BACHELOR THESIS PROJECT

Intonation Training for Children with Hearing Impairment

Sree Mahit Munakala | 160205040

Under the guidance of Sharmistha Banerjee

with Chetan Manda | BDes 2016-20

What is Intonation?

Intonation training involves training your speech in terms of Pitch, Loudness and Rhythm, a subset of voice modulation.

We spoke to a few people...

Prof. A. K. Biswas
SPEECH THERAPIST, GMC

Rohit Gupta
INTERN, GMC

Prof. Samudravijaya
DEPT OF CLST

Prof. P. K. Das
DEPT OF CSE

... and got a few insights!

Speech therapy starts at 3-4 years of age and can go on till age **12-15**.

Patients are **dependent** on therapists. This is **expensive and time-consuming**.

Voice training is **repetitive**, with certain **exercises** suggested.

Problem statement

Design a solution that enables hard of hearing teenagers aged 12-15 years with cochlear implants to improve voice intonation through carefully crafted training exercises and realtime feedback on speech, with minimal remote monitoring by the doctor.

The Gaps in the project

- Is there really a **need** for such a trainer?
- Who are the **potential users**/clients who might use our application.
- What **curriculum** should we add that is **medically supported?**
- What are the **nuances** of training kids who are **hard of hearing?**
- What are the **existing applications** available in the market?
- How should we **test** this concept that we had with **experts?**

For answers, we went to the...

All India Institute of Speech and Hearing

Mysore, Karnataka

and sunk in 16K between us :/

Dr. Nisha K. V.
M.Sc, PH.D (AUDIOLOGY)
AIISH

The Need

The **intonation training** for hard of hearing kids starts at the last stage of speech therapy when the child is **around 12 years old** and is often **neglected**.

The kids **drop out** of speech therapy and go on to do school work since visiting the doctor every week proves **cumbersome**.

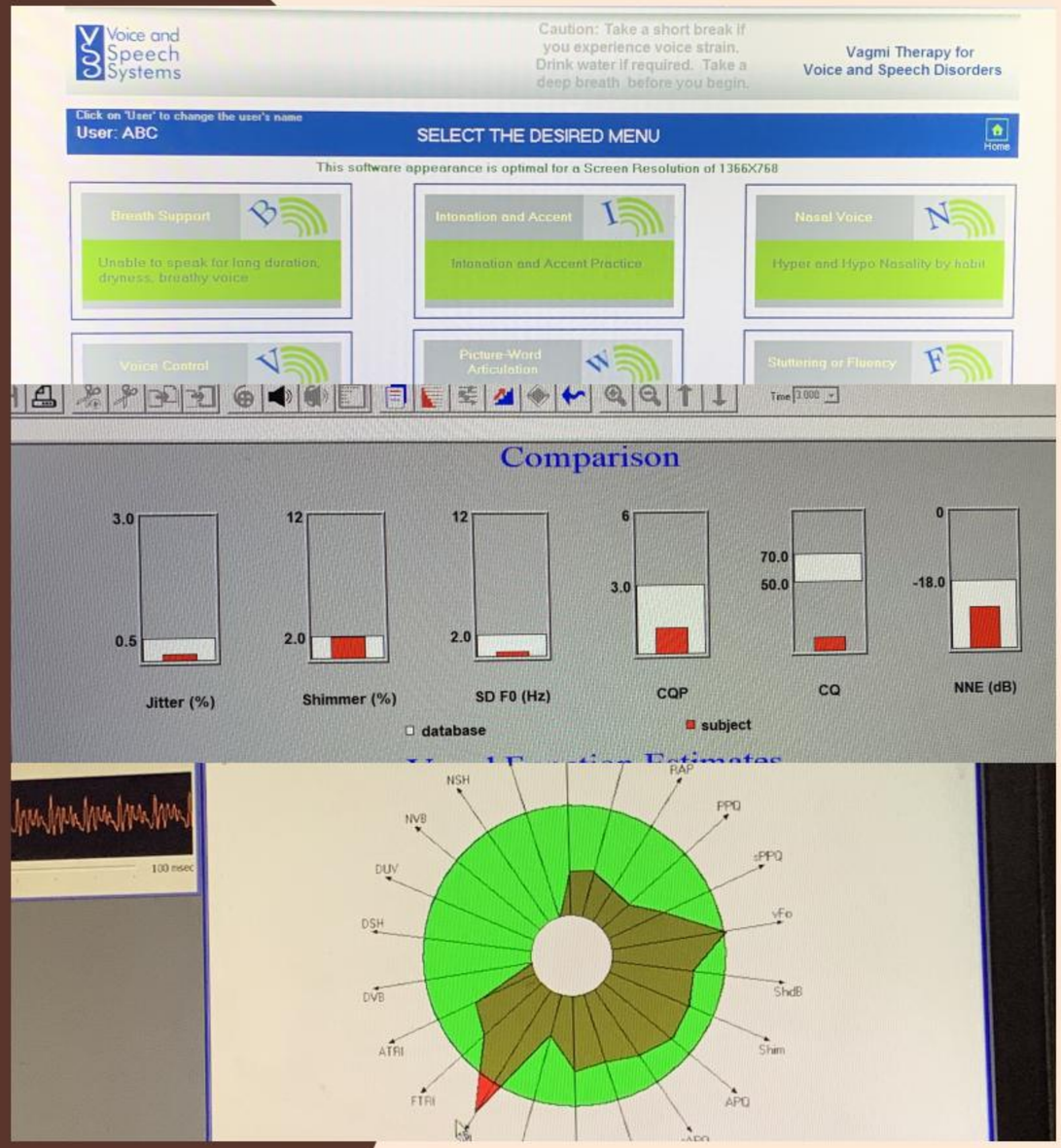
Existing devices

Dr. Speech is an American speech training product that allows children **practice pitch** and other factors.

