

X. YANG, S. ERGAN . **Evaluation of various visualization forms for facility operation and maintenance.** *Gerontechnology* 2012;11(2):337; doi:10.4017/gt.2012.11.02.471.00 **Purpose** Ongoing case studies in different facility settings revealed that current industry solutions (such as BAS and CMMS) still lack the capability to enable users to understand and interpret raw data for operation efficiency as well as plan for maintenance tasks in complex facilities efficiently. There is still a need for facility operators to put data into spatial or knowledge context and make decisions for actions during operation and maintenance (OM). Visualization is a promising aid to provide intuitive support for facility personnel while dealing with complex spatial data and large amount of raw/processed data and to enable them to respond promptly to issues that arise. This research focuses on identifying visualization requirements for facility personnel, evaluating various visualization forms for supporting OM-decisions and developing a formal approach to supporting visualization requirements. **Method** Two case studies and shadowing work are still ongoing in two different types of facilities (one is in a complex campus building, the other one is in a highly-sensed conservatory). The purpose of these studies is to identify the inefficiencies or difficulties associated with the lack of visualization support in current OM-practice. We have identified an initial set of visualization requirements from these studies and analyzed different scientific visualization forms (e.g. 2D, 3D, desktop virtual environment, and immersive virtual environment) as well as information visualization forms (e.g. color/pattern coding, text/number overlay, graph, etc.) used in human computer interaction and architectural engineering construction and FM (facility management) domain through extensive literature review. We developed a matrix of initial set of visualization requirements for different OM-tasks and visualization platforms to understand characteristics of visualization support requirements. **Results & Discussion** This paper provides an initial set of visualization requirements for typical tasks identified from the two case studies and a synthesis of extensive literature review on scientific and information visualization platforms that exist in the current body of knowledge (*Table 1*). The mapping of the initial set of requirements to visualization platforms reveals that OM-work efficiency can be improved by multiple visualization forms, and the characteristics observed from this mapping can be used as a basis for a formal approach to identify applicable visualization platforms for a given task from the OM-domain.

**Keywords:** information technology, facility operation and maintenance, visualization

**Affiliation:** Carnegie Mellon University, Pittsburgh, PA, USA; E: xueyang@andrew.cmu.edu

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Table 1. Visualization requirement analysis of OM tasks identified in industry cases

O&M task	Visualization requirement	Information needed for visualization	Current information source	Current way information provided	Visualization category
Situation awareness in indoor environment for every room	Visualize if sensor readings are within normal ranges and spatially mapped with room layout	Real-time sensor readings	BAS	Number in table	Information visualization
		Threshold values	BAS	Number in table	Information visualization
		Sensor location	Floor plan	Mark on floor plan	Scientific visualization
Plan corrective maintenance work for HVAC system in response to 'Hot/Cold' call	Visualize HVAC system layout feeding a certain room and augment it with HVAC parameters	Room location	Floor plan	Tag on floor plan	Scientific visualization
		HVAC system layout	Mechanical drawing	Symbols, shapes and lines on drawing	Scientific visualization
		HVAC parameters	BAS	Number in table	Information visualization
		Room temperature	BAS	Number in table	Information visualization