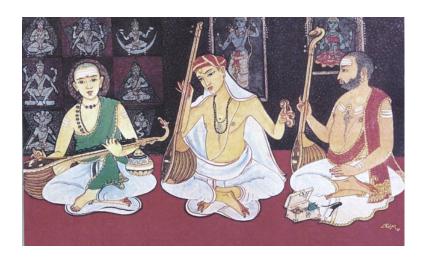
ACADEMIC PROJECT 2

INTERACTION DESIGN

Ramprasad S / 126330011 / IDC IIT Bombay

Guide: Prof. Pramod Khambete

The project Carnatic Music



What is it?

'vocal music' - most compositions are written to be sung with lyrics in the form of kritis, varnams, etc

The basic elements śruti (the relative musical pitch), Swara (the musical sound of a single note), rāga (the mode or melodic formulæ), and tala (the rhythmic cycles).



Carnatic music How do we learn?

Varisais graded exercises (sarali, janda, dhattu)

Alankaras exercises based on the seven talas

Geetams or simple songs

Swarajatis

Varnams

Kritis

Fit to perform at a concert!



The project Objectives

- To design an interactive tool for learning to sing and practise beginner-level Carnatic music lessons.
- ii. To design audio-visual, task based interactions that help in understanding concepts in Carnatic music that are difficult to comprehend when recited or written as text.
- iii. To bring in elements of healthy competition, sharing and life-long music/singing practise.

Design Process

August

- Finalising of topic
- Defining the need of the problem
- Secondary Research
- Existing products

September

- User studies with Music teachers
- User studies with Music learners
- Understand the current learning process
- Analysis and personas

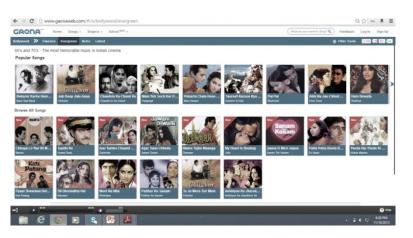
October

- Analysis and personas
- Redefine the brief
- Concepts
- Scenarios

November

- Design
- Report writing
- Prototyping and testing

Secondary Research



www.gaonaweb.com

Secondary Research



Shankarmahadevanacademy

Secondary Research

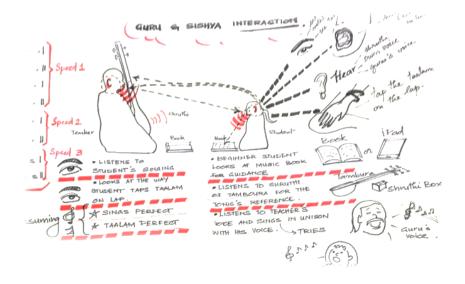


iCarnatic Android App

Primary Research

Shadowing

Semi-structured Interviews



Potential Users

Children between the age group of 4-16

Novices/struggling advanced beginners of carnatic music vocals





Observations



Sing along with the teacher or sing alone as the case may be.

Ask for help, convey difficulties if any to teacher..



See

See the Music Notation on the text book.

See the Teacher's face (also expressions) and his hands tapping Taalam

Understand content



listen

Listen to the shruthi/ tonic drone from tanpura

Listen to Teacher's voice as a reference to one's own singing.

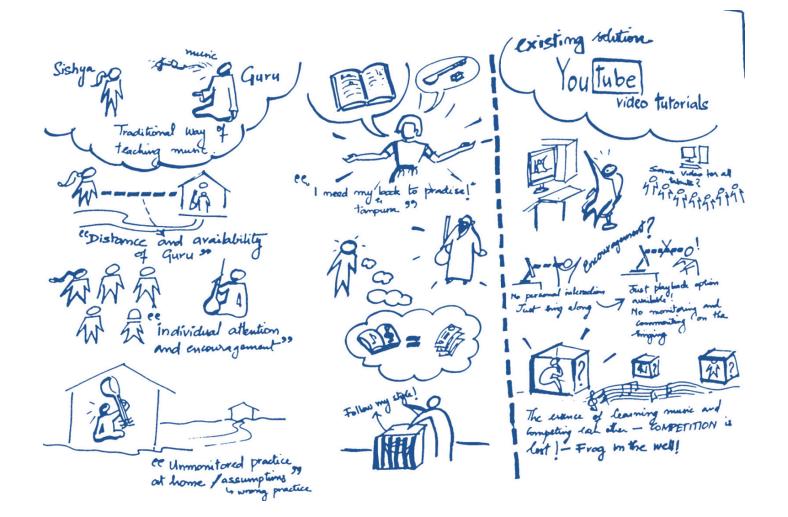
Listen to one's own voice.



Tap/turn

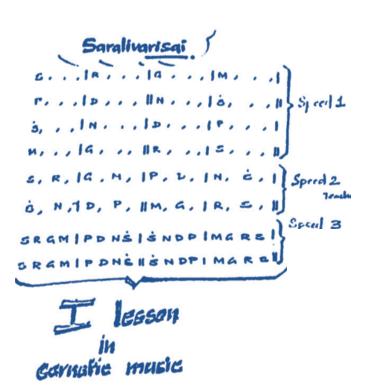
Tap and turn according to Teacher's instructions/Notation.

User Statements



Carnatic music How do we learn?

Varisais graded exercises (sarali, janda, dhattu)



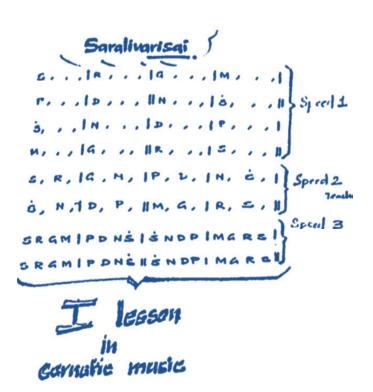
Varisais

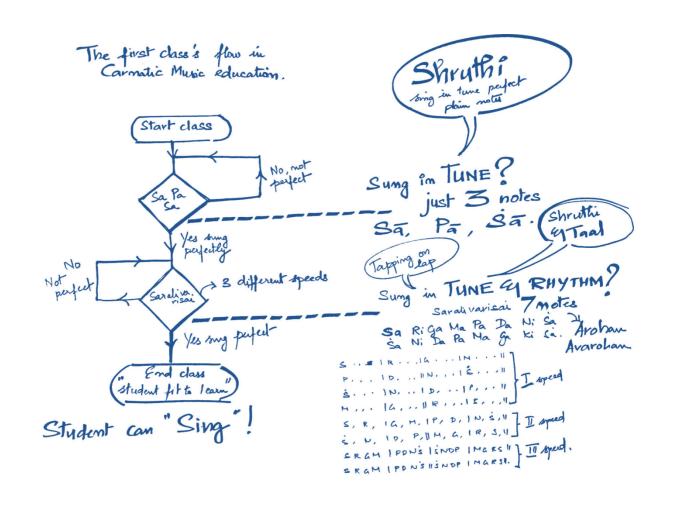
The fundamentals

Tuning (SA PA SA)
Singing in tune and in rhythm (saralivarisa)



Fit to sing!

