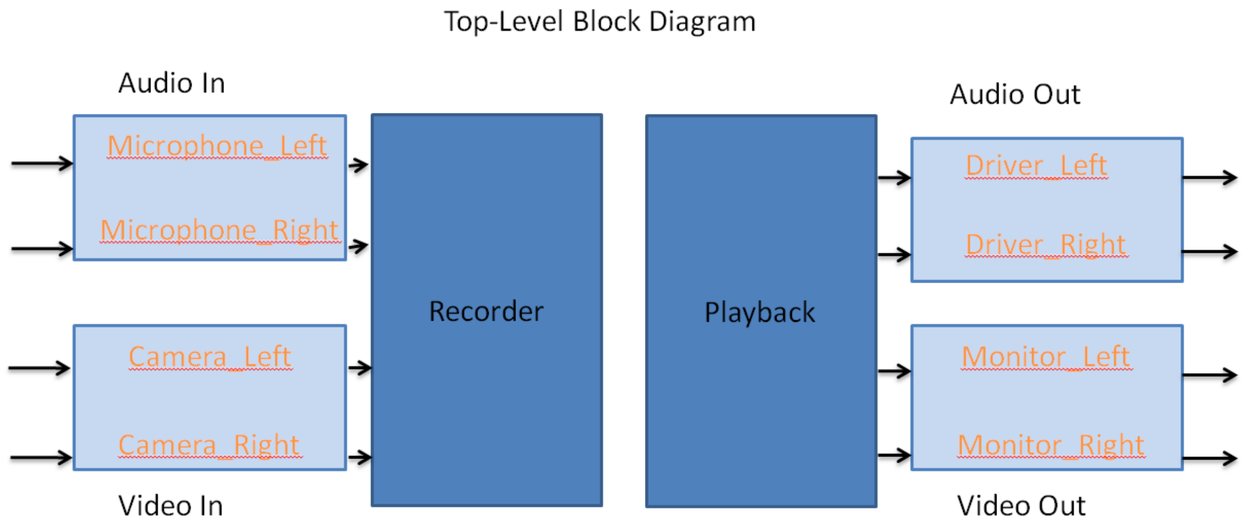
Eric Chae
Phong Lai
Eric Pantaleon
Ajay Reddy
CPE 322 – Engineering Design 6
Assignment 6

Section 1

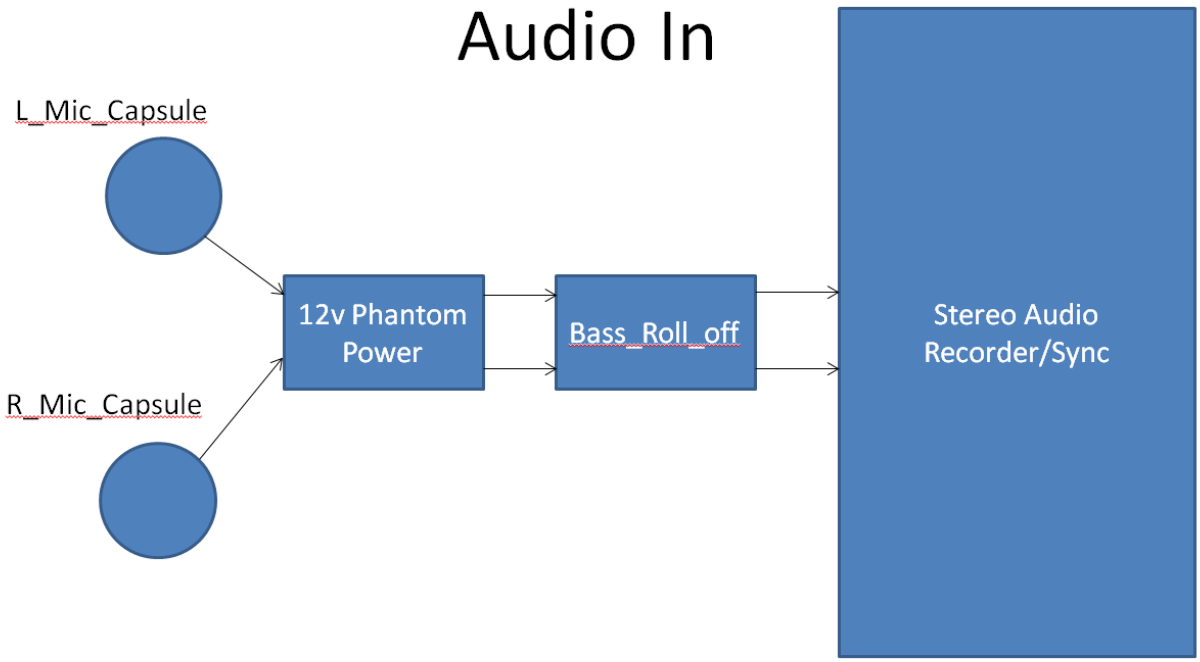
Phong Lai constructed the black box diagrams and provided text on the audio-in and recorder processes. Eric Pantaleon provided text on the video-in and video-out processes. Ajay Reddy provided text on the audio-out and playback processes. Eric Chae compiled this report and constructed the function-means tree diagram.

