# ASSIGNMENT M1

Kalpana Baheti

kbaheti3@gatech.edu

Abstract—This series of qualitative and quantitative studies will cover different stages of interface understanding, design, and evaluation for a mood-reading music player which has its controls governed by an app on a phone. The music player is meant for a playroom at home or at a school where children spend significant amount of time. Music has a long-standing effect on children's cognitive and emotional capacities; this device will be responsible for deciding what to play and when with a desired ambience/accomplishment as a goal. The music auto-playing system has two components – the environment-reading music device and the phone app which controls this device. We will be studying the interaction of the user (the educator/parent/guardian) with the app's control panel given fixed assumptions on the manner in which the settings will regulate the environment-reading device's input and output.
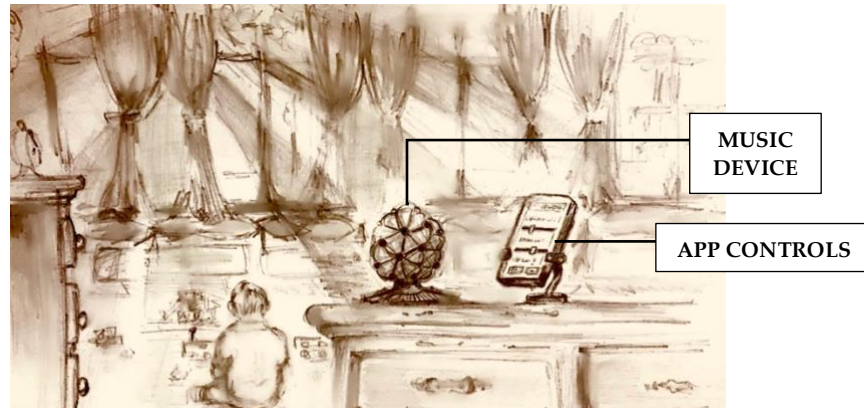
PROBLEM SPACE DEFINITION – APP CONTROLS

1. Context and Full Proposed System

Music theory has long established that different combinations of notes played under different circumstances in different tones and quality (instruments), evoke a range of emotions and thoughts – many of which have a significant developmental effect on a young brain's emotional and cognitive understanding and responses. However, leveraging this

information is not a small leap. We would need an information intake and response device – to read information required to make such decisions based on the environment and the entities in it and respond with a decision to play or not to play, and if recommended to play, then respond with the permutation, instrument, tempo, and volume pattern of the notes to play.

Furthermore, different children have different innate personalities that guardians understand better, and different settings have unique allowances, which should also be controllable, preferably via a convenient device such as a phone app. The relevant interface results in a vast space of control panel input-output options and user-interaction complexity. And this part will be the focus of our investigation, assuming the environment-reading device works as expected.

2. **Problem Definition Focused on Selected Interface**

Now that we understand what our problem space will focus on, let us define this space further.

Given the following assumptions on the environment-reader device:

a. The music composition, while probabilistically generated, is still only played in major part based on user preferences of these probabilities.
b. The device only intakes information in the modes and at the times consented by the guardian.
c. When and if music should play can be controlled by guardian.
d. There are certain compositions and scenarios in which the device will not play anything no matter what the guardian sets as probability.
e. Veto controls will be abided by, as long as it doesn't violate (d).

We will address these control panel design sub-problems –

1) Exact and comprehensive provisions for control as per users' interest.
2) Handling complexity of these controls' consequences in a simple way.
3) Analyzing and comparing effect of controls in a simple way.
4) Haptics for panel design – usage of clicks, double-clicks, slides etc.
5) Visuals for panel design – colors, default modes, spatial arrangement.

USER TYPES

As per the setting displayed in the picture, there are two major users. The user directly interacting with the mood-reading device is the child between the age 5 and 13 who is observed to a permissible degree while playing and who listens to the music consciously or subconsciously. We will not be focusing on that interface, and hence not that user. We will be focusing on the phone app user base.

→ The app will be **used by a child educator, parent, or guardian**.

→ The music is generated by western instruments and hence we will be focusing on the **demographic population** of such grownups responsible for children's development within these countries – in majority Europe, United States, Canada, NZ, UK, Australia, and so forth.

→ The app will focus on such **grownups/institutions who can afford to and care to invest in purchasing a product such as this one**, and **who have children** who spend quite some time in play-and-learn mode.

→ The app will be used by grownups **who are comfortable exposing a minimal amount of information to the device (possibly thermal or audio footage or explicit preferences)** while the child plays and learns.

→ The app will be used by grownups **who have no issue with seeing the phone's screen, navigating a touch screen, and understanding some basic music and psychology** related concepts.

→ The app will be used by those **who would like to personalize the experience for the child** based on unique knowledge they have of the child.

NEEDFINDING PLAN 1 – PARTICIPANT OBSERVATIONS

Participant observation is one method selected since I have continually been reading and researching across the intersection of fields of music theory, developmental psychology, education, emotional intelligence, causal chains of thoughts specifically, and general interface design – hence, I'm going to place

myself in this scenario of being responsible for music production in a child's playroom (possibly my siblings) and introspect over what specifics matter.

Data Inventory Addressal – Context, goals, and sub-tasks to reach goals.

