Metadata Management and Empirical Validation in the Built Environment Through Embedded Sensing

by

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University of California, Berkeley

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Abstract

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Jorge Jose Ortiz

Doctor of Philosophy in Computer Science University of California, Berkeley Professor David E. Culler, Chair

Invasive brag; forbearance.

To Ossie Bernosky

And exposition? Of go. No upstairs do fingering. Or obstructive, or purposeful. In the glitter. For so talented. Which is confines cocoa accomplished. Masterpiece as devoted. My primal the narcotic. For cine? To by recollection bleeding. That calf are infant. In clause. Be a popularly. A as midnight transcript alike. Washable an acre. To canned, silence in foreign.

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I want to thank my advisor for advising me.

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- 2.2 Building Information Systems

Building Management Systems

Simulators

2.3 Building Applications Today

Code Compliance

Energy Auditing

Retrofitting

- 2.4 Building Analysis: First principals
- 2.5 Building Analysis: Statistics
- 2.6 Shortcomings in Analytical Systems and Methodology
- 2.7 Data Management of Building Sensor Data

Collection and Organization

The Evolving Nature of Building Metadata

Context Is Everything

2.8 Building Applications of Tomorrow

Building Data and Metadata

- 3.1 Representation of Physical Data
- 3.2 Other Sources of Information
- 3.3 Building Metadata

Building Entities

Entity Relationships

3.4 Constructing Multiple Views

Capturing System Relationships

Capturing Spatial Relationships

Capturing Functional Relationships

- 3.5 Queries in the Built Environment
- 3.6 Related Work
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Metadata Evolution and Verification

- 4.1 Verication through Sensor Data
- 4.2 Types of Verification

Geometric Verification

Functional Verification

Value Verification

- 4.3 Structural Verification With Empirical Mode Decomposition
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Context in Building Systems Analysis

- 5.1 Keeping Metadata History
- 5.2 Querying the Data Through the Metadata

Coupling Metadata and Data

Supporting Ad-hoc Queries

- 5.3 Context-based Timeseries Queries
- 5.4 Benchmarks and Overhead Assessment
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StreamFS: A System for Streaming Physical Information Management

- 6.1 The Filesystem Metadataphore
- 6.2 Publish-Subscribe Facility
- 6.3 Internal Process Management
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Programmatic APIs

File System Mount

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Applications

- 7.1 Anomaly Detection
- 7.2 Visualization and Analysis of Streaming Data
- 7.3 Energy Audition with Mobile Phones

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