	Eric Chae	**Phong Lai**	**Eric Pantaleon**	**Ajay Reddy**
Percentage Of Effort Towards this assignment	27%	31%	21%	21%

Section 2



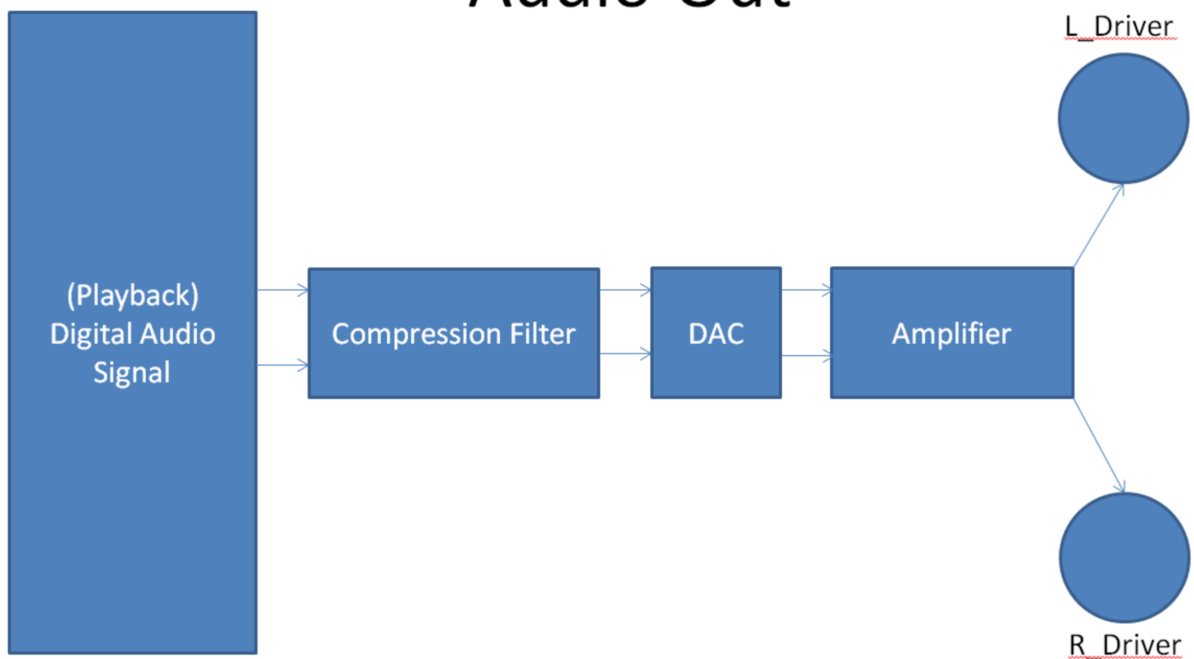
In a top level view of our system, it can be split into two subsystems which include a recorder and a playback device. Without going into much detail, the recorder simply records in stereo audio with two video feeds. The recorder syncs and records the all these files into one file. That file will be played back with a playback device which sends out stereo audio and 2 videos feeds that are synced up. Each of the inputs and outputs will have additional processing involved.



