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METHODS FOR ENGINEERING CHANGE PROPAGATION ANALYSIS

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Abstract

The aim of the methods described in this paper are to simulate and analyse the propagation of changes in an engineering product, process and/or organisation, so that time, cost, and resources can be allocated according to the impact of the change. The paper presents advanced concepts for capturing dependencies between such viewpoints of the overall engineering system. In the proposed approach, simple Boolean dependencies and dependency strengths can be described along with types and levels of change. The objective is to define dependencies more completely by taking into account that the number and the strength of these may vary throughout the product lifecycle. Case studies from the aerospace industry are being used to test the advantages and limitations of the proposed engineering change propagation analysis methods.

1 Introduction

Changes to the design of a product occur frequently during the various phases of the product development lifecycle, from concept, through definition and development, to manufacture, and then into service. Changes are required to fix problems or to improve or update products. It is often the case that new products are variants or derivatives of existing ones. Hence, changes can have different origins or nature, and often not all the consequences of a given change are expected or wanted. The effectiveness and efficiency with which a company can predict or control these changes could have a significant impact on its competitiveness.

In a complex product, where the constituent parts and systems are closely dependent, changes to one item of a system are highly likely to result in a change to another item, which in turn can propagate further. It is widely acknowledged [14] that change propagation analysis (CPA) is necessary for predicting and simulating the impact of change, in order to improve the capacity to manage time, cost, resources and quality. Current practices for analysing the propagation of engineering changes (ECs) often use configuration management procedures and rely heavily on human communication, the knowledge and experience of individuals in a specific system area, as well as common sense. Due to the globalisation and fragmentation of the aerospace and other industrial sectors there appears to be a need for a more integrated and shared CPA approach within organisations and across their supply chains.

Therefore, the objective of this research is to develop an approach to support decision-making in EC processes and the discrimination between concept alternatives [24]. Also, a shared view between all actors could enable a better understanding of the collaborative and concurrent environment. Furthermore, the approach should enhance the anticipation and identification of key design levers and ultimately improve the design robustness.

In this context, the methods discussed in this paper attempt to capture knowledge about dependencies within systems and related information more completely and exploit this knowledge to identify the possible impact of an