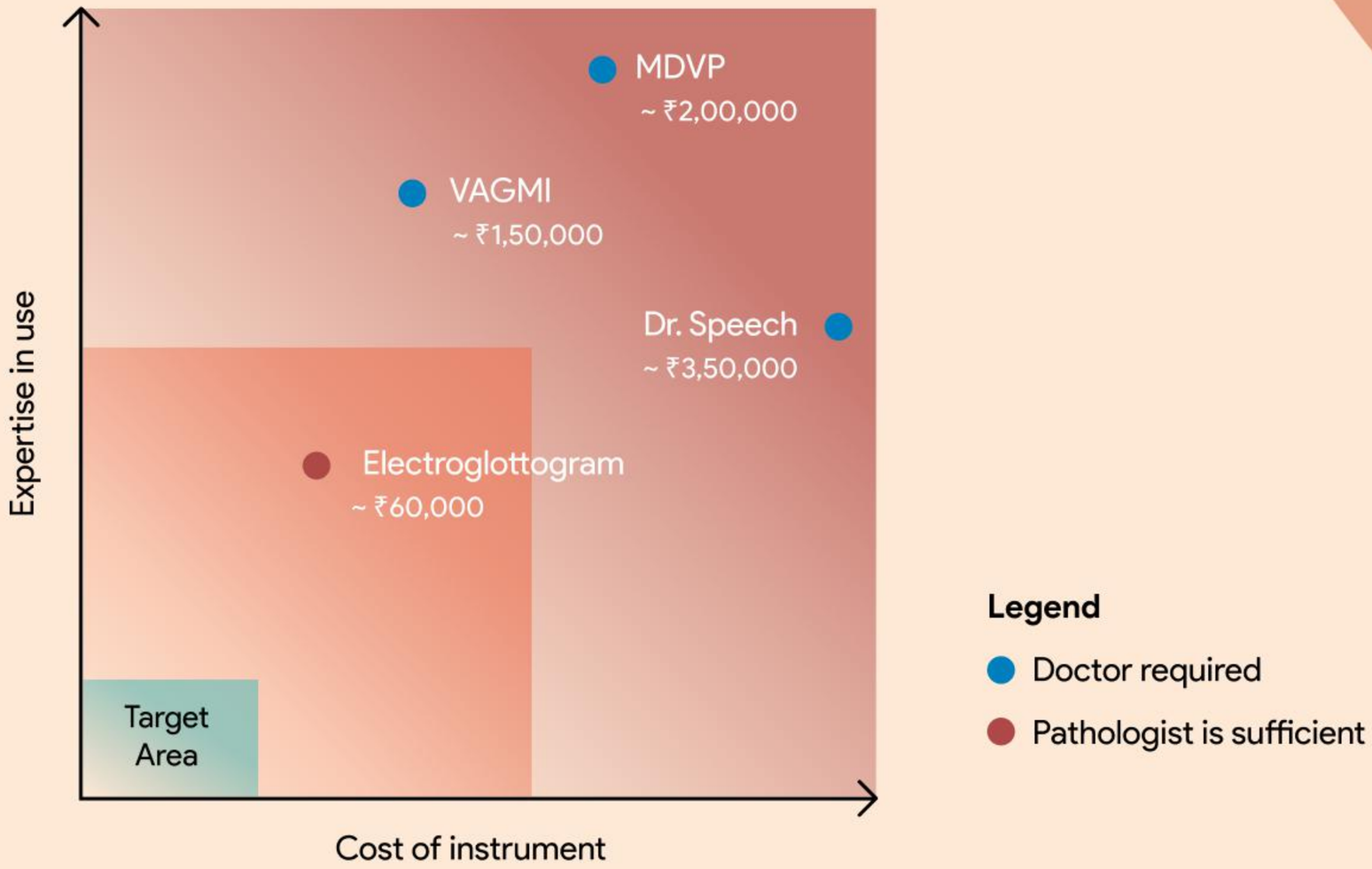
VAGHMI is an Indian speech therapeutic tool designed for **daignostic purposes** for doctors.

The Multi Dimensional Voice Program is used to measure **33 different parameters** of voice.

An electroglottogram helps evaluate and identify any **physical anomalies** in the throat for a patient.



COMPETITOR ANALYSIS



Akshay M.
SPEECH LANGUAGE PATHOLOGIST
AIISH

The Curriculum

We got access to a set of **113 words** used by **Dr. Speech** to train children.

We also found a **research paper** which maps **different syllables** to different levels of **difficulty** while saying them

