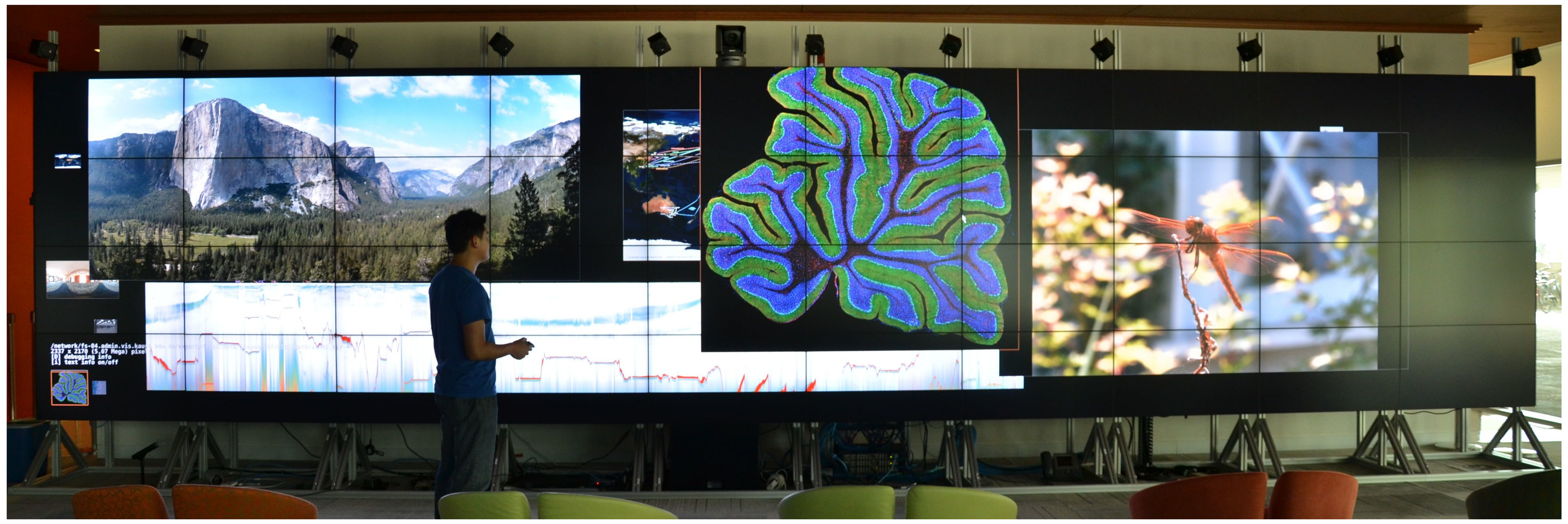
SONNOTILE Audio Annotation And Sonification For Large Tiled Visual Display Environments

