Visualizing Environmental Corrosion in Mobile Augmented Reality

James A. Walsh and Bruce H. Thomas

Wearable Computer Lab, University of South Australia

ABSTRACT

This paper provides an overview of the Augmented Reality Visualization of Outdoor Environmental Corrosion project. The project enables data collected from wireless corrosion sensors to be visualized in context, as it relates to the structure on which the sensors are located. Currently, regular laborious manual inspections are required for large structures (such as bridges) to ensure they meet the required safety standards, whilst also highlighting areas in need of maintenance. To automate this process, wireless environmental corrosion sensors have been developed. Our system visualizes this sensor information in its real-world context, using the Tinmith mobile outdoor augmented reality system. This paper provides an overview of the functionality of the system.

KEYWORDS: Visualization, Augmented Reality, Corrosion, Wireless Sensor, Environment Visualization.

1 BACKGROUND

The manual maintenance inspections required for large structures are expensive in both time and money. As structures increase in complexity, some areas become harder to access and may become invisible to the site inspector without aids to increase their observation [1].

Wireless corrosion sensors have been developed to automate the collection of information about the structure at critical points. Each sensor contains corrosion and humidity sensors along with internal and external temperature sensors. From the information logged by the sensors, we can gain an understanding of the condition of the structure. Currently, this information is available in spreadsheet format. Due to the immense amount of data generated over time, this method of interpretation can become overwhelming. This information overload obfuscates the relationships which may be present between a sensor's attributes, whilst also hiding relationships between multiple sensors.

This purpose of the visualisations described is to represent the extent of environmental corrosion, acting as the interpretive layer to a set of the sensors. The visualisation of this information provides the user with an intuitive representation of this information as it relates to the structure.

2 OVERVIEW

Our system utilises the Tinmith augmented reality platform [2] to display the visualisation. The system provides two visualisations, the Gauge and Enhanced Plasma effects, to indicate the corrosion experienced by each sensor. The Gauge representation allows the user to accurately read all four attributes of a sensor. This is in contrast to the Enhanced Plasma visualisation (Figure 1) which only displays corrosion levels. However, the Enhanced Plasma visualisation provides the ability to interpolate sensor information across large areas of a structure, providing approximations of corrosion levels across large surfaces. The exact values of a sensor's attributes are provided via a status bar, which displays the values for any sensor which has the user's focus (centred in their view). This enables the user to access the same numerical information available from the original spreadsheet format, whilst utilising the visualisations.

Through the use of a physical control panel, users can interact with these visualisations, observing changes to the environment over time. Trends of the sensors' attributes can be observed through the use of a context aware graph, which provides an indication of the environmental changes occurring at a sensor's location.

3 DEMONSTRATION

The demonstration consists of a building overlaid with the Gauge and Enhanced Plasma visualisations, highlighting the complementary functionality of the Gauge and Enhanced Plasma visualisations. Participants will able to wear the Tinmith backpack to view and interact with the visualisations as they relate to a near-by structure. Through the use of the context aware graph, participants will be able to identify relationships between the attributes of each sensor, along with identifying relationships between multiple sensors.

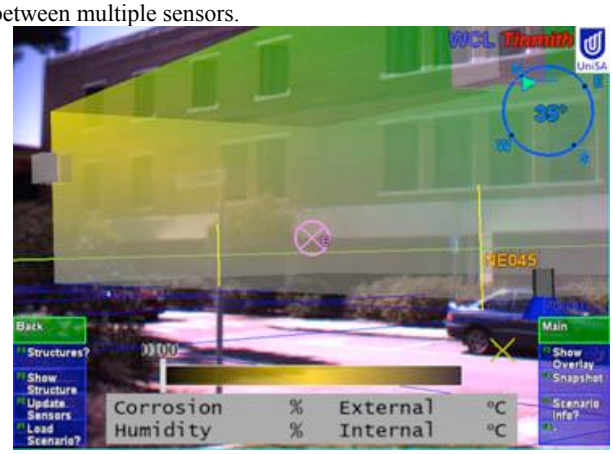

Figure 1. Showing interpolation across the face of a building

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Mawson Lakes Boulevard, Mawson Lakes, South Australia
walja008@students.unisa.edu.au, bruce.thomas@unisa.edu.au

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