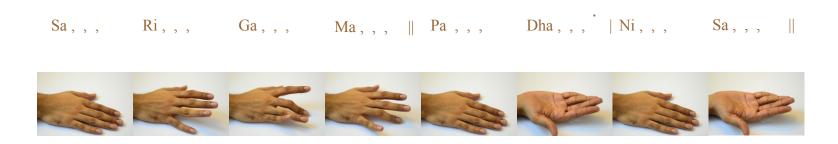


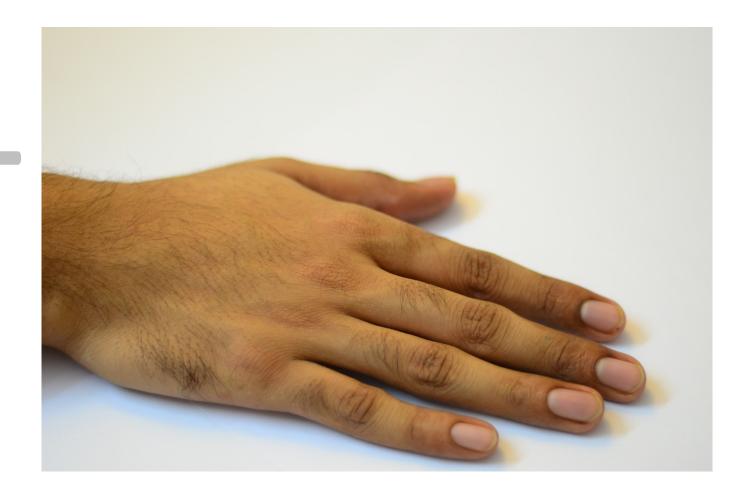


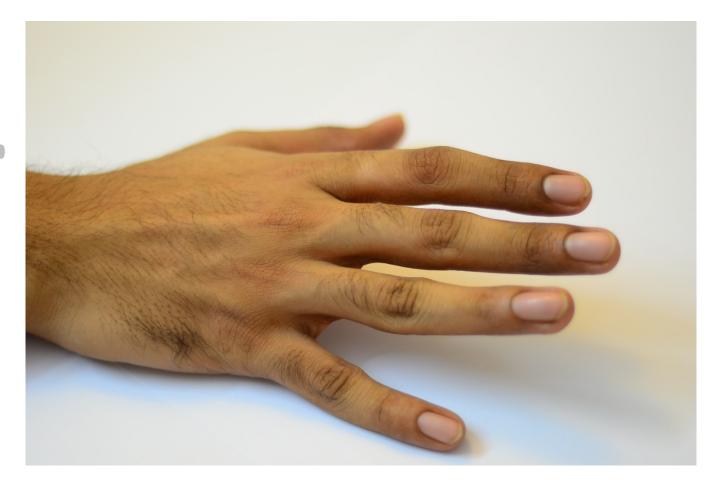
Major Problems

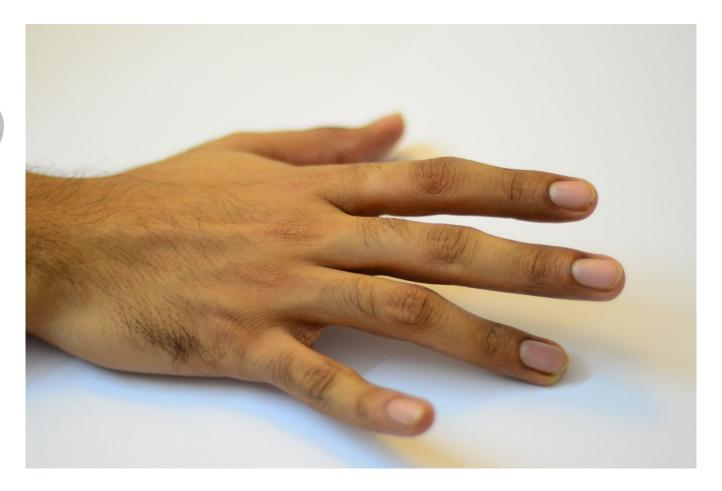
- Singing in tune.
- Singing in rhythm.
- Learning to tap the taalam while singing.
- Pronouncing the apt notes/swaras without error.
- Learning to Sight-sing the music notation.
- Singing in different speeds.