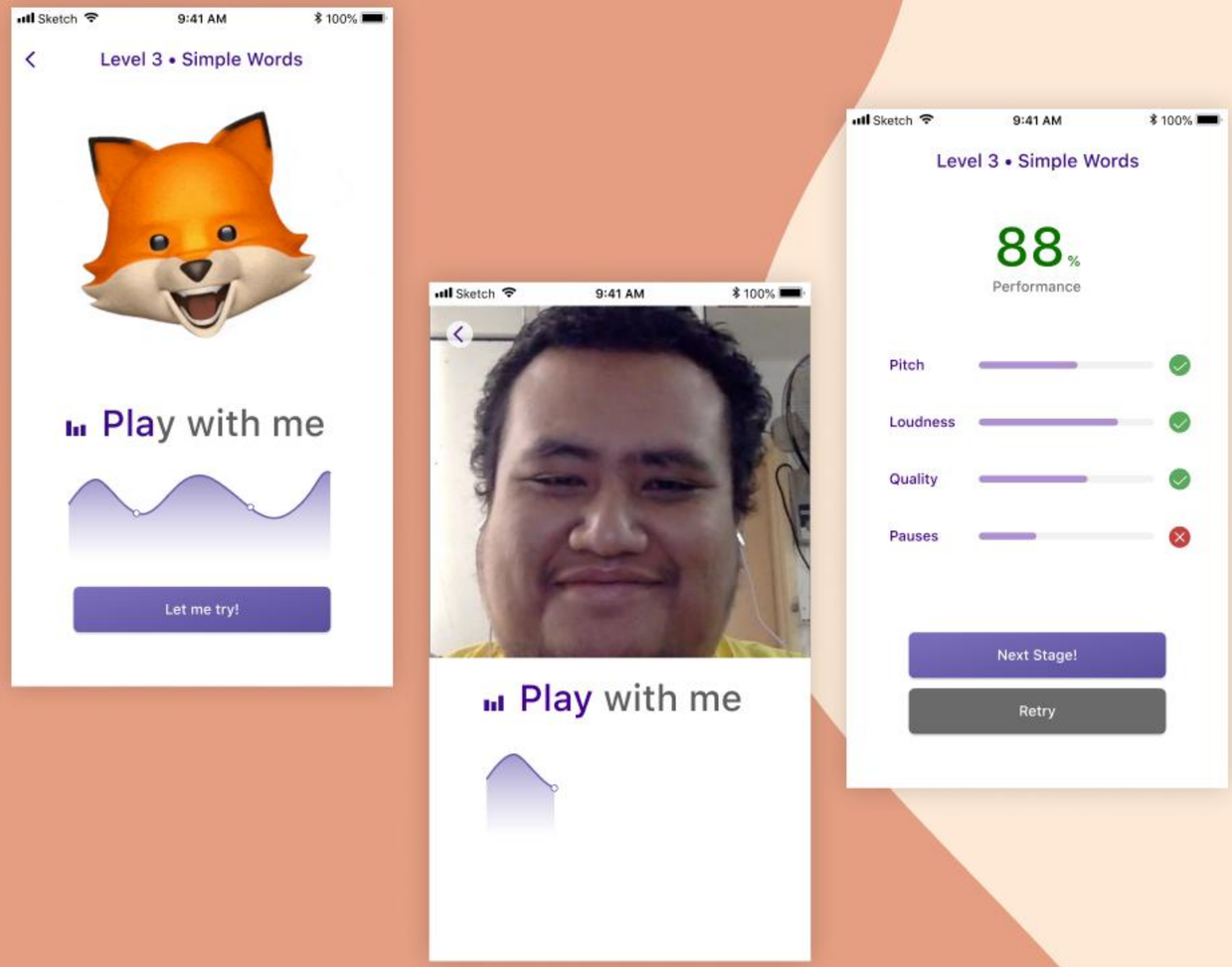
Words

File Edit View Insert Format Data Tools Add-ons Help All changes saved in Drive

Share

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1				Body Parts	Animals	Wild Animals	Food	Clothes	School	Electronics	Daily Use Items	Vegetables	Weather	More Food	Transportation	Nature
2	Total = 113	p	Papa		Pig							Potato				Pond
3		m	Mama													Moon, M
4		h						Hat								
5		n						Pant								
6		w			Cow								Winter			Rainbo
7		b			Rabbit							Cabbage				
8																
9		k			Donkey		Biscuit, Cake		Book	Computer	Comb	Cucumber		Kheer		
10		g			Goat									Dosa, Dal	Firebrigade	
11		d		Hand	Dog	Deer								Noodles		Field
12		t		Tooth	Cat	Tiger		Tie		Television	Toilet	Tomato			Motorcycle	
13		ng														Lighting
14						Monkey										
15		f		Foot			Fruit Juice	Frock, Muffler		Fan, Telephone						
16		y		Eye												
17												Carrot, Brinjal				
18		r		Hair, Ear					Eraser	Tape Recorder	Toothbrush		Rain	Roti		Trees
19		l				Elephant, Lion				Lamp	Towel				Aeroplane	
20		s		Nose	Horse		Samosa, Ice Cream	Socks, Saree	Pencil		Soap, Toothpaste		Summer	Rice, Dosa	Bicycle, Police	Sun,Se
21																
22		ch					Chakli, Chocolate			Washing Machine						
23		sh						Shirt			Shower, Washbasin				Ship	Sunshir
24		z														
25																
26		j				Giraffe	Jalebi									
27		v														
28																
29		th (thumb)		Mouth												
30		th (this)														
31																
32		zh (measure)				Zebra										
33																
34																
35																
36																

Sheet1



Expert Review

The concept was **positively** received. In general, the scope of the concept was appreciated and encouraged.

Feedback

The scores needs to be displayed in a more **understandable** manner.

Do **not** include a front facing camera. it confuses the child.

The concepts of pitch, loudness and rhytm needs to be **taught** first.