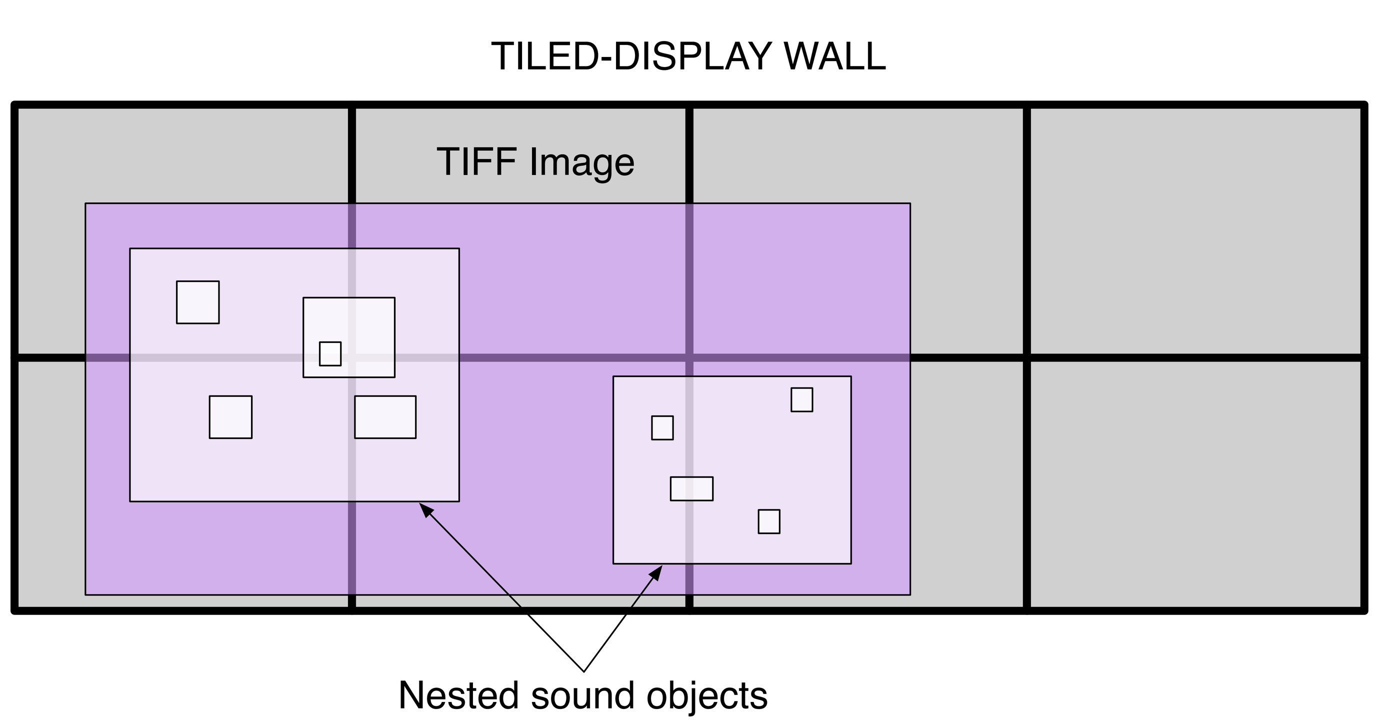


Zachary Seldess, King Abdullah University of Science and Technology
zachary.seldess@kaust.edu.sa

So Yamaoka, **Falko Kuester**, University of California, San Diego
syamaoka@ucsd.edu, fkuester@ucsd.edu