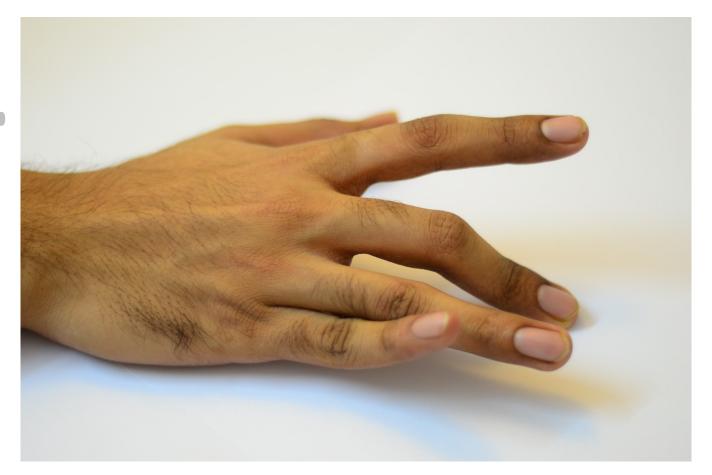
The 8 beat Rhythm Cycle Aadhi taalam

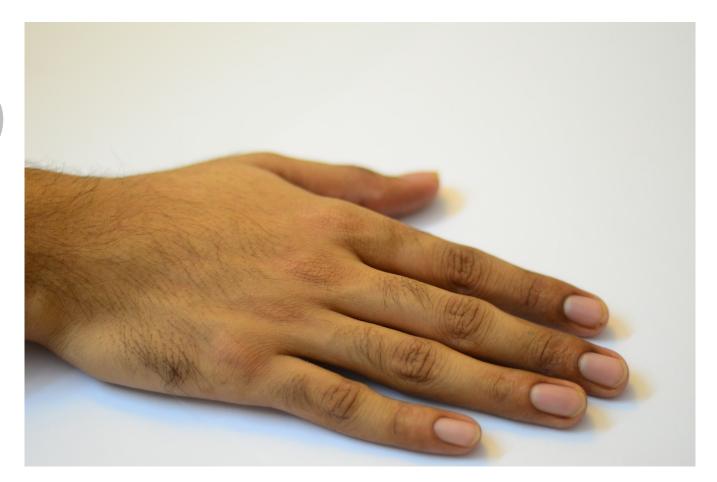


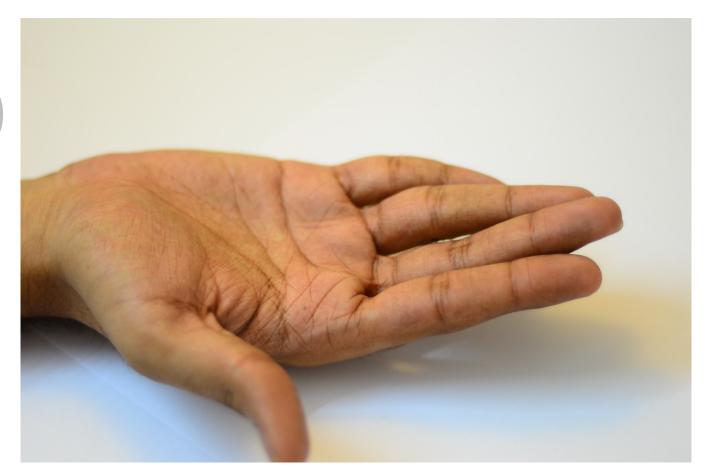


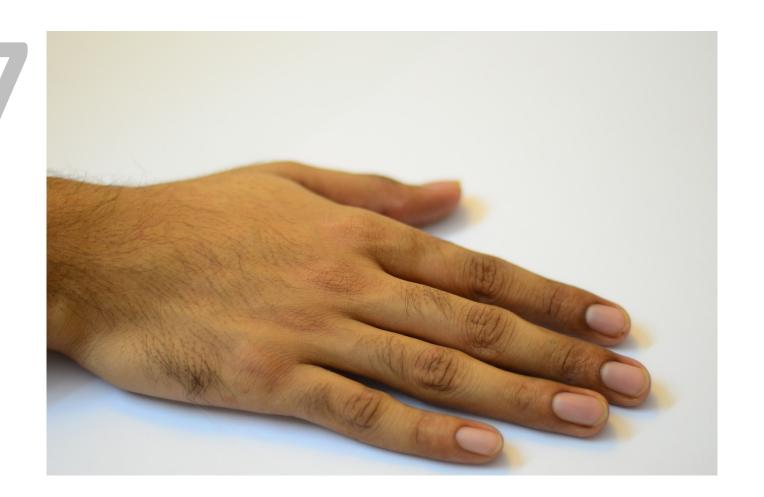












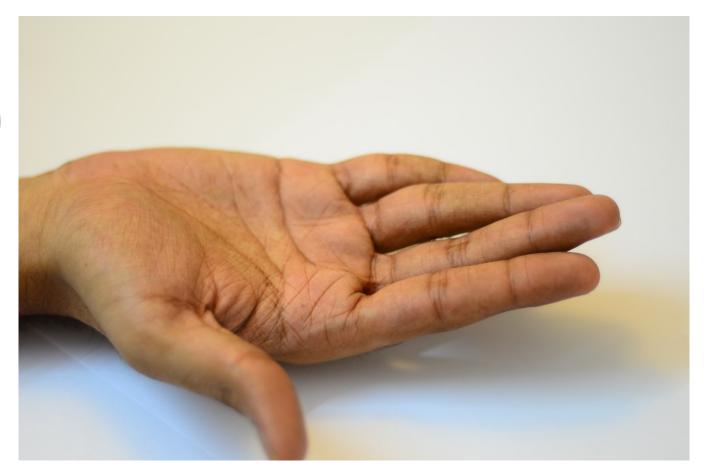
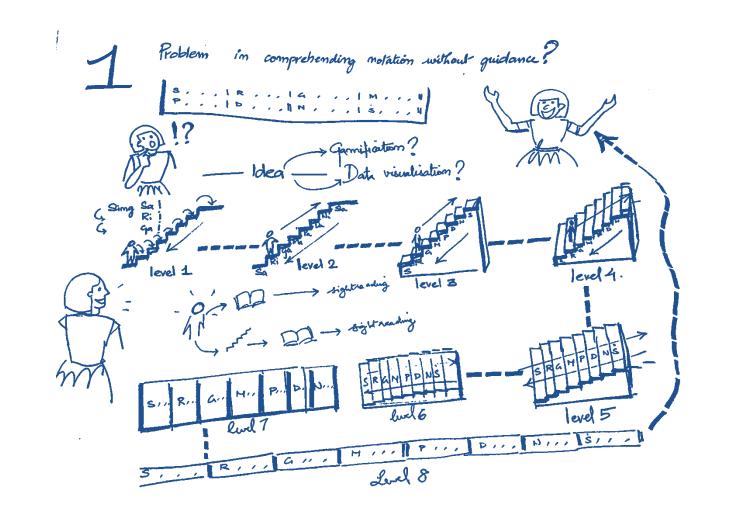




Image: Carnatic Students Tapping the Taalam | Source: the Hindu, Friday Review, 28 December, 2009

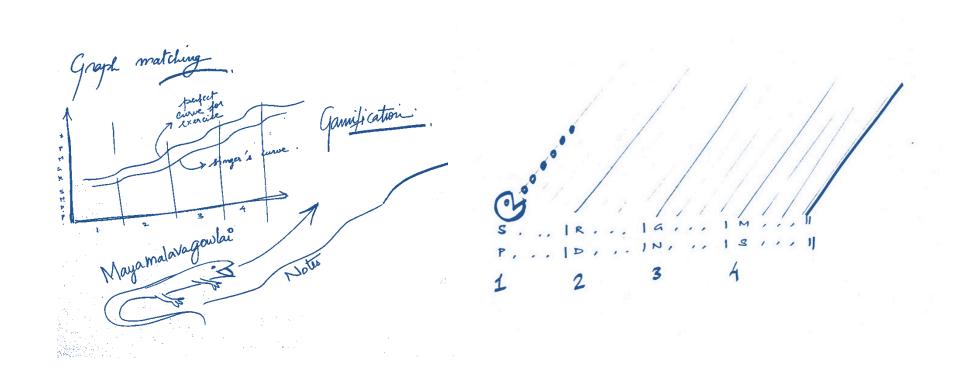


Concept 1: Visualizing music lessons



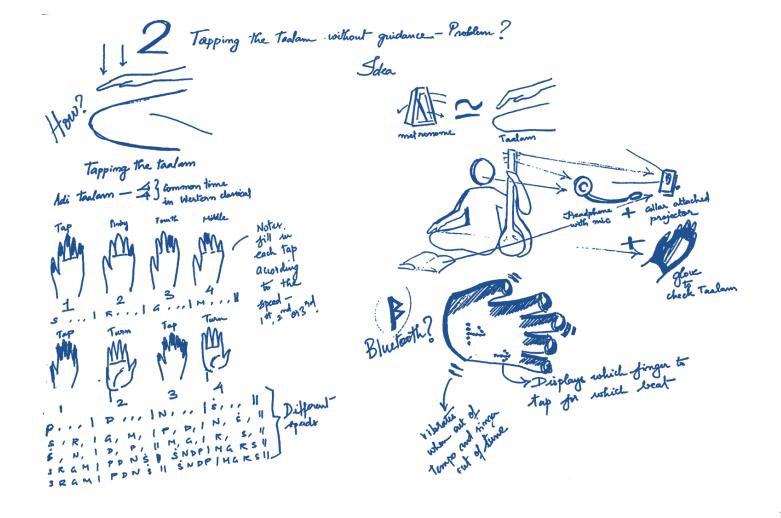
Concept 2:

Game-based learning



Concept 3:

Wearable Devices



Primary

Persona



Janani

8 years old

Studying 2nd std.

Recently shifted to Bangalore with parents

Loves to sing

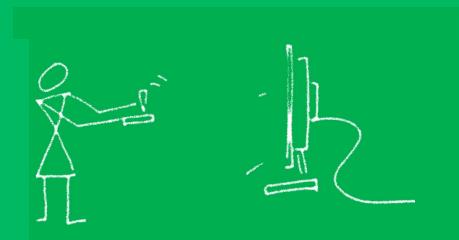
Stopped learning basic carnatic vocals from her aunt in Hosur because of her family shifting to Bangalore





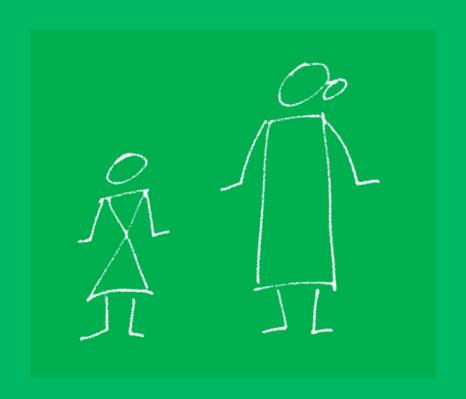
Janani's new classroom environment

Her class friends have been learning carnatic vocal music from a guru in their locality.



Every evening after coming back from school, her favorite activity is playing video games.

She plays for around 1- 2hours till her mom forces her do her homework.



Janu's mother wants her daughter to join the same music class her friends are attending in their locality.