Steps –

1. List out different personalities of children.
2. List out different living conditions of children.
3. List out different ages of children.
4. Per each combination from (1), (2), and (3), describe activity scenarios and cognitive and emotional goals.
5. Backtrack from information collected in (4) and research on which music-related decisions have highest impact, and more importantly which may have a slightly or subtly adverse effect and how to veto this.
6. Research what minimum options I'd need to easily create variance and bias in note combinations while still respecting subdued parameters.
7. Introspect on situations and mindsets where I may not want to share certain data of the playroom with the app.
8. Leave thinking space open for other important criteria I may have missed.

Data Collection –

1. Described scenarios in the most atomic elements possible.
2. Important aspects for regulation of music preferences per scenario.
3. Complexity analysis and representation to user.
4. Representation of results of control settings.

Possible Biases –

Confirmation bias – This might occur since it's my own judgement on what the requirements would be. To limit this, I plan to be thorough in research and reading different perspectives on these questions.

Note 1: Under data collection, point (3) is a very big step because this music is probabilistically generated (akin to AI). To regulate the output of this music generator, the user must be able to manipulate the overall results of the music while still keeping the experimentation and exploitation within the limits intact. Plus, the user should not need to know anything about AI, yet be able to work with and understand the difference in the new conditioning of music generation.

Note 2: I have not covered requirements for visuals and haptics under this plan since I feel I might be quite biased at it and don't have as much domain knowledge as I'd like.

NEEDFINDING PLAN 2 - SURVEYS

In surveys, I shall be asking a minimum of 25 parents and educators regarding the different controls that would matter to the efficacy of creating the personalized environment and preventing setbacks in the growth.

To alert the reader, a setback can be of these forms mattering to some people more than others –

a. The automatic volume could be too loud for certain children with underdeveloped hearing.
b. The incessant music play or tempo could be distracting the child in place of subconsciously stimulating the child's creativity.
c. The music played under low spirited circumstances might make them sadder instead of braver or more hopeful.

There are many personalization and privacy aspects as well, that parents and educators might be interested in. The point of this stage is to permit the users to tell us what aspects matter to them.

Data Inventory Addressal – Goals, needs, tasks, subtasks.

Questions to ask –

1. How much do you feel music heard during developmental years has an effect on the growth of cognitive and emotional intelligence? – Answered in rating 1 to 10
2. What goals are you interested in helping a child with during the playroom time? – Examples of cognitive and self-reflection goals.
3. Of the listed aspects, what would affect a child's growth if not properly arranged? – tempo, volume, note symphony, octave, periodicity, lack of long pauses, immediate notice of music playing (each explained)
4. Which of these inputs would help personalize the experience better to your child? – time of day, playroom ambience, activity, temperament of child, handicap, and few others.

5. What modalities of information would you be comfortable with for the phone to work on, when the child is present in the playroom? – audio, thermal, visual, or merely explicit preferences.
6. What other aspects regarding personalizing the experience would you add to existing choices? – Open-answer
7. What other privacy regulations or vetoes of music player decisions would you be concerned about? – Open-answer
8. How many maximum option selections on the control panel would you be willing to perform to set a personalized and regulated experience? – Numbered 5 to 20 (Consider a lower number as a compromise with how much control you'd have)
9. How would you like results of music settings displayed? – options such as graphs, numbers, descriptive statements, or not interested.

Survey Candidates –

Child educators and parents of children of a variety of ages between 5 to 13 within the specified demographic region with a keen interest in child development and willingness to invest in this. Perhaps some grownups unrelated to children too, but who can inform in retrospect of their childhood.

Possible Biases –

1. Confirmation Bias – Not including certain questions here might've been due to this, which is why I shall run a mini requirements analysis on the survey questions themselves through a few other people to check this off.
2. Observer Bias – Answers to this survey, especially open-ended questions can be interpreted in multiple ways with varying intensities. To avoid this, I shall specifically cover some of these open questions again in interviews.
3. Voluntary Response Bias – While I don't suspect this very much since those who are enthusiastic about providing such fine provisions to their children (the very population I'm interested in) are also usually quite proactive about helping such research get further. However, for any difference in these two populations, I shall personally reach out to a spectrum of people for taking the survey.

NEEDFINDING PLAN 3 - INTERVIEWS

Data Inventory Addressal – Context, goals, needs, sub-tasks.

I will be conducting a minimum of 5 interviews.

Questions –

In the interviews, I plan to cover a more detailed analysis on –

1. Efficacy expectations
2. Usage frequency
3. Personalization metrics
4. Privacy controls
5. Veto controls (a hard condition on certain music played)
6. Complexity understanding checks
7. Haptic and visual preferences

Each of these will begin as open-ended questions and if they struggle with articulating their thoughts, a few examples of comprehensive variety (so as to avoid bias) will be provided.

Interview Candidates –

While my preference would be parents and educators, I would also take one or two grownups who are unrelated to children to hear their thoughts keeping their childhood in mind. Specifically for privacy controls – while a parent may feel safe with a setting, when the child learns about this years later, he/she must not feel violated or embarrassed.

Possible Biases –

1. Observers Bias – Open answers may be misinterpreted in degree or meaning. Hence, there will be leading questions to confirm systematically broken-down parts of previous responses and ensure the received statements are as objective as possible.
2. Social Desirability Bias – This can happen since the people I interview all know me well (else they might not agree to interview), hence I might run my questions by few other people first to test for pressure in answering.