The stereo microphone capsules will require power called plug-in power for it to be used. Plug-in power is normally embedded into many devices but usually give less than 3v of power to the microphone. By having dedicated power box to make the microphones active with a higher voltage you will be able to increase the dynamic range of the audio. Without this dedicated power supply, the microphone is often clipped with very loud audio sample while the recorder is set for recording normal range volume. A dedicated 12v power will increase the range and allow the microphones to capture much louder volumes.

From the power box, the audio signal passes through an optional bass roll off optional filter. Since the microphones are very flat in terms of frequency response, the lower spectrum of audio frequencies will appear to be louder. The bass roll off is a high by pass filter targeted for the lower end spectrum. Then the audio is sent to the recorder.

Audio Out

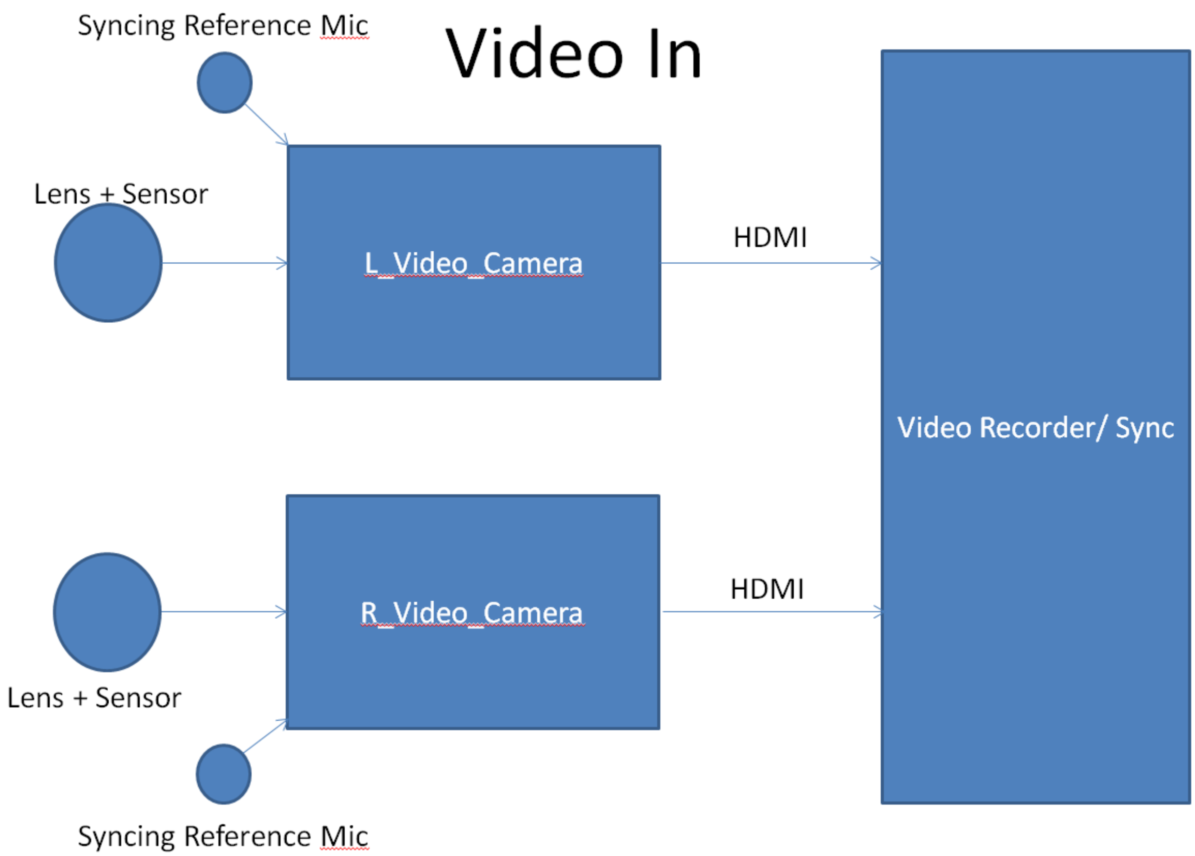


As we will be attempting to create a virtual reality environment, our goal is to have CD quality audio output. For that reason, we have to start with fairly high quality audio in the first place. Once it's processed by the compression filter, we have to have a DAC capable of interpreting a digital signal and converting it to analogue signals at a quality equivalent to CD quality, at the very minimum.