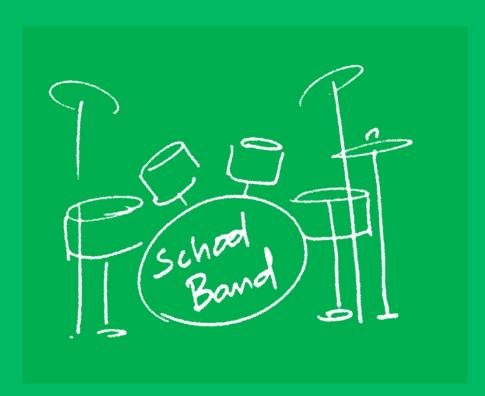




But the music class is very far from her locality.



Janu wants to sing like her friends who are learning Carnatic music.



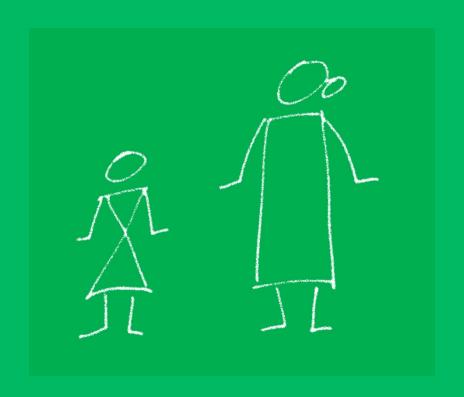
One fine morning, her School Principal announces about the Annual School Day Band and asks students to give auditions.



Janu gives the auditions for the school band.
Her singer friends get selected while she is rejected.



Her friends say she should improve singing in tune and in rhythm

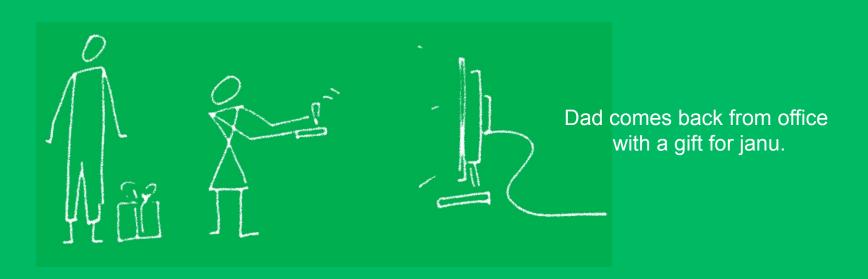


Janu goes to her mother and talks about how she got rejected in the school day music auditions.

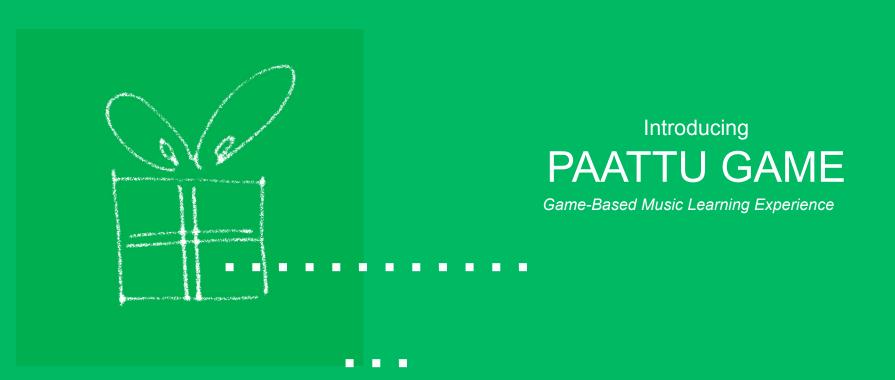


Mom asks her not to worry and to go and do her homework and then leaves for the kitchen.















Introducing PAATTU GAME

Game-Based Music Learning Experience















HOW IT WORKS











Input Hand & finger gestures

Help in tapping the thaalam/ Control elements in the display/ Vibrate suitably to inform about errors



phones – output audio Mic. – input voice

Help in listening to the game audio/ Help in inputting voice/ breath/ Inform errors, encourage through audio



Game interface
TV / Comp. monitor

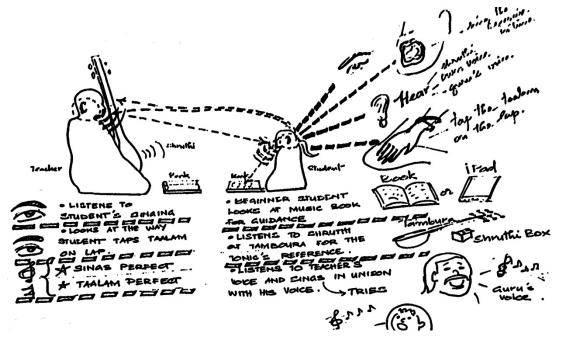
Video output/ Real-time display of performance quality/ Scoring/ Encouragement/ game story



- - - - - - Emotion capturing

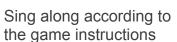
Capture facial expressions/emotions/ Analyze lip movement, body gestures/provide tips Capture performances and share with parent/











Give Voice command wherever required



See

Watch the real-time game proceed as one performs diff. activities.

Understand content/ tips/ score etc



listen

Listen to the shruthi/ tonic

Listen to reference track.

Listen to one's own voice

Listen to game sounds.



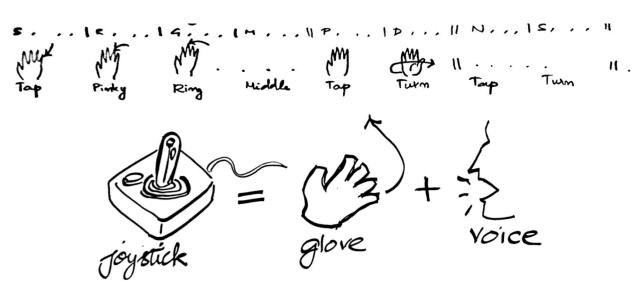
Tap/turn

Tap and turn according to game instructions/ Metronome value.

Understand vibrations for errors.

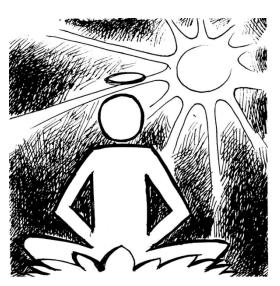
Connecting the dots

A Hybrid Concept



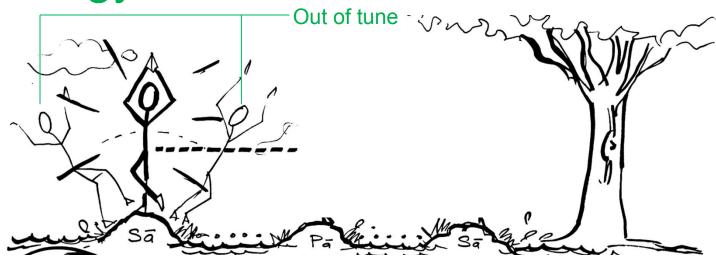
Concept Inspiration

Mythology



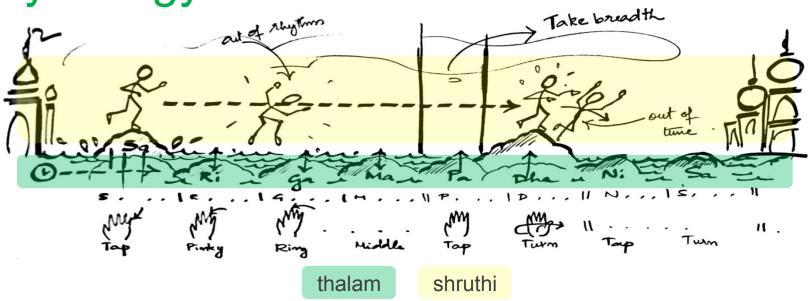
Concept Inspiration

Mythology



Concept Inspiration

Mythology



Ready... steady....

PLAYING THE GAME



.User wears.....









