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Author: Mr. Alejandro Salado
Stevens Institute of Technology, United States

Dr. Roshanak Nilchiani
Stevens Institute of Technology, United States

CATEGORIZING REQUIREMENTS TO INCREASE THE SIZE OF THE SOLUTION TRADESPACE: MOVING AWAY FROM NASA AND ESA'S REQUIREMENTS CATEGORIZATION MODELS

Abstract

Requirements are known as a key element in the success of a system and its development: they define what a system is expected to do; more generally, they establish the boundaries of the problem to be solved. During elicitation a categorization template is usually employed in order to ensure completeness. The same categories are used during design in order to ease the understanding of the designers with respect to what needs to be achieved. In order to harmonize this process space agencies have standardized categorization models based on their heritage, being the ones developed by the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) widely used. However, these categorizations present a major flaw: they do not fulfill the partition criterion. As a consequence, these categorization models facilitate the existence of overlapping requirements, which increases the necessary effort to manage and control requirements and increases the probability of inconsistent information. In addition, both models have been defined following a designer-perspective, i.e. requirements are organized according to design needs or attributes, and consequently they facilitate the elicitation of design-dependent requirements, which constraint (reduce) the solution tradespace without satisfying new needs. The reduction in size of the solution tradespace increases the difficulty to find better solutions and the time required to explore the tradespace for a satisfactory solution. As a result affordability is threatened. Would it be then possible to classify requirements differently so that they facilitate the elicitation of constraint-free specifications, thus promoting system affordability? The present research tests categorization models that fulfill the partition criterion as alternatives to traditional models and proves how they can support the elicitation of design-independent requirements for space systems and the identification of self-imposed constraints that do not support the satisfaction of new needs, or in other words, that maximize the solution tradespace for a given amount of needs.