ABSTRACT

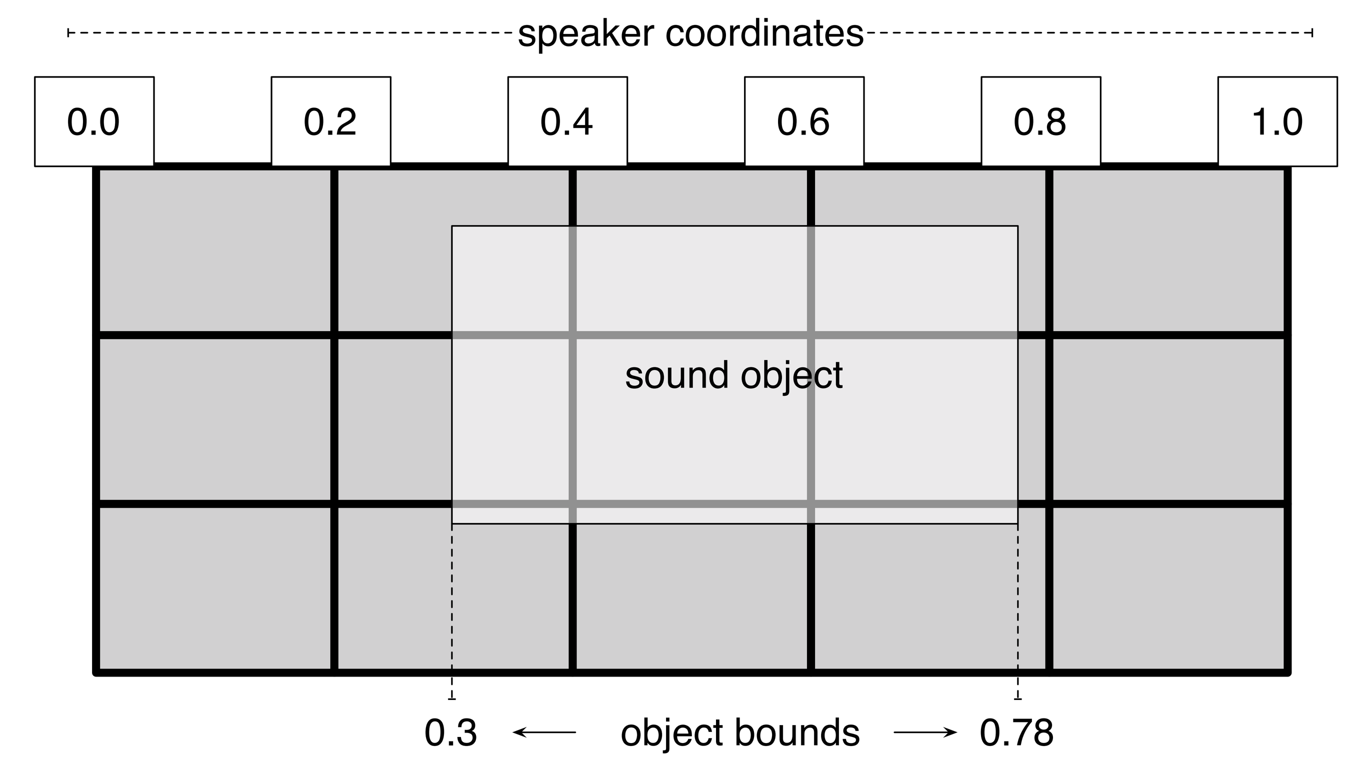
Sonnotile is a multi-modal rendering framework to enhance scientific data exploration, representation, and analysis within tiled-display visualization environments. Sonnotile aims to assist researchers in the customization and embedding of sound objects within their data sets. These sound objects may act as way-finding markers within a media space, as well as allow researchers to attach and recall various sonic descriptions or representations of an arbitrary number of regions within a data set. In designing the software, our initial efforts have been centered on the challenges of sound "annotation" within large-scale pyramidal TIFF files.



1. SOUND OBJECTS

Sonnotile allows users to define and attach sound objects to images in two forms:

- **Sound Markers** are looping sounds intended primarily as a way-finding and search tool within the media space, helping to alert and assist users in finding areas of interest within the display environment.
- **Sound Annotations** are non-looping sounds, triggered by users, that provide a method for storing and recalling specific details on selected regions within the data set, whether they be narrative descriptions of the data, more abstract symbolic sonification of elements of the data not visually rendered, etc.

