

A system concept representation framework and its testing on patents, urban architectural patterns, and software patterns

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Abstract

The development of a concept for a system is a key step toward creating the system's architecture. Most previous concept development approaches focus on the procedures for the conceptual design activity—the sequence of activities and tasks. Our work is motivated by the desire to elaborate in details the notional content of a system concept and to provide the means of encoding and analyzing it in a digital environment. The objective of this work is to develop a *system concept representation framework* that can systematically represent the concept's constituents, their definitions, and interconnections. In order to demonstrate the utility of this framework, we have conducted three studies: mapped eight selected US patents, nine selected urban architectural patterns, and three selected software patterns to the framework. Patents, urban architectural patterns, and software patterns each contain a rich body of knowledge about the system they describe, and therefore they must logically contain a description of the concepts underlying them. We show that the main features of proposed framework can be found in patents, urban architectural patterns, and software patterns. The major utility of the framework is that it provides the means to encode existing system concepts and to inform the conceptual design of new systems, contributing to the INCOSE Model-Based Conceptual Design initiative.

KEYWORDS

concept representation, knowledge management, model-based conceptual design, system concept

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