LOVE BEING EXPERTS

Provide **feedback** instead of informing them upfront

CAN BE CHALLENGING

Keep the complexity rather **high**

DIVE INTO OPPORTUNITIES

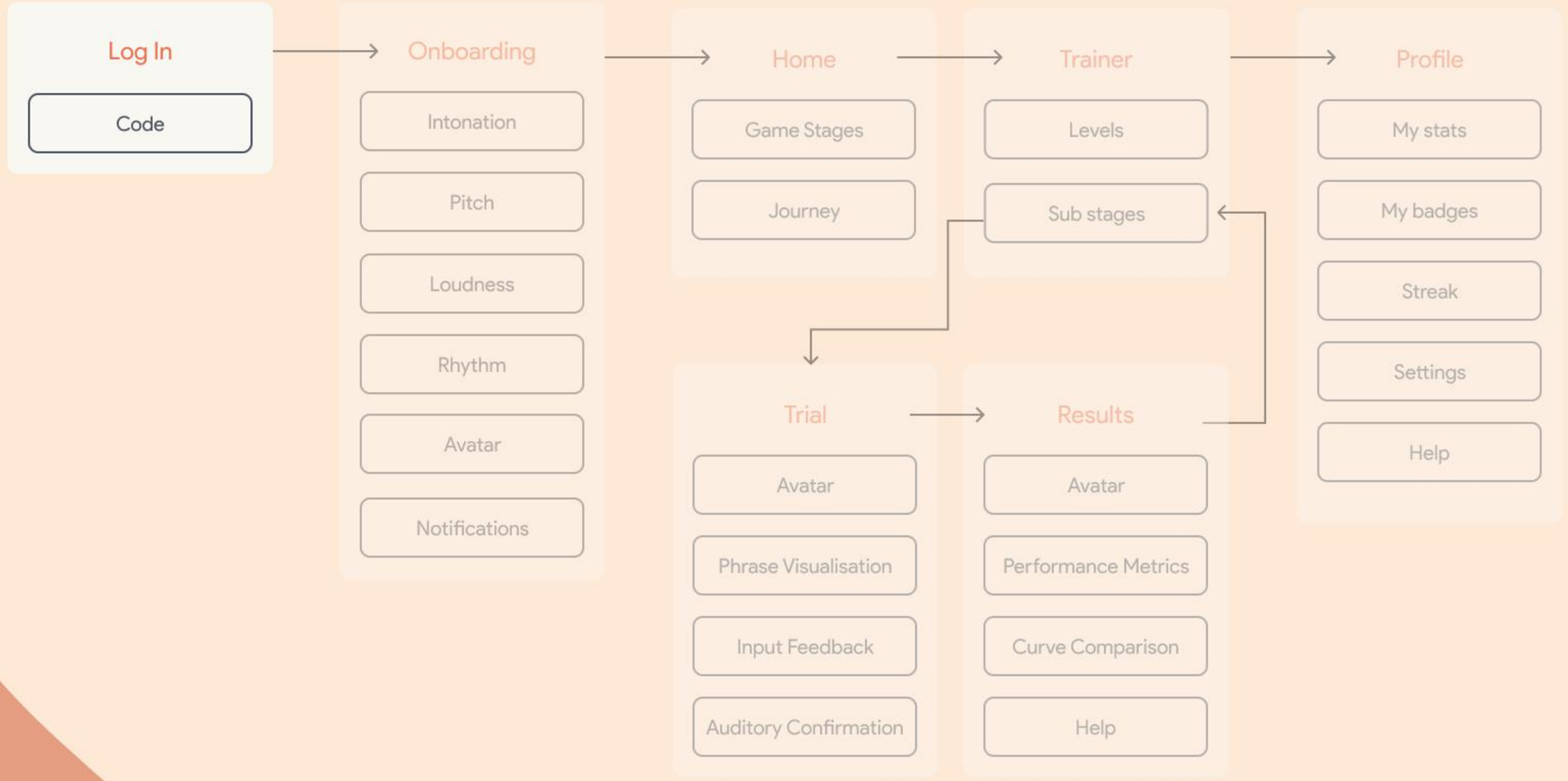
Let them **explore** and investigate

KEEP THEM HOOKED

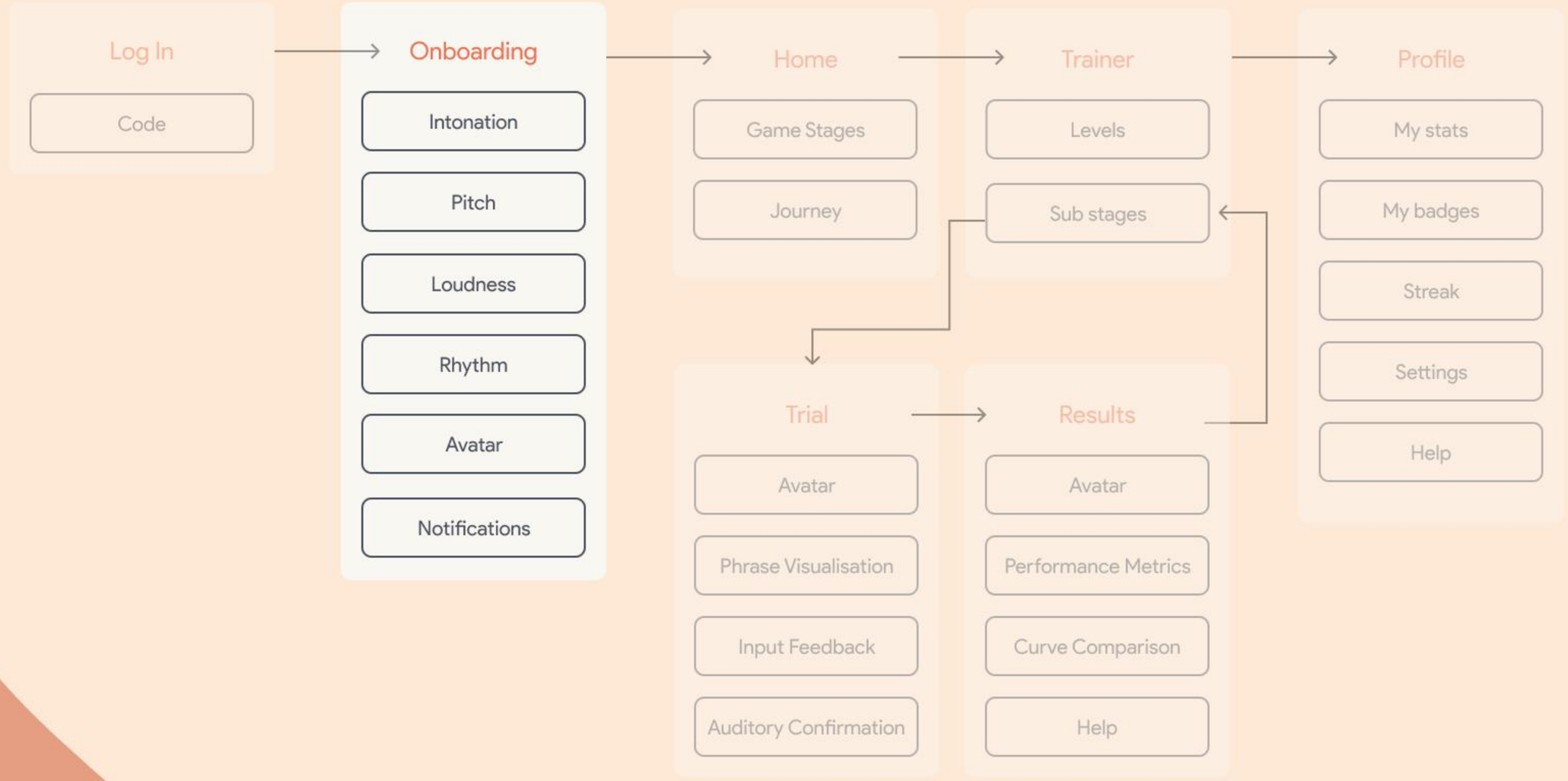
Addictive elements and **rewards** are key

Let’s gamify the experience!

