



Research Hypothesis

High fidelity noise-isolating earphones can significantly improve gaming performance compared to conventional audio systems.

Problem

Consumers generally place earphones in three basic categories: inexpensive, average and high-end. For gaming, there is also a perception that either of the first two categories is good enough to experience what games offer with respect to accuracy, fidelity and overall entertainment; however, different types of games provide different levels of audio realism. Basic games provide a minimum level of audio. Even with the obvious differences between basic and advanced audio, the perception remains that average earphones are sufficient for enjoying and experiencing what games have to offer.

If a high-end earphone product provided an improved experience over less expensive or less technically advanced products, then the benefit of better earphones would be clearly obvious. If advanced features demonstrated that they impact the performance of a gamer, the question of this paper would be answered.

Background

Sound produced in games varies greatly. For some games, sound is less important than in other games. Many games offer sound simply as a background element to help improve the general atmosphere of the game. Other games, like first-person-shooter type games, provide sound that is integral to the overall experience.

Higher production-value games include an improved audio experience. First-person shooter games often include audio that represents the best the industry has to offer at the current time. They can provide not only stereo effects, but also provide information that allows sound to be rendered in three dimensions. The sound effects incorporate advanced audio concepts (like reflections and occlusions) that provide an even more realistic environment. This is far more detailed than the audio provided in basic games.

High-end games use sound not only to provide a better overall atmosphere but also to locate or localize elements within the game. These elements provide spatial cues that allow players to identify and react to the element producing the cue. Footsteps from an opponent are often provided. If they are clearly heard, the gamer can more readily react to the in-game threat posed by that opponent.

Research

To test the core question, an audio benchmarking application, called Marco Polo, was created to simulate the audio provided in a typical first-person shooter game. Sound effects in this application were created using the same software tools and methods used in current games, including Microsoft's DirectSound, OpenAL and Creative's EAX audio creation and enhancement tools.

A comprehensive test protocol was created to ensure that the test process remained objective throughout. Testers followed a rigorous test protocol. Results were recorded in an encrypted format and transferred to Etymotic for analysis.

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Twenty-six self-described gamers were recruited to take part in this process. The testers came from around the world and were not told in advance what the process entailed. The testers all had experience with a varied array of audio equipment. Testers were asked to go through the testing process with their own equipment, then Etymotic in-the ear earphones, and then to reverse that process. The test protocol was designed to minimize any learning effect.

Results

Etymotic earphones yielded better performance results in every category. Scores obtained using Etymotic earphones showed a 36% improvement across all products. Products were broken down into four categories, which included stereo speakers, surround sound speakers, low-to-average quality earphones and high-quality earphones. The lower the quality of the products tested, the poorer the scores. Gamers who used stereo speakers had the lowest scores. High-quality earphone users had the second best scores behind the Etymotic earphones.

Discussion

Based on both the objective data collected and the subjective comments of testers, it is possible to identify key components in achieving better results. Much of the benefit for these users could be attributed to the benefit of isolation. Isolation reduces outside influences that can detract from audio cues. Testers who used stereo speakers achieved the worst scores. Comments from testers indicated that they were unable to hear many of the target sounds. They generally had to resort to random hunting to find the targets. Stereo speakers provide no isolation, so outside sounds often obscured the target sounds. Stereo speakers are placed in a set location typically a few feet from the gamer's ear. This can interfere with hearing the audio well, especially if a gamer moves around during play.

High-end earphone users had the second best scores, but even these testers' scores improved when using Etymotic earphones. They reported that they were able to hear subtle details of target sounds even when they were nearly masked by competing sounds.

Etymotic earphones provide a flat frequency response that provides an accurate, less colored sound. Many earphones that are designed for listening to music have enhanced bass which can alter spatial cues. An accurate audio experience allows testers to more readily identify and react to the challenges of complex audio in a game environment. When these same testers switched to earphones, they were able to locate the target sounds with dramatically improved results.

Conclusion

The hypothesis was: High fidelity noise-isolating earphones can significantly improve gaming performance compared to conventional audio systems. The results of Etymotic's research indicate that this statement is true for nearly all gamers. Data support the assertion that complex game audio is heard better with the sound isolation and flat frequency response of in-the-ear earphones.

Postscript

Etymotic Research has created a new division, E.D.G.E. Acoustics (Enhanced Definition Gaming Earphones) to develop gamer-oriented headsets. This series of headsets will combine the advantages of Etymotic's high-fidelity, sound- isolating in-the-ear earphones and the benefits of Etymotic's patented microphone technology.