**CSC 258 Project Proposal**

Ensure that you fill in all of the information that is requested below. Remember that the TAs will be using this information to look you up and evaluate your project milestones in the lab, so please be specific, be clear, and be concise in your answers.

# Team Information

Your First Name: Shreyansh

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Your Partner’s Last Name: Blinn

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Your Lab Room Number: 3155

Your Lab Station ID: 72

# Project Milestones

What is the title of your project? *(e.g. Laser-Triggered Music Box)*

Musical Memory Game

Provide a one paragraph description of your project.

A musical memory game with several levels of increasing difficulty. The game plays a sequence of notes and the user must replicate them on the DE1-SoC board using key/switches. We’ll have a series of pre-programmed levels, followed by randomly-generated levels of increasing difficulty. We have a series of planned modular features to add according to time, including user-programmable levels, chords instead of simple notes, and the ability to recognize timing patterns instead of just simple sequences.

What will you accomplish for the first milestone?

*(Advice here: Try to be specific in describing the components that you will complete. Don’t just say that you’ll “think about” or “plan” your design. You need a full lab’s worth of work here, so plan to have at least half of your design implemented by Week 1, state below what that will be.)*

We hope to present a single playable level. Because audio generation is an x-factor, we will initially use the LEDRs for output, with actual sound output as a bonus.

We will implement an FSM representing the following game states:

* showing\_pattern
* entering\_pattern
* lose
* win

And implement the following modules:

* storage shifter
* playback module
* answer shifter
* input answer comparator
* state display module

Before the game starts, our fixed level (a sequence of bit strings) is located in a storage shifter module. Then the showing\_pattern state begins: Our pattern is pushed out one note at a time into the playback module which displays it on the corresponding LEDRs. It is also loaded into an answer shifter module. After the pattern has been displayed, the entering\_pattern state begins where the user enters a pattern using the keys. This is compared with the answer shifter one note at a time. If a note fails to match with the right answer, the state is set to lose. If all the notes match, the state is set to win. This final state is represented on the HEX displays.

What will you accomplish for the rest of the milestone?

*(Try to be specific here about what you will be demonstrating to the TAs, don’t say “everything” just because this is the final milestone)*

We will add additional features as time permits:

Phase 1 – Base features

* A sequence of fixed levels of increasing difficulties, employing more complex patterns of increasing length. If the user wins, they advance to the next level. If the user loses then they go back to the first level.
* We will add a level\_select state to our FSM where the user can use the switches to enter the number of the level to skip to.
* After the user completes the final level, there will be an “endless” mode, where we use a Fibonacci random number generator to random note patterns.

Phase 2 – Stretch Goals (OPTIONAL)

* Create support for the user to press more than one key at a time to create chords. i.e. multiple notes being played at the same time.
* Create support for playing/recognizing notes of varying durations.
* Create support for playing/recognizing varying durations between notes.

# Project Motivations

How does this project relate to the materials covered in CSC 258?

We will use the following concepts learned in class in our project:

* Finite State Machines
* Look-up tables
* Shifters
* Counters
* Decoding including Seven Segment Display

We also hope to learn about the following extraciricular material:

* DE1-SoC Audio output
* Random Number generator

What’s cool about this project (to CSC 258 students and non-CSC 258 students)?

We think that modular design is the coolest part of this project, because we can quickly implement a simple playable base, which we can use to rapidly iterate on more advanced features. This project will also be cool for (non-CSC258) toddlers of 4 years of age and help them improve their memory skills and musical coordination.

Why does the idea of working on this appeal to you personally?

The initial phase is simple because we can get things working quickly and it won’t take us long to get a working prototype. If we manage to add additional features, this project has the potential to sell to the coveted early-education market.