- IIIIIIIIIIIIIIIIIII + Head phone volume



- IIIIIIIIIIIIIIIIIII + Microphone volume





Camera check

Choose level

^ _

Go on! Start game!



Level 1 Singing in tune

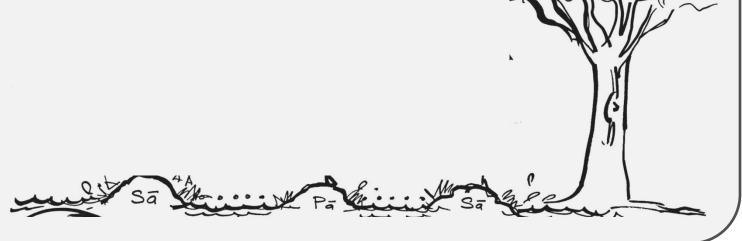






POINTS 1500+

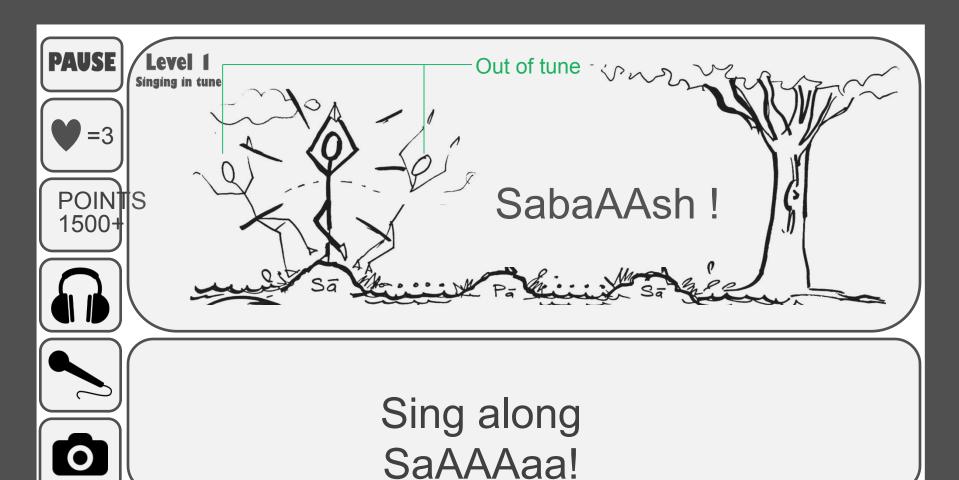


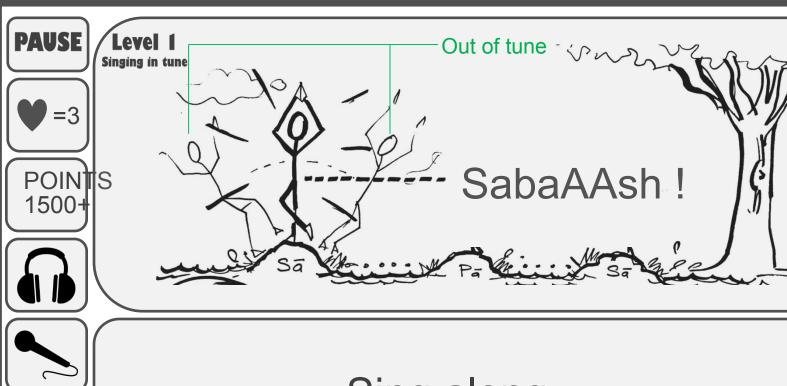






0...1...2...3...go!

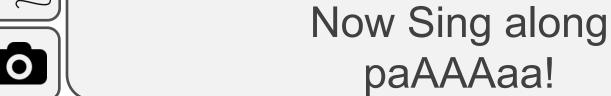






Sing along SaAAAaa!

Singing in tune POINTS 5000



Singing in tune POINTS 6000+





Now Sing along mel SaAAAaa!







Now Sing along mel SaAAAaa!

Good! You scored 7500

Tip: Look straight & Smile

Don frown during high notes



Bonus Round

Tapping the thaalam





Please wear the glove





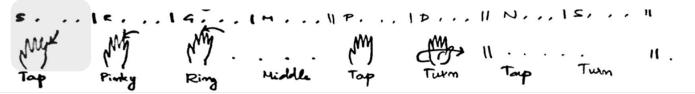
























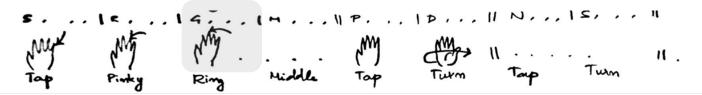










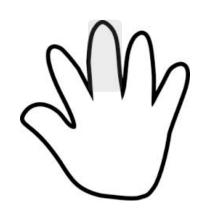














Perfect!

You scored 3200

Tip: from level 2, tap the same thaalam pattern and sing along simultaneously

Go back! practise! Go on! Start game!



Level 2

Singing in tune And in rhythm





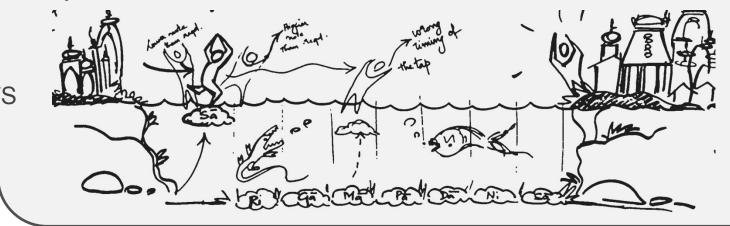
Level 2

Singing in tune And in rhythm



POIN 100











Perfect!

You scored 3200

Tip: keep practising the same way in three speeds for voice culture improvement.

Go back! practise! Go on! Next speed!



So you want to quit?

You scored 3200

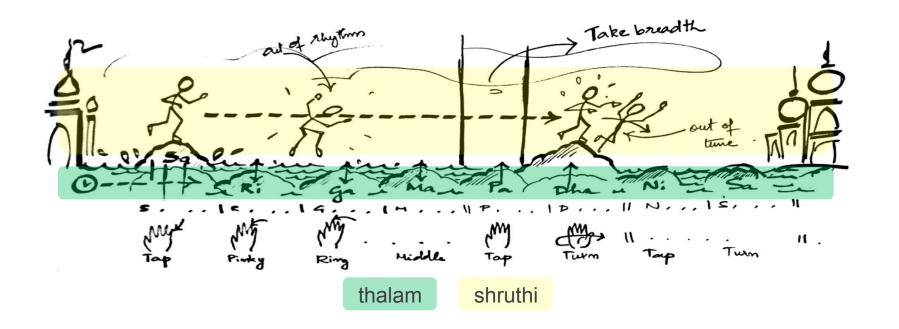
We have saved your highest score recordings with us

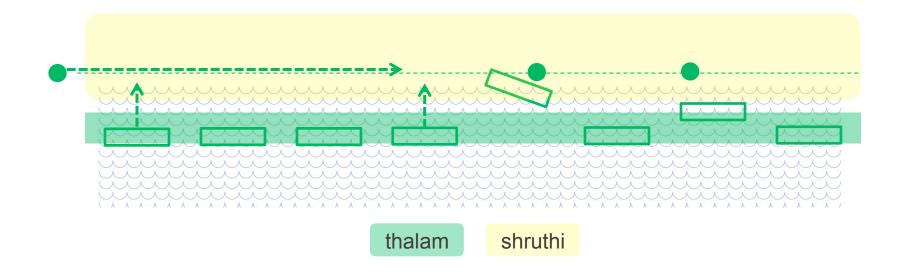
Are you willing to a hare it with friends?





