



CALIFORNIA STATE SCIENCE FAIR 2008 PROJECT SUMMARY

Name(s) Andrew T. Nguyen	Project Number J1622
Project Title Active Noise Control: Searching for the Sound of Silence	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to demonstrate the active noise control technique and to measure the effects of noise type, noise frequency, and the separation distance between the noise and the antinoise speakers on the effectiveness of active noise control. The goal is to understand the fundamentals of active noise control to design more effective and affordable active noise cancellation applications.</p> <p>Methods/Materials Materials used include a computer to synthesize the noise and antinoise signals, two speakers, and a noise meter. The test apparatus was built of plywood and the walls are lined with acoustic absorbing foam. Tests were conducted using different types of noise (sine, sawtooth, and square wave) at different frequencies (250 Hz to 2000 Hz). The distance between the speakers was varied between 2 cm and 10 cm. to simulate the effect of separation distance on Active Noise Control. The decibel level with and without active noise control was recorded as a function of the noise type, the distance in between the speakers, and the frequency of the noise</p> <p>Results At fixed distances between the speakers, the percent reduction in the noise intensity decreases as the frequency increases from 250Hz to 2000Hz. Active noise cancellation is very effective at a small distance between the speakers (25% reduction at 2cm), but not at longer distances (5% reduction at 10cm). Sawtooth functions have the highest reduction rate in noise level (30% reduction), while the square wave function is least effective (20% reduction). 72% of those surveyed are aware of noise pollution, but only 41% understand that active noise control works best at low frequencies.</p> <p>Conclusions/Discussion Active Noise Control performs best when noises at low frequency are used in the tests. Active Noise Control is more effective at short distances between the speakers because the noise and the antinoise signals interact with each other without interference from the surrounding. The everyday, broadband noises are not strongly canceled by Active Noise Control. The shape of the narrowband noise does not make a significant difference in the results. In conclusion, the effectiveness active noise control depends on frequency, type of noise, and the distance between the noise and the antinoise.</p>	
Summary Statement Active noise control works best with noise functions at low frequencies and small distances between the noise and the antinoise; therefore it is an effective method to manage the noise pollution problems in an industrial environment.	
Help Received My mother helped format my board. My father helped me construct my test apparatus and edit my report.	