After that, we will need a good amp capable of driving headphone speakers. It's important to use quality gear at this stage, because if the amp is noisy or doesn't work well at certain frequencies, this will cause huge problems to the user when he or she actually listens to the audio from the headphones.

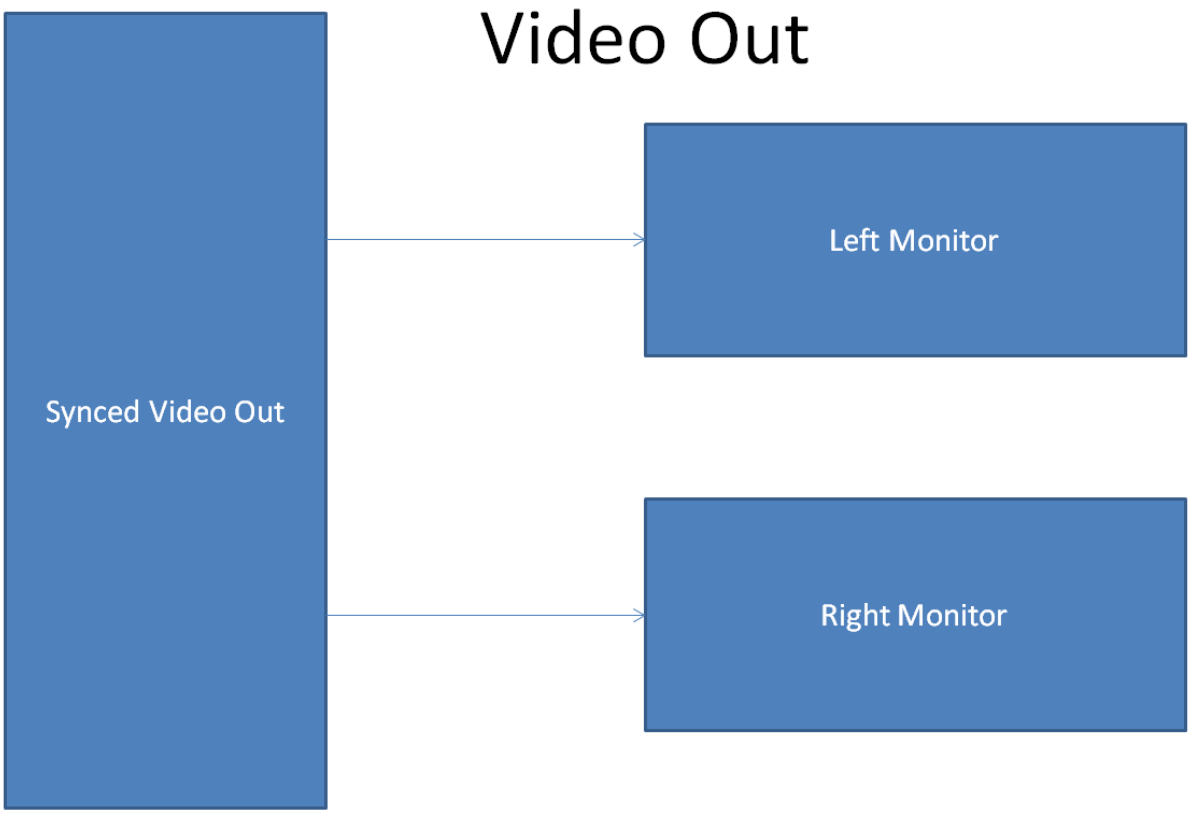
As for the compression filter, it's important that we use something that works well, but not so well that absolutely everything is the same decibel level. We certainly don't want to deafen users, nor do we want them to strain to hear whispers even if they've just listened to loud noises like one might hear in action films, but at the same time, there does have to be a certain variance between softer noises and louder noises. If there isn't, we run the risk of destroying suspension of disbelief.

