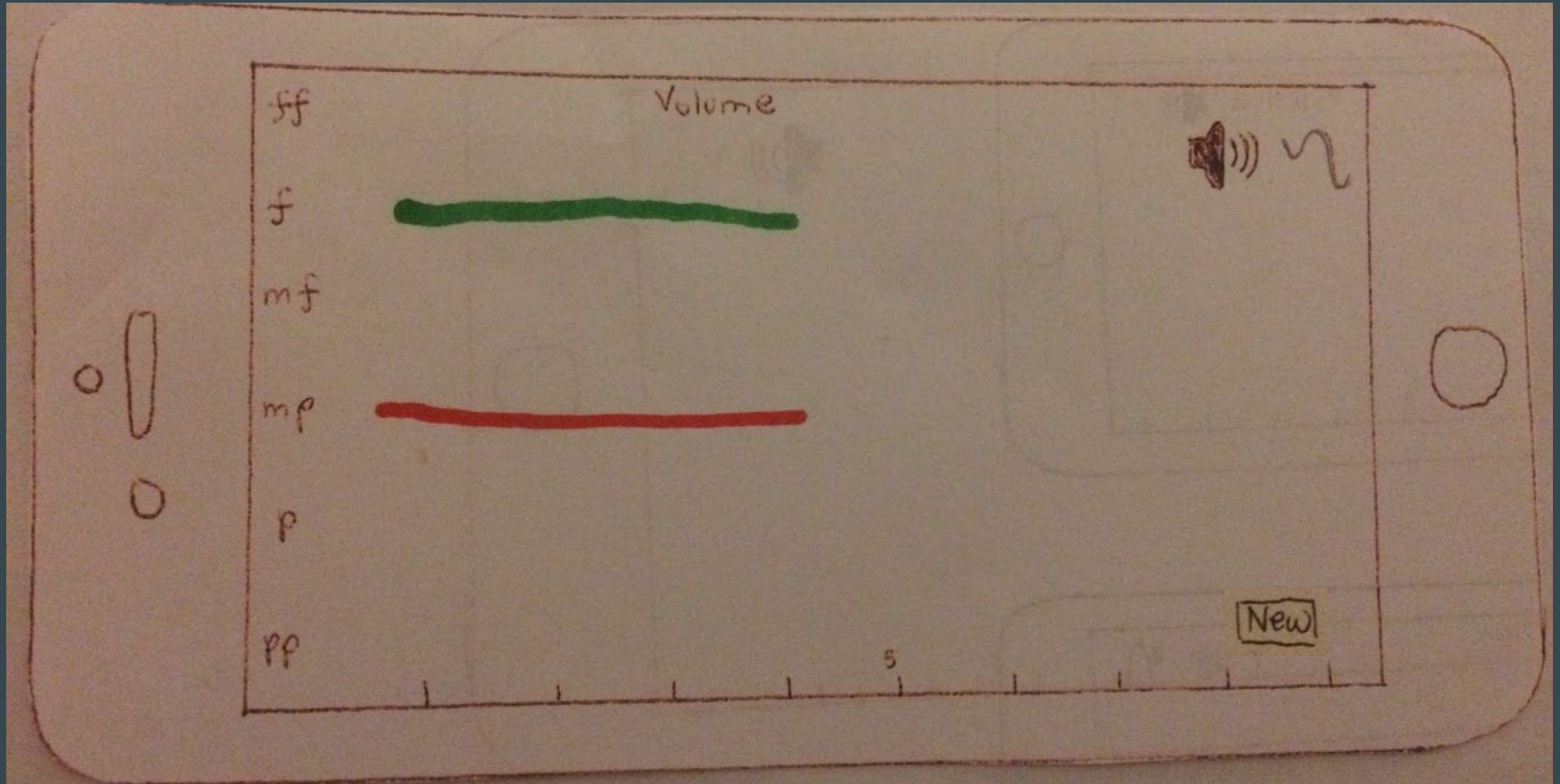
Task 2 (pitch view, multiple parts)



Task 2 (pitch view, multiple parts)



Task 2 (volume view, multiple parts)