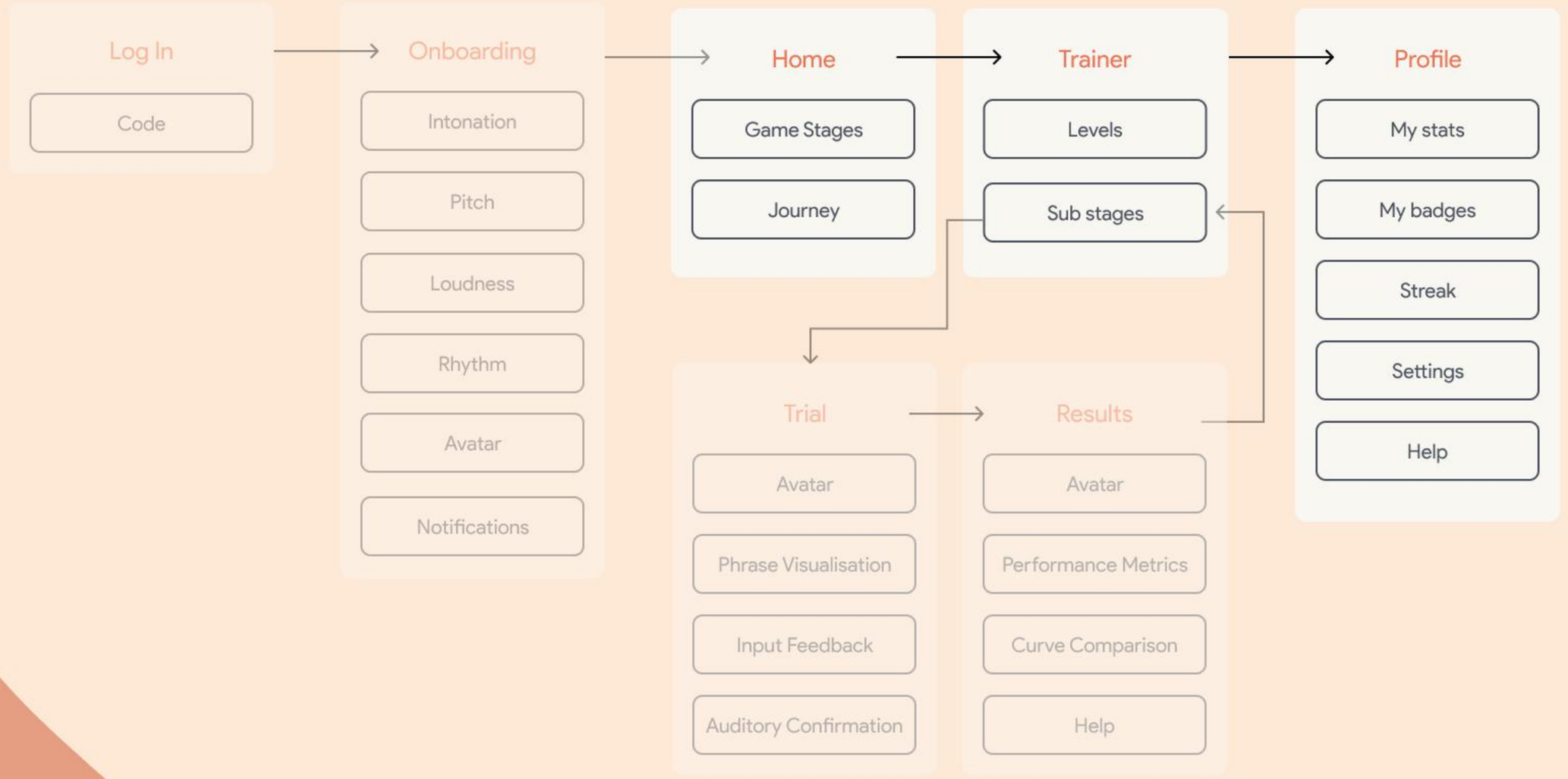
User Journey



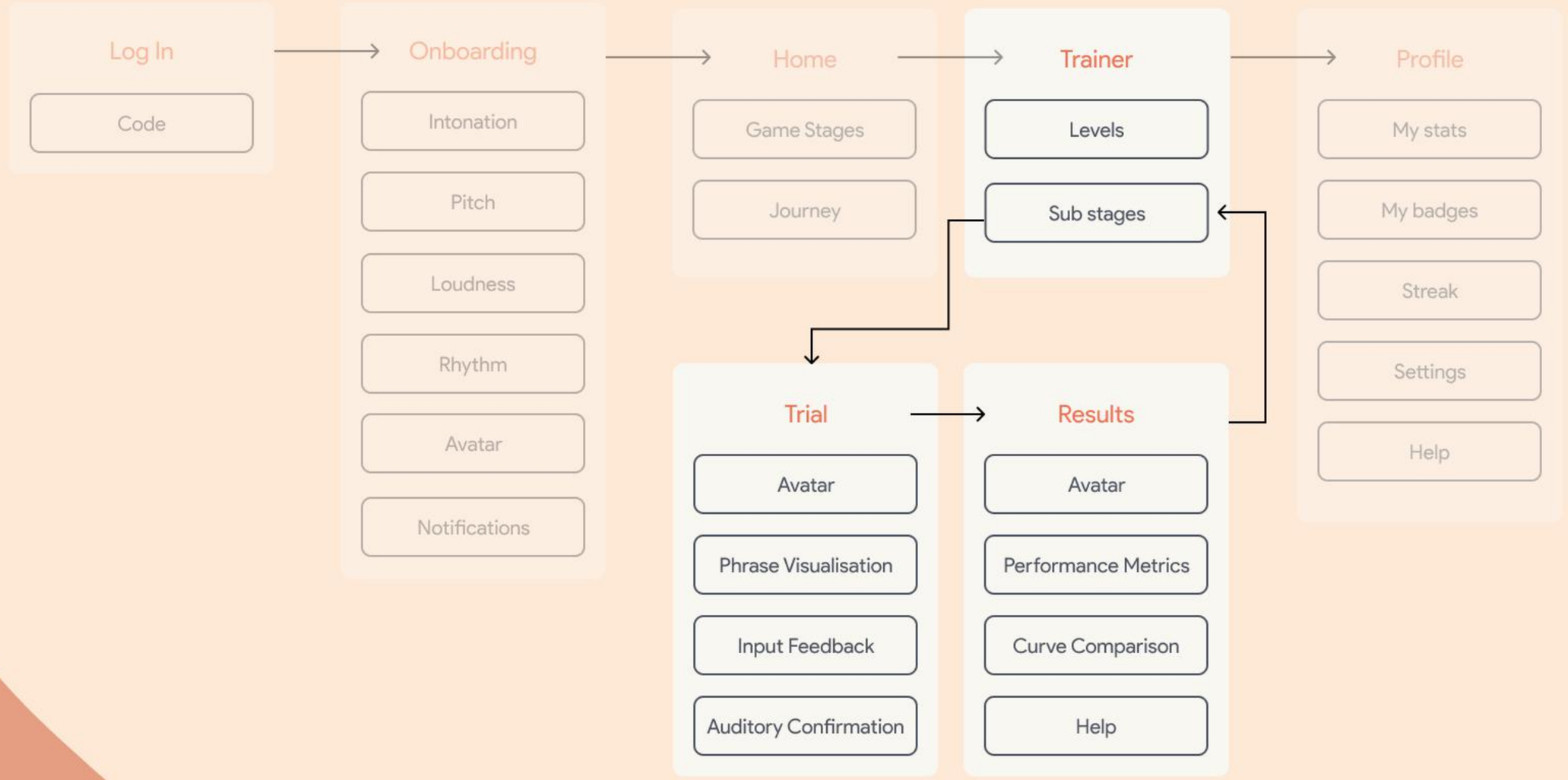
User Journey



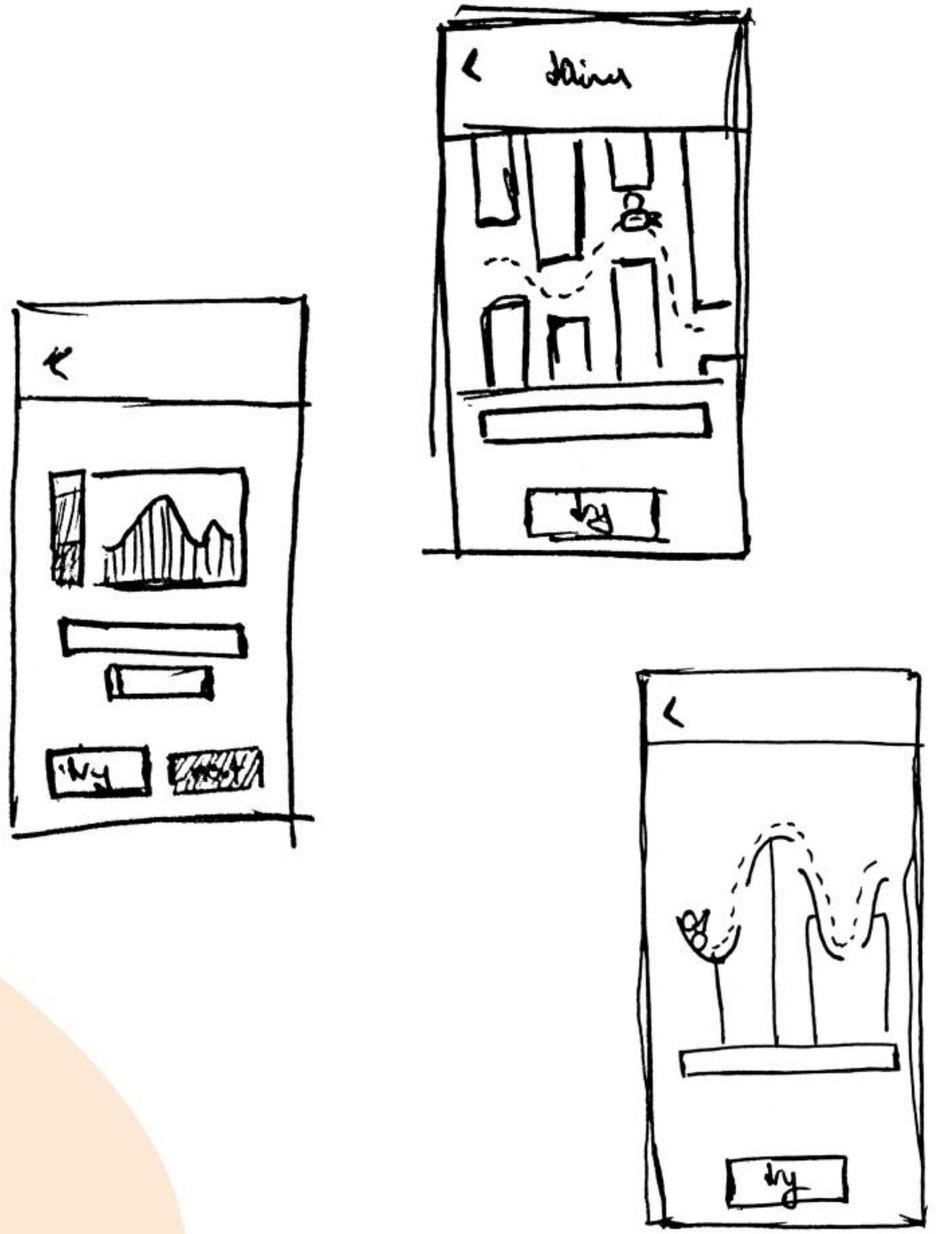
User Journey



User Journey



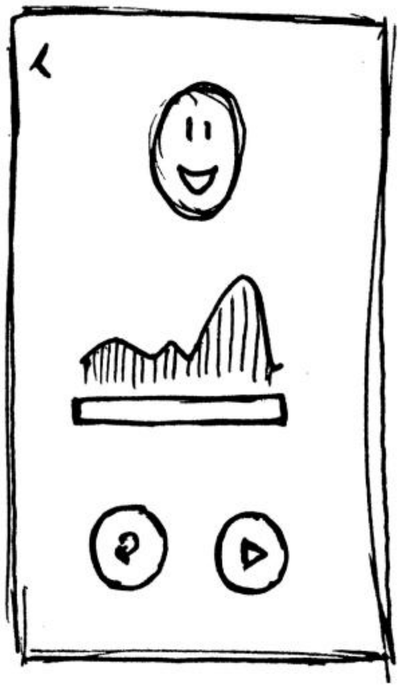
Wireframing

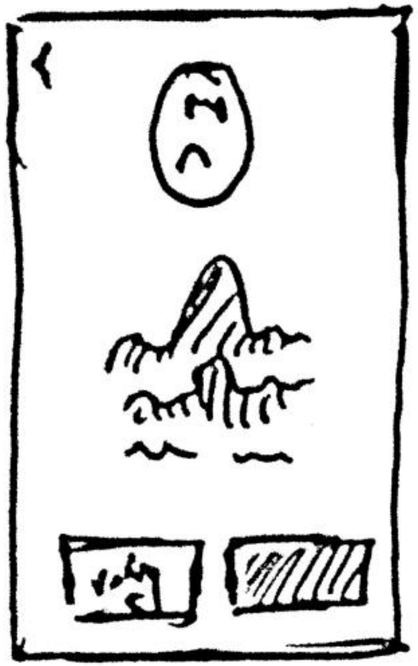


CONCEPT 1

This concept looked at making the pitch graph an engaging, playful game where the pitch curve dictates the movement of the hero.

