A Ubiquitous Sensing Model for Environmental Science, Interaction Research, and Public Engagement with Restored Wetlands

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Abstract:

Increasing availability of off-the-shelf environmental sensor devices is supporting a growing interest in quantitative assessment of wetland restoration. But a gap remains between the nearly ubiquitous fixed and mobile sensor devices that permeate the built environment and the mostly manual processes for collecting and examining data in restoration settings. Over the past four years, we have been working to close that gap, developing an environmental wireless sensor network and a diverse set of user interfaces for the Tidmarsh Farms restoration project in southern Massachusetts. Our system is designed to support a broad array of applications, interpretations, and artistic expressions, from primary ecological research to musical composition. Our wireless, low-power sensor node, currently in its second generation, measures a set of local conditions, including temperature, humidity, motion, and light levels, and is easily connected to outboard sensors in the soil and water. Separately, we have developed a dense acoustic monitoring system, supporting live, multi-channel audio streaming from dozens of custom-built microphones and hydrophones. We are only beginning to tap its potential for measuring biodiversity and identifying wildlife. But sensing is only half the story. Our work in this space extends to novel web services for providing real-time sensor data to end user applications, public-facing data visualizations, sensor-driven virtual and augmented reality environments based on the restoration landscape, wearable devices for exploring the data in situ, and tools for environmentally based artistic creation. Our efforts raise a series of new research questions within the fields of sensor networks, user interfaces, and restoration science. What is the role of ubiquitous sensing in the future of how we understand and experience landscape? What opportunities are created by weaving a continuously sampling, geographically dense web of sensors into the natural environment, from the ground up? We see these inquiries intersecting in the restored landscape and its many stakeholders, from neighboring communities, visitors, and scientists to a global online audience.

Keywords:

ubiquitous sensing, restoration, augmented reality, public engagement

Management & Applied Science:

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