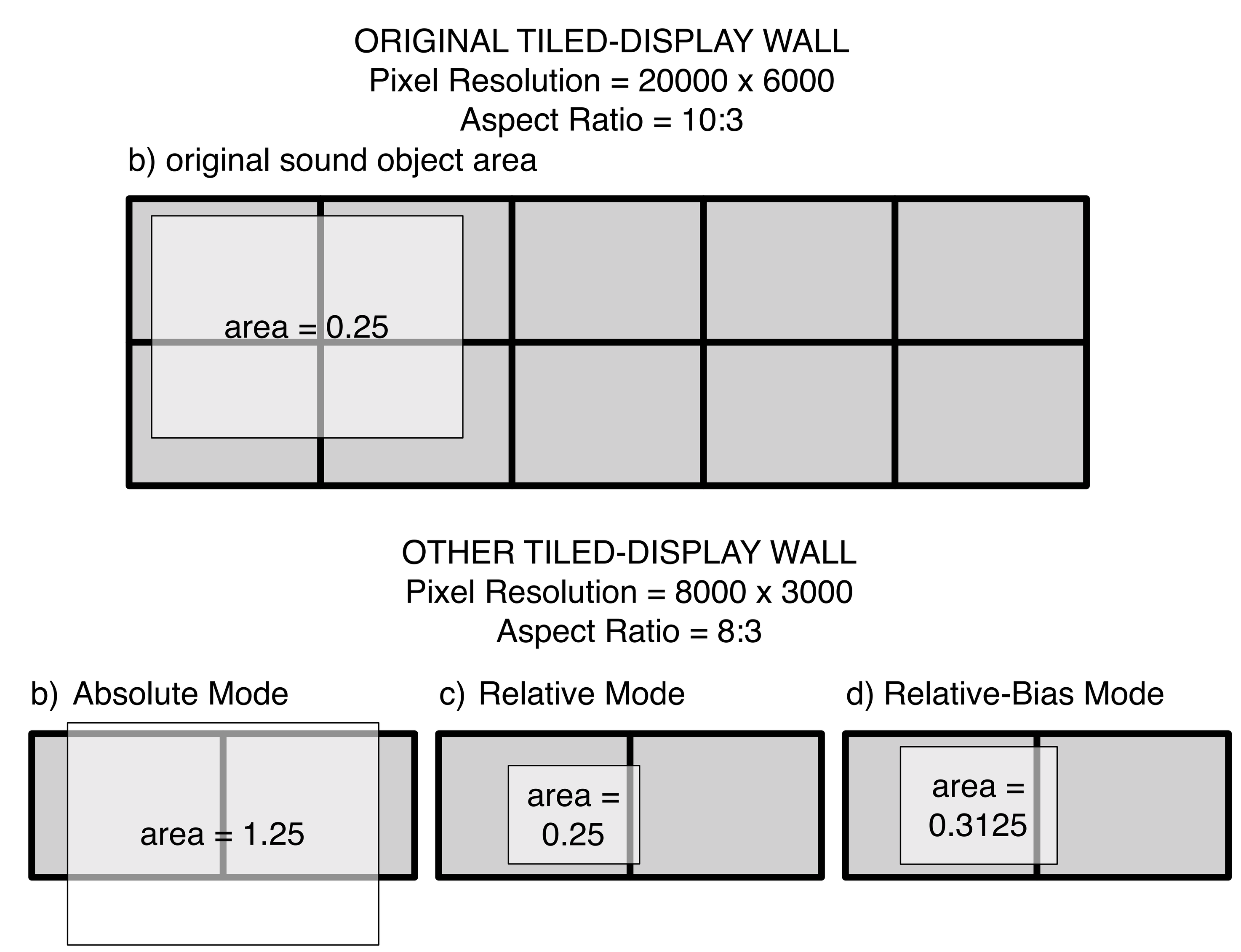


speaker weights = { 0.0, 0.5, 1.0, 1.0, 0.9, 0.0 }
normalized weights = { 0.0, 0.147059, 0.294118, 0.294118, 0.264706, 0.0 }
amplitude scalars = { 0.0, 0.383482, 0.542326, 0.542326, 0.514496, 0.0 }

2. PANNING METHOD

We have developed a variable-channel equal-power panner that renders width in addition to basic point-source location.

- Weighting values are assigned to each speaker based on its location in relation to the object's boundaries.
- These weights are then normalized and converted to amplitude by calculating the square root of each value in the array.
- A scalar is then applied to all speaker amplitudes depending on the pre-defined fading behavior of the object and its current size on the wall.



3. PHYSICAL MAPPINGS

In 3-D media space, perceptual fading of a sound object is often coupled to its distance from a camera or virtual head. For the 2-D media space of an image, we have adopted an analogous mapping that equates visual size to loudness (size being a byproduct of distance in 3-D space).

Fading behavior for a sound object is defined in terms of its normalized area relative to the overall area of the display wall. Normalized areas provide an intuitive method by which to deal with this sonic parameter. However, tiled display walls come in a variety of sizes, and therefore realizations of these normalized areas can change drastically when defined in reference to different pixel resolutions and aspect ratios. To counterbalance the awkwardness of mapping sound objects between different sized spaces, we have developed three "Fade Modes".