Abstracting the Characters





Visual Design

Mood Board





Saralivarisai Exercise No.1

Score:

х3



Score:

х3

JUST LISTEN

SING ALONG



Guru vocals



Game sounds



Microphone



Master Volume



PDNS SNDP SRGM MGRS | SRGM PDNS | SNDP MGRS SRGM PDNS SNDP MGRS || SRGM PDNS | SNDP MGRS



Prototyping and Testing

Key questions

... Is the user able to find out whether he is singing in tune, from the visuals?

... Is the user able to understand the correct timing of the taps and the number of notes each tap is assigned based on the speeds of the rhythm cycle, from the visuals?

... Is the user able to comprehend the visuals with the corresponding music notation?

The prototype Wizard-of-oz Prototyping

...simulating machine behaviour with human operators

The prototype Wizard-of-oz Prototyping

...simulating visualisation changes according to the user's singing pitch with a music expert behind the frame.

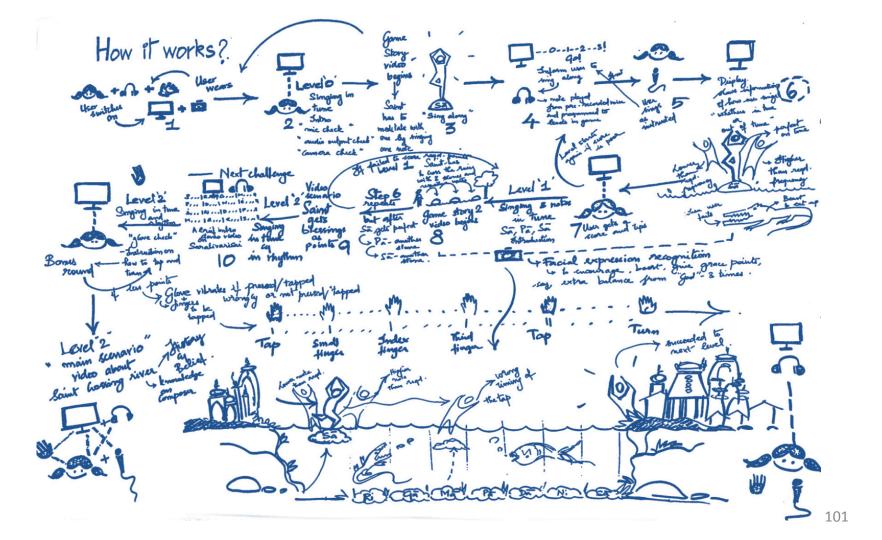
The prototype Wizard-of-oz Prototyping

...by making a Hi-fidelity front-end interface design to make users think it's more real.

...observing and getting feedback from the users.

The prototype Application flow & user scenario

... what should happen in response to user behaviour?



Where and how the wizard will provide input

- recognising the singing pitch provide signals on whether tuning is perfect or not.
- checking if tapping matches the tempo of the exercise and giving signals for wrong timing.

Rehearsals

The Users

- ... No prior Carnatic music Vocal training.
- ... 7 users 4 kids (ages 9 14) and 3 adults.

Method

- ... providing tasks and taking notes.
- ... Facilitator and Wizard roles played by myself in most of the cases.
- ... Authentic results when wizard role is hidden and user is not informed.



Method

- ...Pilot-tested with one participant and revised prior to use.
- ...test sessions averaged approximately 10 minutes.
- ...Data analysis involved the identification of common difficulties faced by the users because of inefficiencies in design.
- ...After singing or tapping, participants were also asked to perform a think aloud protocol in which they described their thoughts as they completed each task.

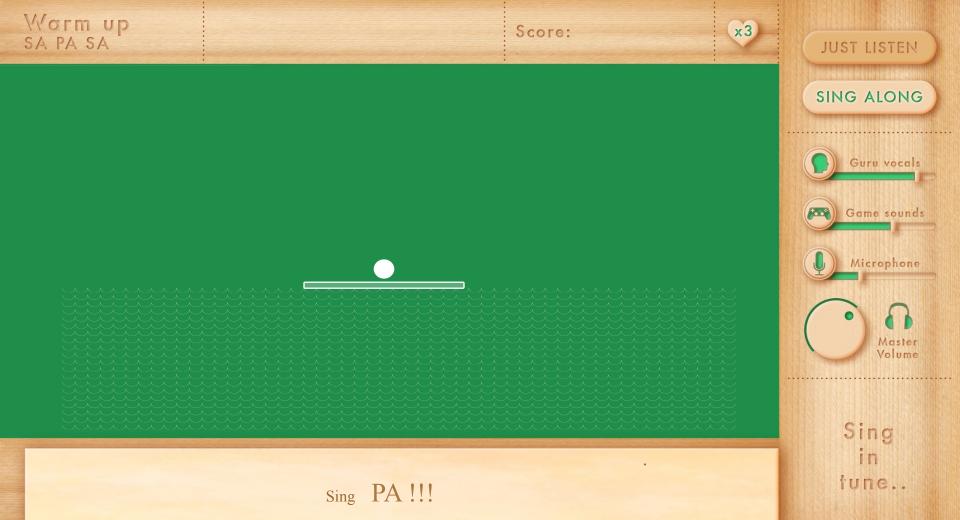
Task 1 – Singing In Tune

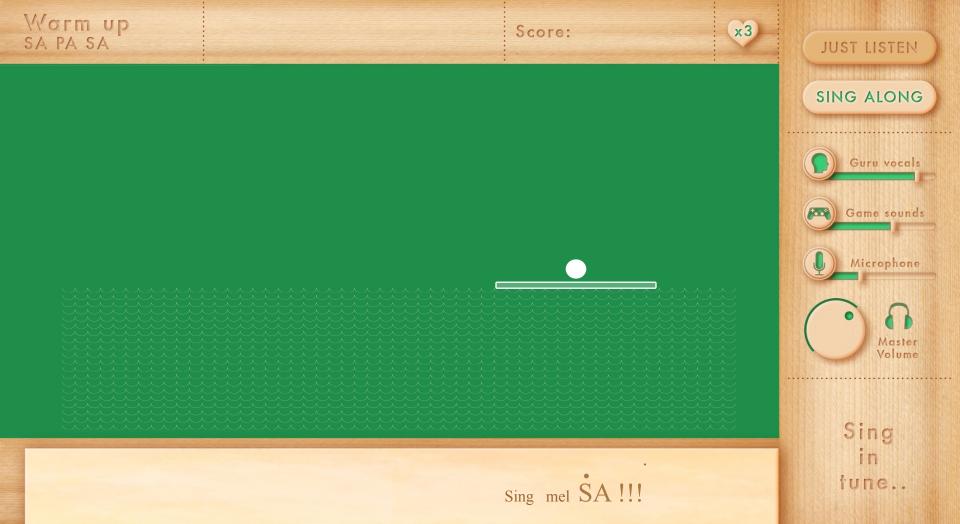
...The users were given the "SA PA SA" exercise where they had to sing just three notes SA, PA and SA in tune.

