Description of the High- Level Block Diagrams [Milestone 1]

Directional Microphone:

In order to perform the noise filtering characteristic of real hearing aids, we have two microphone jacks for directions. This allows us to better identify where the sound is coming from and consequently, remove noise from the signal.

Audio Processing Core:

The microphone receives input from the directional microphone which gets sent to the ADC that converts the analog signal into a digital signal sent to the processor in the FGPA. This output is then delivered to the hearing loss simulator.

Hearing Loss Simulator:

The hearing loss simulator consists of three different types of hearing loss - more types will be increased if time allows. The first type is a high and low pass filter that filters out low and high frequencies to emulate how people lose their ability to hear certain frequencies. The second mode is noise reduction for all frequencies, so all signals have reduced volume. The last mode is applying distortion to the original signal. This is sent to the speaker when the hearing loss simulator is enabled. If it is not enabled, then the output will get sent to the adaptive frequency based gain control section. Each mode has four levels of intensity.

User controlled interface:

Mode and intensity are respectively controlled by switches and keys.

The VGA is used to display what mode is currently on as well as the intensity.

Adaptive Frequency Based Gain Control:

The split frequencies from the hearing loss simulator are then sent into different channels based on the level of sounds there are [soft sounds, moderate sounds, loud sounds]. Also, the user can select which hearing aid mode they want to select [amplification mode, noise mode, speech mode]
Then, it performs large amplification, moderate amplification, and small amplification based on user selection (buttons).
[as of milestone 1, implemented this section]
LEDS are used for debugging and indication of the mode and level of amplification for the user.

Final Hearing Aid Simulator Audio Output:

The digital signal of the sound after the hearing aid simulator is sent to DAC to be converted to analog signal and will be connected to a 3.5mm earphone jack for the hearing aid.