Wireframing

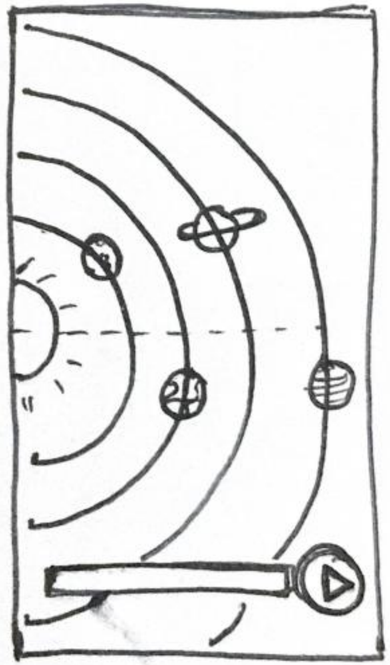


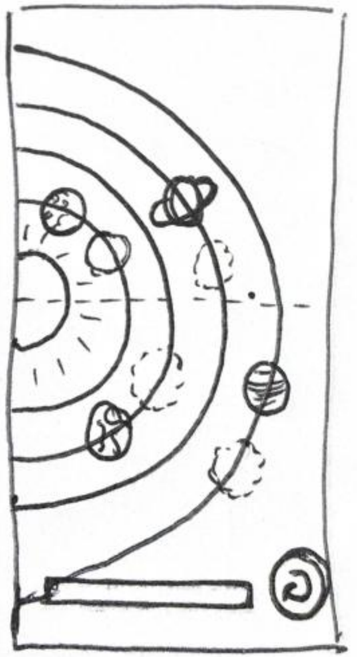


CONCEPT 2

This concept focused on the pitch curve itself and offers a quantitative comparison of the reference and the user curves.

Wireframing

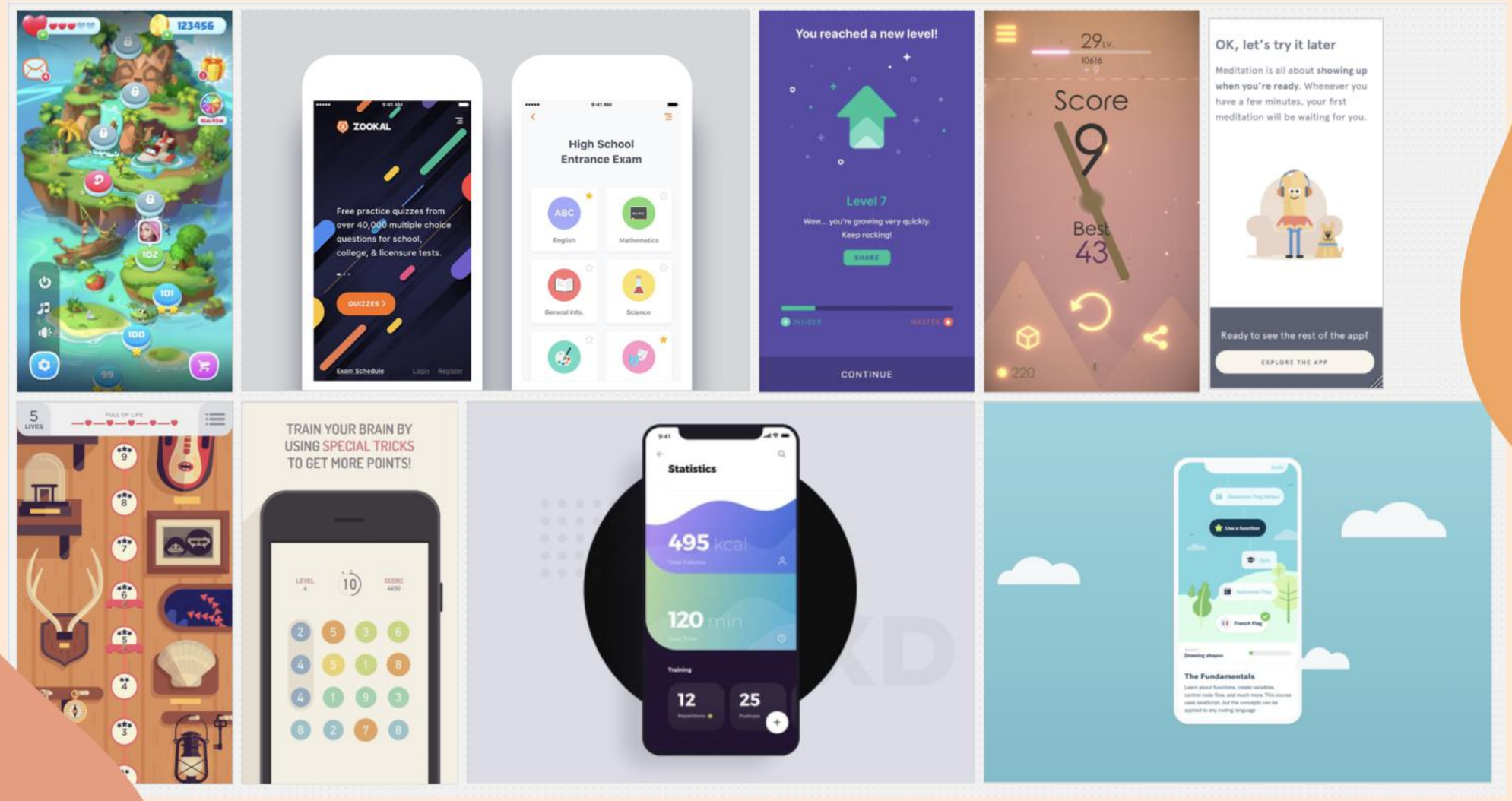




CONCEPT 3

This concept visualises the pitch curve with the help of the relative positions of planets, and they are controlled by the user's pitch and intensity.