This should not be a big problem, since most compression filter algorithms allow the designer to dictate minimum and maximum decibel levels. Everything in between is prorated based on the algorithm itself.



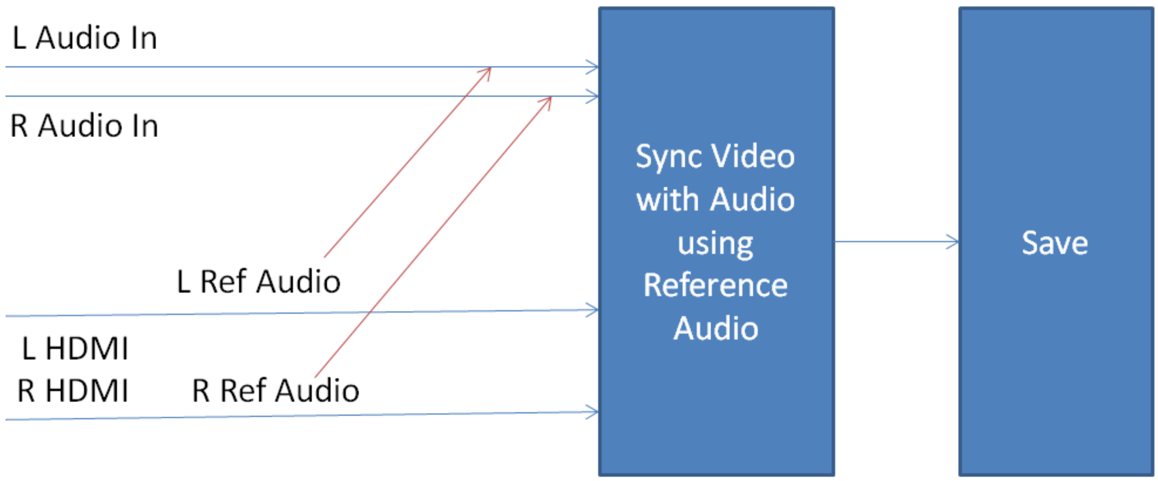
The left and right cameras will both need to be plugged into a power supply that can safely power both cameras operating at the same time. The device would require a powerful enough power supply that keeps our portability feature and powers all the devices on the glasses. Also each camera will be connected via HDMI to a video recorder/sync. The HDMI connector must be of type D. This type is the micro connector and defined for HDMI 1.4 specification which allows 3D over HDMI. This is currently the smallest connector type for HDMI's. If we can somehow incorporate a locking tab to keep the cable from vibrating loose and a small shell to prevent moisture and dirt, then it would make for a durable product.

These cameras, coupled with a small mic, will be mounted on the glasses in a way that will model human eyes. They will be a few centimeters apart and since they cannot be placed directly in front of your eyes, they will be angled to capture around the same area where vision is possible. If using one camera, as mentioned in the "Recorder Process", it can be mounted in the middle of the glasses to get a centered view. This would be able to use a less demanding power supply, but the HDMI port will still be the same.



This process is the playback of the finalized, synced file. There are a number of ways of possibly viewing. If exporting the file from the glasses to a computer and watching from the computer screen, then 3D glasses must be used as well as a surround sound speaker to fully utilize the features of the file (3D video and audio). This would also be the same for viewing on any single monitor setup such as televisions or projectors. In order to view through the glasses, the product itself must have viewing capabilities such as somehow getting them to project the video files onto the lenses or have a virtual reality feature like the iTVGoggles. If the goggles have one large lens then it will use the coupled video file, but if it has a separate left and right lens, then it can display the left recording in the left lens and the same for the right side. The binaural audio file should work just as well. Essentially, to keep the portability aspect of the goggles, it would probably be best to just be able to export the synced file and view through a television or computer screen.