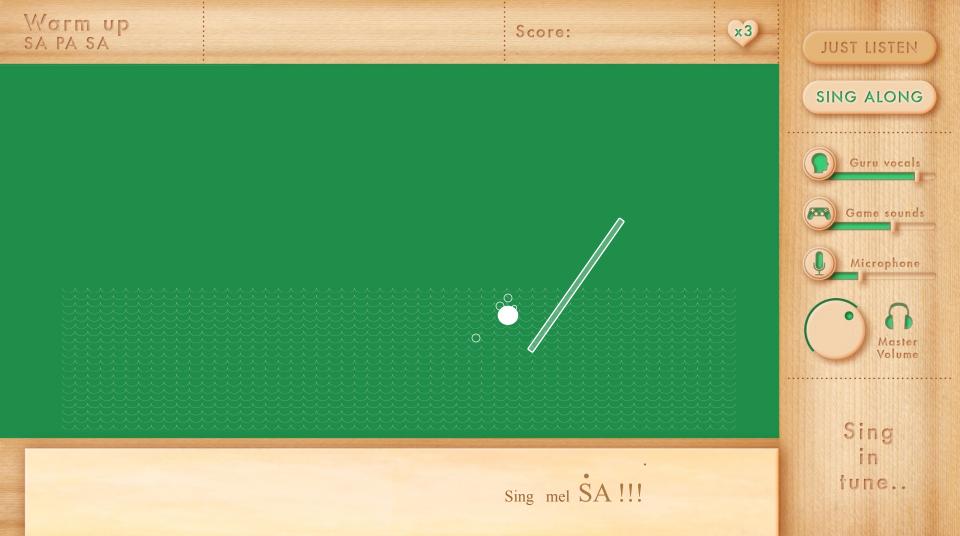
... Relevant audio files were played for reference and they were given instructions to sing along.

Worm up SA PA SA х3 Score: JUST LISTEN SING ALONG Guru vocals Game sounds Microphone Master Volume Sing

in tune...





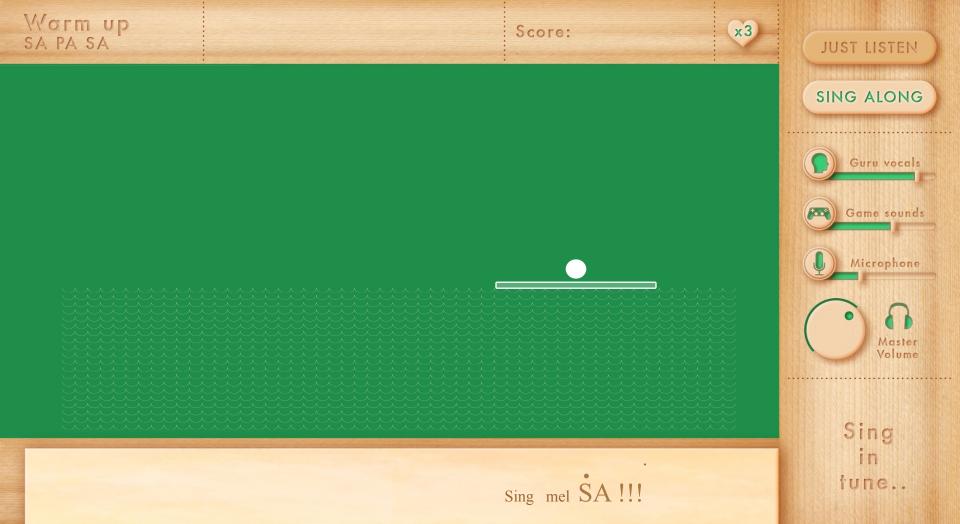


Worm up SA PA SA х3 Score: JUST LISTEN SING ALONG Guru vocals Game sounds Microphone Master Volume Sing tune.. Sing mel SA!!!

Worm up SA PA SA х3 Score: JUST LISTEN SING ALONG Guru vocals Game sounds Microphone Master Volume Sing

Sing mel SA!!!

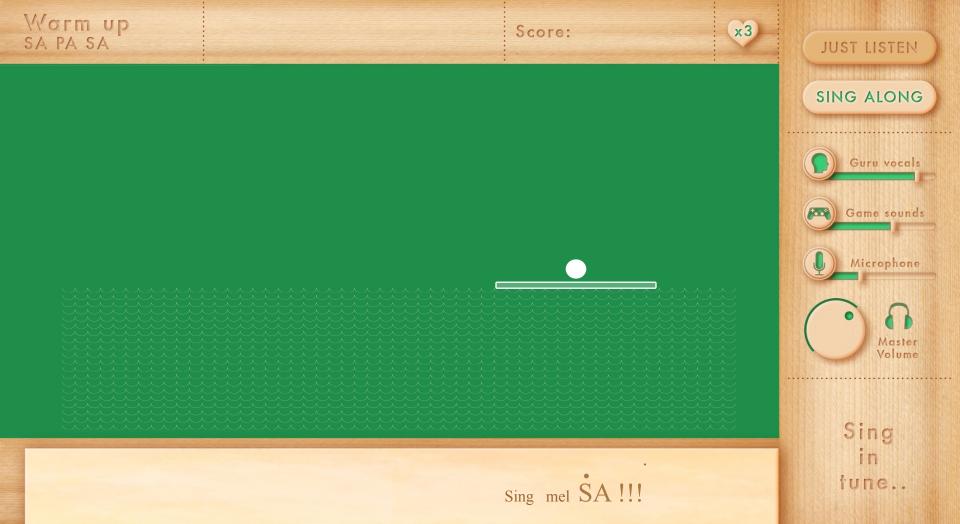
tune..



Worm up SA PA SA х3 Score: JUST LISTEN SING ALONG Perfect Shruti! Guru vocals Sabaash! Game sounds Microphone Master Volume

Sing in tune..

Sing mel SA!!!



Worm up SA PA SA х3 Score: JUST LISTEN SING ALONG Guru vocals Game sounds Microphone Master Volume Sing tune..

Sing mel SA!!!

Worm up SA PA SA х3 Score: JUST LISTEN SING ALONG Guru vocals Game sounds Microphone Master Volume Sing

Sing mel SA!!!

tune..

Worm up SA PA SA х3 Score: JUST LISTEN SING ALONG Guru vocals Game sounds Microphone Master Volume Sing

Sing mel SA!!!

tune..

Worm up SA PA SA х3 Score: JUST LISTEN SING ALONG Guru vocals Game sounds Microphone Master Volume Sing tune.. Sing mel SA!!!



Worm up SA PA SA х3 Score: JUST LISTEN SING ALONG Guru vocals Game sounds Microphone Master Volume Sing tune.. Sing mel SA!!!

Worm up SA PA SA

Score:

х3

JUST LISTEN

SING ALONG

Guru vocals

Game sounds

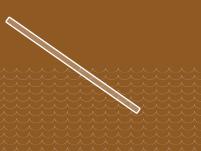
Microphone



Sing in tune...

Game Over!

Try singing again!



Sing mel SA!!!



Key question 1

... Is the user able to find out whether he is singing in tune, from the visuals?

User Feedback

... In their first few attempts, 4 of the 7 users did not understand that the ball sliding left meant lower to the preferred pitch and right meant higher.

Insights

... Signal/instruction to sing lower/higher pitch to be added in case user keeps singing the wrong note for a long time.

Changes



Task 2 – Taps & Corresponding notes

...The users were given the first exercise in "Saralivarisai" exercise where they had to just keep tapping according to the rhythm cycle's metronome.

... Relevant audio files were played.

... Were asked to "think aloud" as they explore the interface and the visualisation







Key question 2

... Is the user able to understand the correct timing of the taps and the number of notes each tap is assigned based on the speeds of the rhythm cycle, from the visuals?

User Feedback

... All the 7 users understood the concept of when to tap according to the metronome of the exercise irrespective of speed 1, 2 and 3.

Other Insights

... The ball sliding along the surface of the brick bats would not mean "a steady note" since users expect realism in the physics behind the visuals.

Change?



Bat would not float steadily when a ball rolls on it.

... The ball sliding along the surface of the brick bats would not mean "a steady note" since users expect realism in the physics behind the visuals.





Key question 3

... Is the user able to comprehend the visuals with the corresponding music notation?

User Feedback

... During think aloud, to 5 of the 7 users the notation looked detached from the interface and the relationship of the grids & brick bats with the notation was not understood in the first glance.

