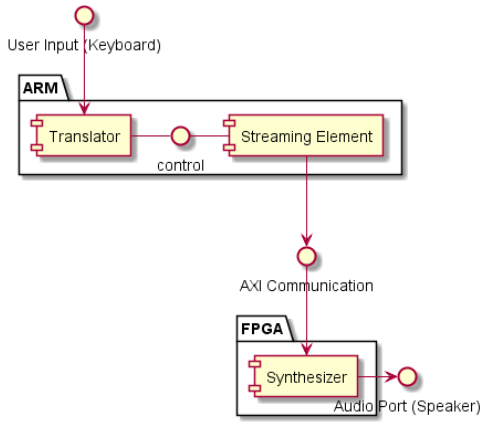
The project I aim to complete is a hardware/software system that synthesizes and plays musical tones, as given to the system via a coded string of musical notation. e.g. C4E5F5-E5-F5G5C4-

The inspiration for the project was the idea to create a hardware-accelerated voice synthesizer, capable of speaking sentences that are fed into the system. Voice synthesis is far beyond the scope of what I could accomplish in the time frame given — (consider that there are 3 weeks to complete said project and a 4SH course *should* require no more than 4*[2,4] = 8-16hr of work outside of class per week). As such, the general idea will be preserved by replacing voice synthesis with tone synthesis and sentence streaming with musical note streaming.

Voice synthesis and text-to-speech have importance in communication and translation (including for cross-language uses or for those with disabilities), artificial intelligence (such as in human plus machine interactivity/cooperation), and even in synthesized music. These systems can be implemented through software, but the waveform generation step for synthesized sound is better suited for hardware acceleration.[1,2]

While such streaming sound-synthesis systems do exist, they are generally not open-sourced or well-documented. For this project, I will aim to design and implement such a system, providing a model for a streaming sound-synthesis system. The system will perform tone synthesis, rather than speech synthesis, in order to simplify the algorithmic development and allow more focus to be made on the system design, as relevant to the course. The system will be implemented on a Zedboard, or similar SoC. At the front-end of the system is the software (running on ARM processor) that will receive an input string from the user and translate it into data representing the sequence of musical notes. This data will then be streamed into the tone synthesis hardware (implemented in FPGA) that will generate the musical tones and playback over an audio port.[3,4]

The system is generally drawn as follows:[5]




As the system is aimed to be implemented on an ARM/FPGA SoC (e.g. Zedboard), a demo would be the most demonstrative approach to prove successful behavior. A test bench can be written and simulated to prove functionality as well.[6]

I will work alone on this project. I will likely be out of state or otherwise unavailable to regularly meet with partners, and I would rather not impede anyone elses experience.[7]

The first week and a half will be allocated for designing the system as a model, likely with simulation in SpecC. The next week will be for completing and validating implementation. The final half week will be used for creation of the presentation and report. This will encompass the 3 weeks prior to project presentations.[8]

1. Area (what is the general field in which your solutions is useful for)
2. Motivation (Why is your solution important / relevant to be solved)
3. Challenges (what are the currently unsolved challenges out there), this leads to your problem statement
4. Approach (what is the system level approach you will take), this will include
5. System Diagram with general hardware / software blocks and their interfaces
6. Evaluation Metrics: what experiments will you run to demonstrate the approach is successful?
7. Work responsibility split across team members
8. Rough timeline