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# Tangible Ubiquitous Media Explorer

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**Abstract**

We demonstrate a multi-user sensor network explorer that provides a haptic, aural and visual experience, allowing viewers to experience sensor data ported from other spaces.

**Introduction**

Our ubiquitous sensor network and media explorer integrates sound, images, and diverse data sampled throughout the Media Lab into a visual, aural and haptic experience. Real time data drives the system, allowing the observer to sense the overall activity of the Media Lab. Sound and images are streamed into our system from a selection of 45 sensor nodes distributed throughout our Lab. Observers can interact with the piece, both observing the generic activity of the Media Lab and drilling down to browse media streamed from particular locations. The installation reflects the essence of the Media Lab as a holistic entity.

**The Explorer**

Participants are presented with a large hanging picture frame. Within the picture frame is a dull piece of brushed aluminum sheet. On this substrate, a visualization of randomly-directed flocking bodies is quiescently projected – the grainy character of the aluminum screen gives the projection a “painted” appearance. These bodies represent sensor data, and

they will school towards the area of most sensor activity once significant activity is detected. If a viewer moves a magnetic wand attached to the frame over the position corresponding to a particular sensor node, the sheet will vibrate with the live audio from that sensor position (a set of voice coils behind the frame are driven by audio streaming from the corresponding nodes). As the magnetic fields from the coil and magnet interact, the viewer will both be able to hear and feel the vibrations of the space that data driving the coil represents. In this way, the viewer becomes an extension of the sensor output. They are drawn into the sensor space and feel the auditory vibrations through this interaction. A reed switch mounted within the voice coil detects the proximity of the magnet when a node is being browsed, at which point a current image taken by the corresponding sensor node in the remote space is projected onto the aluminum sheet. This image further connects the viewer to the remote environment (see Figure 1).

### **The Ubiquitous Media Portals**

The data and content for the Explorer is delivered by a sensor network and media system distributed throughout the Media Lab that streams views from many vantage points. These nodes (termed "portals") contain temperature, humidity, motion, light, IR and vibration sensors, along with microphones and video support [1]. When a portal is being remotely browsed, a warning message appears on its display and a set of bright LEDs are illuminated to alert any nearby individuals that they are being watched.



**Figure 1:** Interaction with the Explorer at the ARS Electronica 2009 festival: Human Nature

### **Acknowledgements**

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[1] Lifton, J., Laibowitz, M., Harry, D., Gong, N.-W., Mittal, M. and Paradiso, J. A.: *Metaphor and Manifestation - Cross Reality with Ubiquitous Sensor/Actuator Networks*. IEEE Pervasive Computing, July-September, vol. 8, no. 3, pp. 24-33 (2009)