Insights

... Extending the green space till the notation thereby making the notation and visualisation relationship more seamless.



Saralivarisai Exercise No.1

Score:



JUST LISTEN
SING ALONG
Guru vocals
Game sounds









SRGM PDNS SNDP MGRS || SRGM PDNS |SNDP M G R S S N D P MGRS || SRGM PDNS SRGM PDNS |SNDP MGRS

Enhancing the learning experience

... to render recordings with beats and attractive accompaniments to break boredom in the learning process.





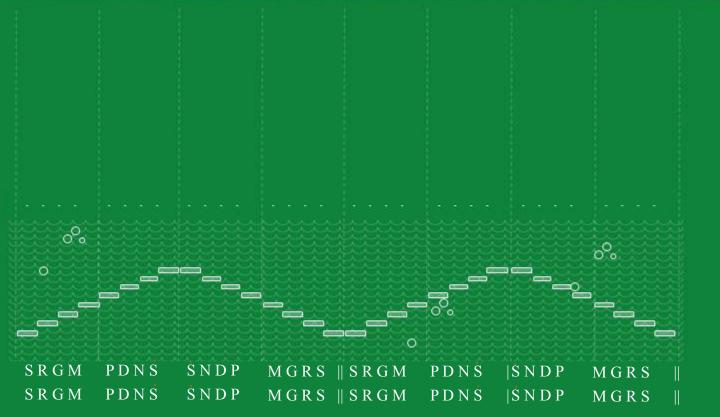
Saralivarisai Exercise No.1

Score:

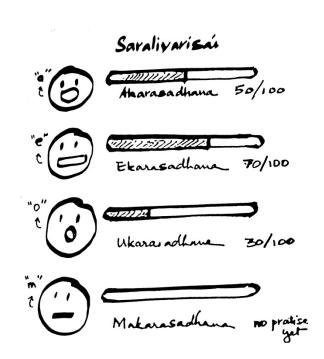


JUST LISTEN SING ALONG Game sounds Microphone

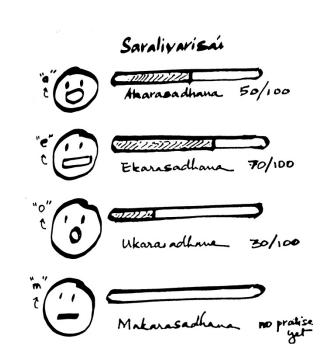




The same concept to train singers can be extended to all the graded exercises namely saralivarisai, jantavarisai, dhattuvarisai and Melsthai Varisai.

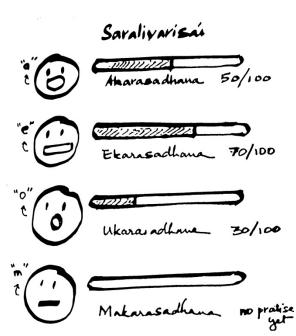


Also all of these lessons have to be sung and practised in 3 different progressive speeds, on the basis of which the 3 difficulty levels in each lesson of the game will be based on.



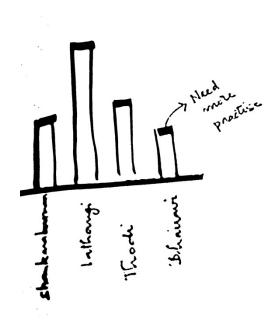
They can also practise these lessons in akaarasadhana, ukaarasadhana, Makaarasadhana[13]where the singer sings the whole lesson in a single sound instead of pronouncing the musical notes.

This can help them greatly in singing compositions that are highly challenging, later in their musical journeys.



There being a total of 72 Mela-kartha ragas or "mother" ragas that contain all the seven notes (heptatonic scale), every student is advised to practise all the lessons in each of these 72, throughout their singing education.

The product designed can be a suitable tool for music learners to practise more and more.



MELAKARTHA CHART

SUDHA MADYAMA

PRATHI MADYAMA

ASAMPOORNA		SAMPOORNA	RI	GA	DH	NI	SAMPOORNA		ASAMPOORNA
Kanakambari	1	Kanakangi	S	S	S	S	Salakam	37	Sowgandini
Penadyuthi	2	Rathnangi	H		10	K	Jalarnavam	38	Jaganmohanam
Ganasamavarali	3	Ganamoorthi			•	KA	Jalavarali	39	Thalivarali
Bhanumathi	4	Vanaspathi		*	C	K	Navaneetham	40	Nabhomani
Manoranjani	5	Manavathi	16	-		KA	Paavani	41	Kumbini
Dhanukirthi	6	Thanaroopi	H.		SH	KA	Ragupriya	42	Ravikriya
Senagrani	7	Senavathi	S	SA	S	S	Kavambodhi	43	Kirvani
Janathodi	8	Hanumathodi	7	-	"	K	Bhavapriya	44	Bavani
Dunibinnasadjam	9	Dhenuka		+		KA	Subapanthuvarali	45	Sivapanthuvarali
Natabharanam	10	Natakapriya			C	K	Shadvidamargani	46	Stavarajam
Kokilaravam	11	Kokilapriya	H		H.	KA	Suvarnangi	47	Sowveeram
Rupavathi	12	Roopaavathi			SH	KA	Divyamani	48	Jeevanthini
Geyahejjejji	13	Gayakapriya	S	A	S	S	Dhavalambari	49	Dhavalangam
Vativasanthabairavi	14	Vakulabaranam				K	Namanarayani	50	Namadesi
Mayamalavagowla	15	Mayamalavagowla		*		KA	Kamavardhani	51	Kasiramakriya
Thoyavegavahini	16	Chakravakam			C	K	Ramapriya	52	Ramamanohari
Chayavathi	17	Suryakantham		-	•	KA	Gamanasrama	53	Gamagakriya
Jayasuddhamalavi	18	Hatakambari			SH	KA	Viswambari	54	Vamsavathi
Jankarabramari	19	Jankaradwani	C	SA	S	S	Syamalangi	55	Samala
Naririthigowla	20	Natabairavi		*		K	Shanmugapriya	56	Samaram
Kiranavali	21	Keeravani	*	77		KA	Simhendramadyamam	57	Sumadyuthi
Sri Ragam	22	Karaharapriya			C	K	Hemavathi	58	Desisimharavam
Gowrivelavali	23	Gowrimanohari	20			KA	Dharmavathi	59	Dhamavathi
Veeravasantham	24	Varunapriya	**		SH	KA	Neethimati	60	Nishadam
Saravathi	25	Mararanjani	C	A	S	S	Kanthamani	61	Kunthalam
Tharangini	26	Charukesi				K	Rishabapriya	62	Rathipriya
Sowrasena	27	Sarasangi	38	26	13.5	KA	Lathangi	63	Geethapriya
Harikedaragowla	28	Harikambodhi			C	K	Vachaspathi	64	Bhoshavathi
Deerasankarabharanam	29	Deerasankarabharanam	•			KA	Mechakalyani	65	Santhakalyani
Nagabharanam	30	Naganandini	*	. P.	SH	KA	Chitrambari	66	Chaturangini
Kalavathi	31	Yagapriya	SH	A	S	S	Sucharithra	67	Santhanamanjari
Ragachoodamani	32	Ragavardini	-			K	Jyothiswarupini	68	Jhothiragam
Gangatharangini	33	Kangeyabhooshani	•			KA	Dhathuvardani	69	Dowthapancham
Bhogachayanata	34	Vagadiswari	•	**	C	K	Naasikabhooshani	70	Nasamani
Sailadesakshi	35	Sulini	77	п		KA	Khosalam	71	Kusumakaram
Chalanata	36	Chalanata	16		SH	KA	Rasikapriya	72	Rasamanjari

Thank you!

Vanakkam!;)

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