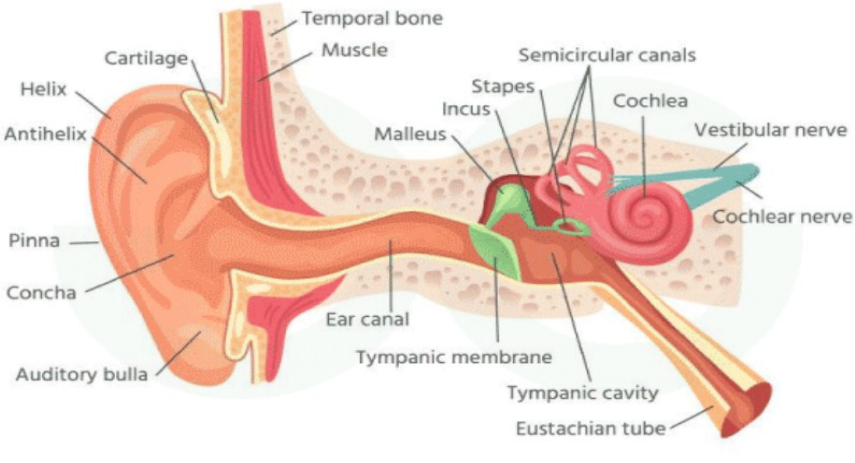
CS 559 P3

Aim: To create a model of human ear and show the working of each part of the ear, in Three.js. It will consist of three parts: the outer, middle and the inner ear. For the outer ear I aim to show small animations of sound waveforms hitting the pinna from all directions and then getting centered into the ear canal. Then in the ear canal, I will show the animation of the ear drum and the movement of the three bones malleus, incus, stapes (created by cone, torus or cylindrical geometry) when hit by the sound waves.

I will also add a slider for controlling the intensity of the sound waves (showing damages to ear drum when the intensity is too high) and a slider for controlling time (showing deposits of wax over time in the ear canal), making wax block some of the sound waves if accumulated.
I can also indicate the values in the slider which are optimal for the ear to function properly and indicate a risk message when harming values are selected. Additionally, I can add a slider for controlling air pressure and a check box for blocking eustachian tube. If the eustachian tube is blocked and the air pressure is low, it will cause the ear drums to pop out (like we feel in airplanes) and I can show the effect of sound waves (less waves perceived) because of that.
All these combined shows give a basic working of a human ear in three.js. I can also play with different textures and camera perspectives (maybe perspective of a sound wave in the ear), and other resources taught in the class, to make it more realistic and accurate.
A labelled diagram of human ear for reference:



GitHub repo link: https://github.com/ats-atharvan/Human-Ear-model/tree/main

Grading Scheme:

A-level (0.8pt each):

- Ear model is accurate and contains all following structures (0.8pt for all):
  - Outer Ear
  - Auditory Canal
  - Malleus
  - Tympanic Membrane
  - Incus
  - Stapes
  - Cochlea
  - Eustachian Tube
- Controls present for (required for A, 0.8pts each)
  - Wave amplitude
  - Time
  - Air pressure
- Ear structures are labeled, and labels can be hidden
- Waves are animated and realistic
- Warning message shown when amplitude raised too high (required for A)
- Camera can freely move around the scene (required for A)
- Wax buildup is apparent in 3D model
- Tympanic membrane concavity obviously changes when air pressure goes below a threshold

B-level: (0.64pt each):

- Ear model is accurate and contains 6 or more of the structures
- [Placeholder]
- Ear structures are labeled, but hiding ability is not there
- Waves are animated, but not realistically
- [Placeholder]
- [Placeholder]
- Wax buildup is present but hard to notice
- Tympanic membrane concavity changes when air pressure goes below a threshold, but effect is not obvious

C-level (0.56pt each):

- Ear model is not accurate and contains 3 or more of the structures
- [Placeholder]
- Ear structures are not labeled
- Waves are not animated
- [Placeholder]
- [Placeholder]
- Wax buildup is not present
- Tympanic membrane concavity does not change