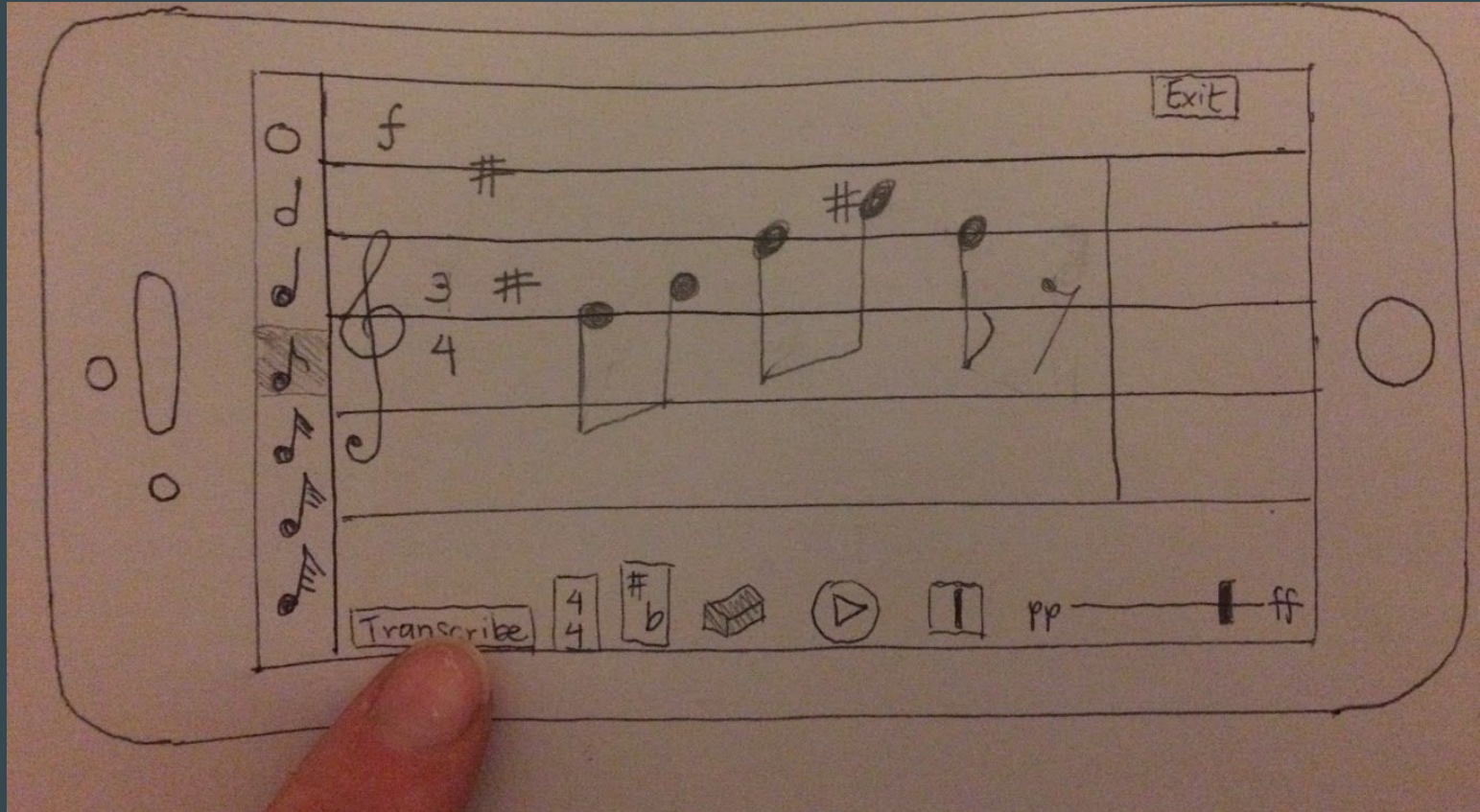


Task 3: Transcribe

Transcribe the composition to a PDF score to give to a musician.

[Simple]

Task 3



Task 3

"Jazz Funk" - Piano

The image shows a handwritten musical score on a piece of aged paper, titled "Jazz Funk" - Piano. The score is written on two staves: a treble clef staff on top and a bass clef staff on the bottom. The music is divided into four measures by vertical bar lines. The first measure contains a treble staff with a quarter note G4 (with a sharp sign) and a quarter note A4, and a bass staff with a whole rest. The second measure contains a treble staff with a quarter note G4 (with a sharp sign), a quarter note A4, a quarter note B4, a quarter note C5, a quarter note B4, and a quarter note A4, and a bass staff with a whole rest. The third measure contains a treble staff with a quarter note G4, a quarter note A4, a quarter note B4, a quarter note C5, a quarter note B4, and a quarter note A4, and a bass staff with a quarter note G2, a quarter note A2, a quarter note B2, and a quarter note C3. The fourth measure contains a treble staff with a quarter note G4, a quarter note A4, a quarter note B4, a quarter note C5, a quarter note B4, and a quarter note A4, and a bass staff with a quarter note G2, a quarter note A2, a quarter note B2, and a quarter note C3. The score is written in black ink on a piece of aged, yellowish paper. There are some faint markings on the left and right sides of the paper, possibly from a scanner or a notebook binding.

User Testing

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Experimental Method

Participant 1: **Byron**

- Composer
- Stanford graduate in Music, Science & Technology
- Involved with research through CCRMA

Participant 2: **Alexander**

- Composer
- Vocal director
- Ear training instructor in the music department
- Member of the Stanford Mendicants

Participant 3: **Joss**

- Composer
- Prolific user of music composition apps (Sibelius, Finale, MuseScore, Notion, and Logic)
- Member of Stanford chamber chorale

Desired Features

- ✓ **Copy and paste:** ability to duplicate notes, chords, and phrases
- ✓ **Tied notes** (including across bar lines)
- ✓ **Tempo:** (in beats per minute, for playback)
- ✓ **Click and drag notes** to change their pitch
- ✓ **Chord inversions**
- ✓ Notes should **change color when selected**
- ✓ **Articulation mode** (e.g., accents, stacatto, legato, crescendo)
- ✓ **Select all** to make multi-note changes
- ✓ **General menu** or “welcome” screen to go back to
- ✓ **Clear all** and **undo** buttons
- ✓ Ability to **stack multiple notes** (even if they’re not a chord)

Experimental Results

- ✓ Users remembered the gestures, and all found them intuitive!
- ✓ Had fun playing with the app and found it useful.
- ✓ Were pleasantly surprised by all of functionality packed into a deceptively simple interface.
- ✗ Users were all confused by the “chord drawing” screen, and drew different things depending on their backgrounds.
- ✗ Hated the “insert bar line” button, and wanted automatic bar lines.
- ✗ Ambiguity about creating chords, e.g., what octave? What duration? What notation (jazz or classical)? Closed or open position?
- ✗ Everyone was confused by the “Exit” button and never got to the visualization screens.

Summary

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- ✓ Compose, Arrange, Share.
- ✓ Visual-centric prototype.
- ✓ Interfaces are intuitive and easy to use -> Natural Mapping
- ✓ Limitation: Music is complex! It's challenging to make a simple interface.
- ✓ Implementation: easier, faster -> embodied interaction, suggestion.
- ✓ Design the whole experience.