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

i. 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**

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!
The first class's flow in Carnatic Music Education.

Start class
- No, not perfect
  - Sa Pa Sa
    - Yes, sung perfectly
      - Yes, sung perfectly
        - "End class. Student fit to learn"
      - No, not perfect
        - Yes, sung perfectly
        - 3 different speeds
          - Yes, sung perfectly
    - No, not perfect
      - Sa Pa Sa
      - Yes, sung perfectly
      - 3 different speeds
        - Yes, sung perfectly

Sung in TUNE?
just 3 notes
Sa, Pa, Sa

Sung in TUNE & RHYTHM?

Tapping on
Saralia varizai
Sa Ri Ga Ma Pa Da Sa Ni Sa Ga
Ki Sa, Arohan Avarohan

Student can "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

Sa, , , Ri, , , Ga, , , Ma, , , || Pa, , , Dha, , , | Ni, , Sa, , , ||
Interactive and Game-based Carnatic Music Lessons for Beginners

First Lessons in Carnatic music

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 2: Game-based learning

Graph matching

Mayamalavagowla

Gamification

Notes

1 2 3 4
Concept 3:  
Wearable Devices
2 Tapping the Taalum without guidance—Problem?

Idea

Tapping the taalum

Adi taalum — common time in Western classical

Tap Play Thumb Finger Middle

1 2 3 4

Tap Turn Tap Turn

Different speeds


Bluetooth?

Display which finger to tap for which beat

Headphones,

Volume, tempo, and time

Face to check Taalum
Primary Persona
Janani
8 years old
Studying 2\textsuperscript{nd} 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 **1-2 hours** till her mom forces her to 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.
Angry and sad Janu starts playing her Video games
Dad comes back from office with a gift for Janu.
Janu is excited as the gift looks like another interesting video game kit.
Introducing PAATTU GAME
Game-Based Music Learning Experience
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/
**User**

**Sing**
- Sing along according to the game instructions
- 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

[Diagram of joystick and hand gestures]
Concept Inspiration

Mythology
Concept Inspiration

Mythology

Out of tune
Concept Inspiration
Mythology
Ready… steady…

PLAYING THE GAME
User wears.
Camera

Display
Choose level 1
Go on! Start game!
Level 1
Singing in tune
Level 1
Singing in tune

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

Sing along SaAAAaaa!
Level 1
Singing in tune

Out of tune

SabaAAsh!

Sing along
SaAAAAaa!
Now Sing along
paAAAaaa!
Now Sing along mel
SaAAAAaa!
Well done!!

Now Sing along mel
SaAAAaaa!
Good!
You scored 7500

Tip: Look straight & Smile
Don't frown during high notes
Bonus Round
Tapping the thaalam
Please wear the glove
Tap Pinky Ring Middle Top Turn Tap Turn
Pause

Heart = 3

Points 800

Tap  Pinky  Ring  Middle  Top  Turn  Tap  Turn
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

Tap  Pinky  Ring  Middle  Tap  Turn  Tap  Turn
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 share it with friends?

YES  NO
Abstracting the Characters
thalam  shruthi
Visual Design
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.
Sing SA !!!
Sing PA !!!
Sing me "SA!!!"
Sing me! ŠA!!!
Sing me! ŠA !!!
Perfect Shruti!

Sabaash!
Sing me! ŠA !!!
Sing me! ŠA !!!
Sing mel ŠA !!!
Sing me! ŠA !!!
Sing me ŠA !!!
Game Over!
Try singing again!
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.
You are singing a higher note
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.
1st speed
3rd speed
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.
Saralivarisai
Exercise No.1

1st speed
1st speed
out of tune!
bad timing!
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

Microphone

Master Volume

SRGM PDNS ŠNDP MGRS || SRGM PDNS ŠNDP MGRS ||
SRGM PDNS ŠNDP MGRS || SRGM PDNS ŠNDP MGRS ||
Enhancing the learning experience

... to render recordings with beats and attractive accompaniments to break boredom in the learning process.
Life-long practice?

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

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.
Life-long practice?

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.
Life-long practice?

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.
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<thead>
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<th>SAMPOORNA</th>
<th>RI</th>
<th>GA</th>
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S = SUDHA; C = CHATUSRA; SA = SAADARANA; A = ANTHARA; SH = SHATSUTHI; K = KAIKSI; KA = KAKALI
Thank you!

Vanakkam! ;)

Ramprasad Sedouram
M.Des Class 2012-2014 (Interaction Design)
IDC IIT Bombay
9769012629