Recorder Process

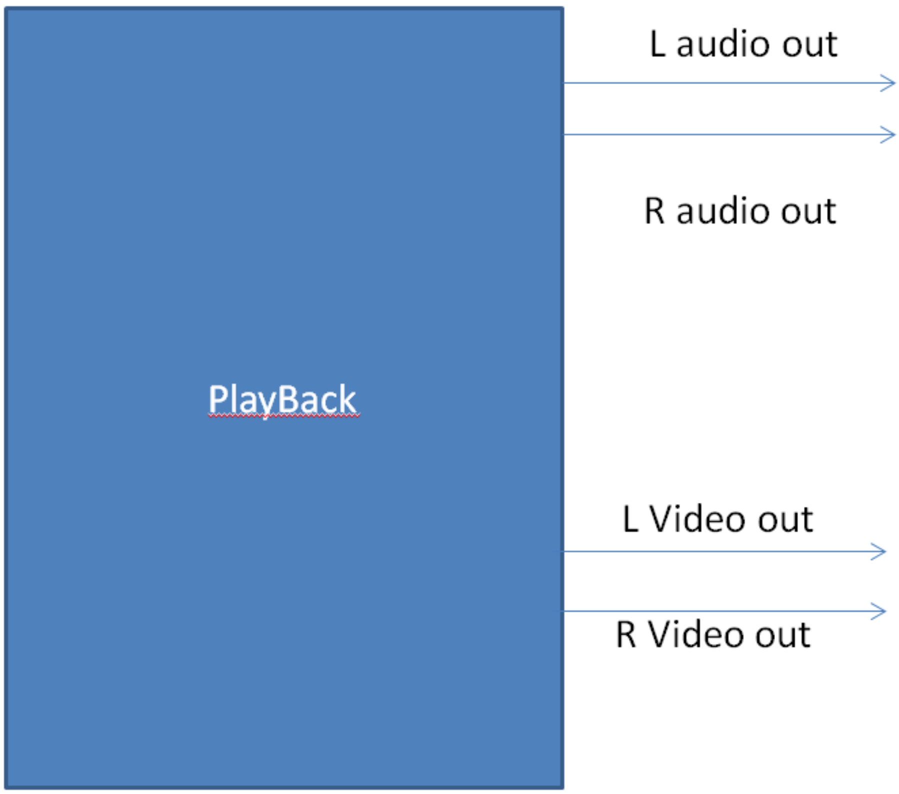


The recorder device brings all the input peripherals into one common device. The input peripherals would be stereo channel audio from the binaural microphones and two video channels (Left channel and Right Channel). Each channel of the video feed will have a reference audio track as well by HDMI. The main purpose of the recorder is to sync up all the inputs and save it into a package where video channels and audio channels as combined into a single file.

The reference audio tracks are only used to sync the videos tracks and audio tracks to have the same time code. After the sync is complete, there is no use for the reference audio tracks because it will be replaced with the binaural tracks.

Another aspect that may be implemented if we are using one camera instead of two is applying a copy of the single video feed with 2 separate crops. Each video will have a horizontal and vertical offset as well as slight rotation from each other. The videos will then be in a side by side format for 3d stereoscopic viewing. Binaural audio track will also be imbedded into this file. Lastly the final track will be compressed and saved to be used for playback. Compression is mainly used for saving space but also serves to reduce the processing power required for playback. This process may have a long time for the buffer to clear, but it is better to do the processing during the recording process than during the playback process. If the process is implemented in the playback process, the user would have to wait for the buffer to clear each time the user wishes to view the video.

Playback Microprocessor



The playback microprocessor is one of the most important parts of the VR headset that we hope to build. It will have to do a few tasks, but it will have to do them well enough that the user is convinced of the validity of what he or she sees and hears. Fortunately, technology has improved enough that such powerful processors are small and cheap enough for our purposes and for marketability to the general public.

What we will need is a microprocessor that can deliver high quality (CD quality or better) audio to the audio output subsystems. It will also have to deliver high quality video to the monitors themselves, and the minimum we would hope to achieve is 720p resolution at 25 frames per second. This is high quality at a good enough frame rate that unless one specifically looks for imperfections, one ought to be really draw into whatever experiences the movie or video game attempts to create.

Function-Means Tree