

Relation Analysis Among Patterns on Software Development Process

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Abstract. The activity of the software process improvement can be supported by reusing various kinds of knowledge on existing successful software processes in the form of process patterns. There are several catalogs of process patterns available on WWW; however, all of relations among patterns are closed in each pattern catalog. To acquire the cross-cutting relations over the different process pattern catalogs, we have applied the technique for the automatic relation analysis among the patterns. Our technique utilizes existing text processing techniques to extract patterns from documents and to calculate the strength of pattern relations. As a result of experimental evaluations, it is found that the system implementing our technique has extracted appropriate cross-cutting relations over the different process pattern catalogs without information on relations described in original pattern documents. These cross-cutting relations will be useful for dealing with larger problems than those dealt with by individual process patterns.

1 Introduction

In the activity on software process improvement, we use various types of knowledge such as well-known successful organizational structures, successful existing development processes, and successful techniques for project management. If we can share and reuse such existing experience-based proven knowledge (i.e. know-how), we will be able to achieve more efficient software process improvement. One of sharing and reusing methods to express such knowledge is to describe the knowledge used in defining software processes as a software pattern.

A process pattern is a software pattern that describes a proven and successful approach for developing software[1]. Several catalogs of patterns regarding

software process are available in public on the World Wide Web (WWW) and in other resources, such as the business process reengineering pattern language[2], the development process generative pattern language[3, 4], and the process improvement patterns[5]. However, all of relations among provided process patterns are closed in each pattern catalog. Therefore, users of available process patterns can just reuse each process pattern in the context defined in each catalog. In other words, users cannot seamlessly reuse two or more process patterns that belong to the different catalogs. Some researchers have claimed that cross-cutting pattern relations over the different catalogs are not useful because the context that each of catalogs assumes might be different[6]; however, there is no experimental evidence for that claim. Therefore, there might be a useful cross-cutting relation, which is not explicitly described in original pattern documents.

The relation analysis among process patterns involves determining the relation among two or more patterns, and obtaining the set of patterns that relates mutually. The purpose of the analysis is to obtain a combination of patterns. A combination of patterns can deal with larger problems than individual patterns can. Moreover, two or more solutions with different constraints might exist for the same problem. Therefore, a variety of patterns giving a solution to a certain problem can exist. In this case, the user/developer should select the best pattern according to the constraints. At this time, the user wants to obtain many patterns that can be applied to the target problem. Therefore, it is important to analyze the relations among patterns.

There are several approaches for analyzing relations among patterns by hand, such as [7] [8] [9]. However, conventional approaches have only used the small number of patterns. There are difficulties in the following activities associated with the manual analysis (i.e. analyzing by hand).

- Analyzing the relations among a large number of patterns.
- Directly comparing patterns in different pattern forms with each other.
- Directly comparing patterns published in different catalogs with each other.

The relation analysis among a large number of patterns by hand is not realistic. An automatic approach that can be applied to a large number of patterns is required; however, to the best of our knowledge, there is no approach for automatic relation analysis. Moreover, none of the conventional manual approaches has been applied to process patterns.

In this paper, we have applied our technique for the automatic pattern relation analysis[10] to several process patterns that are collected manually from WWW, in order to acquire the cross-cutting relations over the different process pattern catalogs. Our analysis technique can treat major pattern forms and various process patterns belonging to different catalogs, by using a common pattern model and several text processing techniques (such as stop-word removal[11], stemming[12], the TF-IDF term weighting method[13], and vector space model[11]).