Deliverable D - Conceptual Design

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## Objective

The smart glasses should provide functional and clear audio to the user through an API, ensuring real-time communication between junior employees and senior mentors. This system must offer a seamless audio connection, ensuring both clarity and reliability, especially in potentially noisy and disruptive environments.

## Design Criteria

* **Clear Audio**: The sound quality must be high to help with effective communication.
* **Audio Connection via API**: The audio subsystem must connect through the API, which is network-aware and adaptable.
* **Lightweight and Durable**: The auditory component should not significantly increase the weight of the glasses, keeping them lightweight and comfortable (under 75g total).
* **Battery Efficiency**: The audio component should be power-efficient, ensuring the glasses operate for at least 5 hours.

## Conceptual Design for the Auditory Component

**1. Bone Conduction Audio**

* **Description**: This concept uses bone conduction technology, which transmits sound directly through the skull to the inner ear. This would allow the user to hear the audio without blocking environmental sounds.
* **Benefits**:
  + Does not block environmental noise, allowing situational awareness.
  + Lightweight and fits well within the glasses' design constraints.
  + Efficient battery usage since the volume does not need to be very high.
* **Drawbacks**:
  + Audio quality might not be as clear as traditional in-ear speakers.
  + Some users may find the bone conduction earpiece uncomfortable.

**2. In-Ear Wireless Speakers**

* **Description**: Small, detachable wireless in-ear speakers integrated with the glasses. These could either rest on the ear or sit within it.
* **Benefits**:
  + Provides the highest audio clarity and volume control.
  + Easy to detach and replace, offering more flexibility to the user.
* **Drawbacks**:
  + Potentially heavier and may block environmental noise, reducing situational awareness.
  + Higher battery consumption due to the need for wireless transmission and higher audio quality.

**3. Directional Speakers Built into the Frames**

* **Description**: Small directional speakers integrated into the arms of the glasses, positioned to direct sound towards the user's ears without requiring in-ear speakers.
* **Benefits**:
  + No direct contact with the ear, making the glasses more comfortable for extended wear.
  + Does not block environmental sound, ensuring situational awareness.
  + Lightweight and minimally impacts the design.
* **Drawbacks**:
  + Audio may not be as clear in noisy environments.
  + Battery consumption could be higher due to the need to project sound efficiently.

## Evaluation Chart

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Specifications | importance of specifications | In-Ear Wireless Speakers | Bone Conduction Audio | Directional Speakers Built into Frames |
| Audio Clarity | 3 | 3 | 2 | 1 |
| Comfort | 2 | 2 | 2 | 3 |
| Battery Efficiency | 2 | 2 | 3 | 1 |
| Weight | 2 | 2 | 2 | 3 |
| Situational Awareness | 1 | 1 | 2 | 3 |
| Results: |  | 22 | 22 | 19 |

3 = good, 2 = meh, 1 = bad

## Conclusion

Both In-Ear Wireless Speakers and Bone Conduction Audio offer distinct advantages, but the best choice depends on the use case. For environments where situational awareness is important, Bone Conduction Audio is the better option due to its lightweight design and ability to allow external sound. However, for environments requiring sound clarity, In-Ear Wireless Speakers would be more appropriate.

## References

[In-Ear Wireless Speakers](https://www.amazon.ca/soundcore-Wireless-Bluetooth-Water-Resistant-Customization/dp/B0BTYCRJSS/ref=sr_1_5?dib=eyJ2IjoiMSJ9.lVow50BJ23eqI2vyvNLsD5C7GtHfB_T95S1SHlJB8-w5ke5ATVBtCls7mM9bDHqBJ_tAS_SHE9EoqvGuCTpsddo1kJc2VBHRQDiq1XNPTLkPVhn6hjxD9WQcHw2u0OS5Ft662jVQKWpzDq9Tdrq2n6WFUd0uI7O0_VfQK0nI9raUzLtFihqp_gAfRFwXjdKnP9W5BQRuo2fB00kxkRWx8OEt_nBWCI3bfMLoRsxC720yKqEXZK6U_zWbpqbeaC4C8_sURe_WuX4SfGAta4hOSVUuorZWVlC1YC-dq8Q7sX8.nc7_pbq9oQQAAQyJjizsE_WHq-oOm1pAcvjj19dU-Vk&dib_tag=se&keywords=wireless+earbuds&qid=1728656591&sr=8-5#customerReviews)

[Bone Conduction Audio](https://www.amazon.ca/OpenMove-Conduction-Bluetooth-Lifestyle-Headphones/dp/B09BW29FJS/ref=sr_1_5?crid=27OJ50030Z991&dib=eyJ2IjoiMSJ9.LNz9QQHGYOluf2-EOx_0sSWpbiZYZMpEv-bL4MJNjUW73KRA2x8_q5D9OBI16dKEx8nyvAbsdgBeSE1CDVjqRMFqabdnJAA9cLLrAJQdOGYA40QpHRMm4Vb1CBbRURFPI8xypkGyHY--6cEXRajTtdNashh8B8MY0kSAtyG6RFHhC3MrYhya9e6zKBABJ7NO8qtk7VwCoS3MOfQsZTaq_2yPf4mMmdBuAgdMzBNSfswOntKqYDaX0ITyRMjxlduCzUzZ_KmsWXrPZoo7A-whQRHPQTaTTysFusD7nba-ROA.2CahBldiyMLNajdStdUcaW3tcYtDDVNmc8sXMDAOxXA&dib_tag=se&keywords=bone%2Bconduction%2Bheadphones&qid=1728656829&sprefix=bone%2B%2Caps%2C88&sr=8-5&th=1)

[Directional Speakers Built into Frames](https://www.amazon.ca/Gikfun-Speaker-Diameter-Arduino-AE1054/dp/B01G6FCDDE/ref=cm_cr_arp_d_product_top?ie=UTF8#customerReviews)