Moodboard

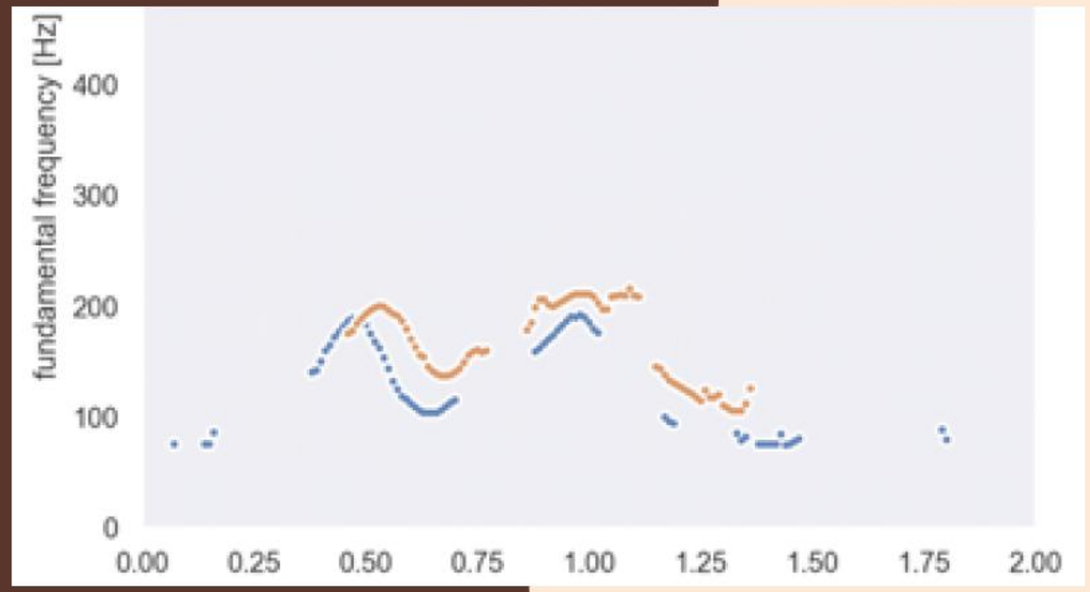

123456
ZOOKAL
Free practice quizzes from over 40,000 multiple choice questions for school, college, & licensure tests.
QUIZZES
Exam Schedule
Login
Register
High School Entrance Exam
ABC
English
Mathematics
General Info.
Science
You reached a new level!
Level 7
Wow... you're growing very quickly.
Keep rocking!
SHARE
CONTINUE
29 LV.
10616
Score
9
Best
43
220
OK, let's try it later
Meditation is all about showing up when you're ready. Whenever you have a few minutes, your first meditation will be waiting for you.
Ready to see the rest of the app?
EXPLORE THE APP
5
LIVES
TRAIN YOUR BRAIN BY USING SPECIAL TRICKS TO GET MORE POINTS!
LEVEL
10
SCORE
Statistics
495 kcal
120 min
Training
12
25
The Fundamentals

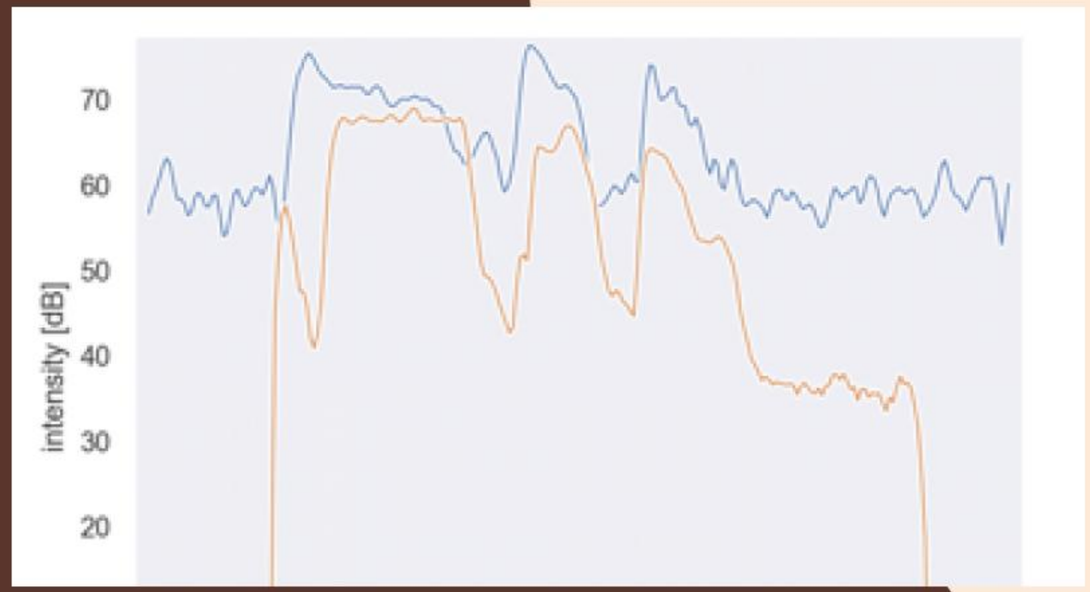
The Product

BOLO

Speak with Confidence

The Tech





Shivang Dalal

B.TECH 3, C.S.E

The Backend

We roped in Shivang Dalal, a third year Computer Science graduate to help us **develop** the trainer.

We developed a **python script** that compares the frequency, intensity and time of the child's speech and the reference audio, to get a **score**.

Preliminary Testing

Parameter Ranges

Quality	Pitch Range
Good	29-54 (Any value below 54)
Moderate	54-79
Bad	79-112 (Any value above 79)

Loudness	Intensity Range
Suitable	9-20
Improper	>20

*The values are obtained from preliminary testing and are subject to change after further testing

	Sentence number	Pitch difference	Intensity difference	Percieved quality of attempt
User 1:	1	77.39153279	14.55359936	Moderate
Arpit	2	168.3775291	19.72238092	Moderate
Male	3	48.38882048	13.90234261	Good
20 years old	4	45.58303316	13.56563872	Good
	5	54.58022734	18.04910546	Good
	6	49.35139068	17.61462372	Good
User 2:	1	32.31226309	10.92568187	Good
Vidhi	2	58.8700051	17.62019685	Moderate
Female	3	73.70368063	11.09055468	Moderate
20 years old	4	78.0614718	16.7859459	Moderate
	5	50.2642165	16.18856248	Good
	6	82.02779853	40.72396594	Bad
User 3:	1	64.67670996	9.818618145	Moderate
Prakash	2	83.65626304	17.81121389	Bad
Male	3	29.39878874	11.68236639	Good
20 years old	4	69.47149783	13.93354754	Moderate
	5	51.22054157	18.00058369	Moderate
	6	86.22852684	17.69086359	Moderate
User 4	1	36.66227873	17.9330928	Good
Adrita	2	43.49850416	18.94158249	Good
Female	3	36.62812748	10.17897918	Good
26 years old	4	45.50532454	18.14816295	Good
	5	41.66986962	21.86897007	Good
	6	32.50611731	22.13529111	Good
User 5	1	34.95831742	15.0930193	Good
Anshuman	2	143.8294947	20.74296377	Bad
Male	3	28.45125125	18.82196437	Good
20 years old	4	79.15989216	26.87655115	Moderate
	5	98.83289371	19.1074078	Bad
	6	112.7514345	24.08214785	Bad

Monthly Spotlight

TIMELINE

DEC

App **Development**

Finetuning application
Front-end development
Integration

JAN-FEB

Concept **Testing**

Hearing-impaired children
Child experts
Subject-matter experts
Usability evaluation

MAR-APR

Product **Launch**

AIISH
Third-party vendors
App publishers

“Once the application gets developed, AIISH would love to be your first user and the other speech institutes would follow us”

PROF. M PUSHPAVATHI

DIRECTOR, AIISH

Thank you very much!