

## **Biomimetic Sound-Localization in the Plane Utilizing Head-Related Transfer Functions**

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### **Research**

**Title:** Biomimetic Sound-Localization in the Plane Utilizing Head-Related Transfer Functions

In this research, we examined the feasibility of creating a biomimetic system to locate sounds in a plane. A sound measuring system consisting of two microphones with asymmetrical “pinnae” was constructed. To circumvent the need for knowing input sound wave, the ratio of Head-Related Transfer Functions (HRTFs) corresponding to the right and left ear was used for spatial mapping of sound field. Using a least squares matching method and a 72-position (5 degree increments) database, our proposed biomimetic system yields 100% localization accuracy when an actual sound source is located at any one of the 72 positions in the database. Our present coarse database yields less than satisfactory results for adjacency-matching (when actual sound source is between two neighboring locations from database). We intend to improve our database with a finer discretization, which is expected to yield improved and accurate interpolation and adjacency-matching. After demonstrating our biomimetic sound localization technique in the plane, we expect to generalize this approach for sound localization in 3D-space. As previously indicated, the proposed approach obviates the need to know the sound source signal. Furthermore, HRTFs have the benefit of potentially being distinct for all directions, eliminating the front-back ambiguity of strategies utilizing the inter-aural time delay or the inter-aural volume difference.

### **Lesson Plan**

**Title:** Thinking Like a Researcher—Adding and Subtracting Integers

Students are introduced to “Researcher Habits of Mind.” A few habits are demonstrated to the students, who are then asked to utilize them to better understand the behavior of integers under addition and subtraction.

