UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORD MOTOR COMPANY

Petitioner,

v.

VERSATA SOFTWARE, INC.

Patent Owner.

DECLARATION OF DR. RALPH BERGMANN

I, Dr. Ralph Bergmann, hereby declare as follows:

1. I currently am employed the University of Trier, in Germany. I have personal knowledge of the matters stated below. I am over 18 years of age, and I am competent to testify regarding the following.

2. Attached as Exhibit A to this declaration is a true and accurate copy of the article that I am a co-author of titled "A Customization Approach for Structured Products in Electronic Shops." On May 31, 2000, I included a link to the paper attached in Exhibit A on the webserver of the University of Kaiserslautern in Germany, were I was employed during this time. That webserver included a list of links to my published articles, and was publicly accessible via the internet.

3. The webserver including the list of my published articles and the associated links, was also linked to the research group that I was working with at the time, which specialized

in Artificial Intelligence and Knowledge Based Systems. Furthermore, that research group webpage was linked to the University of Kaiserslautern's Computer Science Department. Therefore, individuals visiting the University of Kaiserslautern website seeking information about Artificial Intelligence and Knowledge Based Systems would be able to find the research group webpage and visit my personal page, including the link to the paper attached as Exhibit A.

4. In 2004, I moved to the University of Trier, where I set up a new web server to publicly host and share my published articles. For this new webserver, I converted the word version of of the article titled "A Customization Approach for Structured Products in Electronic Shops" (attached as Exhibit A) into a pdf file, and made that pdf file publicly accessible on my new webpage, located at http://www.wi2.uni-trier.de/publications/WI2Pub.html.

5. Therefore, my article titled "A Customization Approach for Structured Products in Electronic Shops," included in Exhibit A was made publicly available via the webpage on the webserver of the University of Kaiserslautern no later than May 31, 2000.

I declare under the penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on: October 14th, 2016 R. Bergmann
Date Dr. Ralph Bergmann

Electronic Commerce: The End of the Beginning

13th International Bled Electronic Commerce Conference

Bled, Slovenia, June 19-21, 2000

A Customization Approach for Structured Products in Electronic Shops

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Abstract

Customers of electronic shops find more and more support for the search and selection of products in the sales systems. Unfortunately, most of the shops do not provide additional support with parameterizable or configurable products. Such products could be further customized. One of the major problems most customization techniques suffer from is that they require large knowledge acquisition effort, which leads to problems in the rapidly changing e-Commerce scenario. In this paper, we present a new approach to customization that is particularly suited to e-Commerce applications. It assumes that products can be structured hierarchically into sub-components. Customization is achieved by incrementally replacing unsuitable sub-components through recursively finding best-matching alternative sub-components, using Case-Based Reasoning technology for this search process. The presented approach avoids huge portions of the knowledge acquisition effort. The approach is implemented as a prototypical system.

1. Introduction

A sales system that offers products that can be modified to some degree has to provide its customers with the possibility to further customize the base products, i.e. to enable the customer to tailor the base products according to her or his wishes. Examples of appropriate products, i.e. customizable products, are technical equipment like computers [12], designs for electrical engineering [10], holiday trips, service products like insurances or investment plans, etc. For this paper, we limit our considerations to the customization of complex technical systems.

Customization is especially important when complex products with a large number of possible variants must be supported during sales [7]. Product customization can be realized by the known customization techniques. However, the applicability of the different techniques strongly depends on the kind of products to be supported, in particular on the number of different variants. A general problem of most approaches to customization is that they require a large effort for acquiring the customization knowledge, to be represented, e.g., by rules or by operators [7]. This turns into a real problem when products have many different variants or if the product spectrum changes rapidly so that the customization knowledge must be updated. Other approaches require a complete problem solver for product recommendation and sufficient knowledge for this problem solver. Such approaches also suffer form intractability, both in terms of computational efficiency

and knowledge acquisition effort. Hence, for customizing complex products with a large number of possible variants, the existing customization approaches are often not suitable in practice.

In this paper, we present a new approach to customization that is particularly suited to electronic commerce applications. This approach avoids huge portions of the knowledge acquisition effort of the previous approaches. It assumes products that are structured into sub-components, possibly in a hierarchical manner. The knowledge required is knowledge about available pre-configured complete products as well as knowledge about available sub-components. Both kinds of knowledge are easily available in an electronic commerce setting. After retrieving the best pre-configured product with respect to the customer's requirements, the product is customized by incrementally replacing sub-components by more suitable sub-components. These new sub-components are determined by recursively applying CBR, i.e. similarity-based product retrieval, on the level of the sub-components [1, 7]. In the remainder of this paper, this approach is described in more detail. We will first describe a typical e-Commerce scenario and analyze the shortcomings of existing approaches. Then the general idea of recursive CBR is introduced before it is specialized for the purpose of product customization. Finally, we report on the current state of the implementation.

2. Product Customization in e-Commerce Applications

Within the set of possible products, a continuum of products can be identified (see Fig. 1) [12]. It classifies different products according to their ability to be customized by a customer. Generally, we distinguish between constant and variable products. Constant products are products which cannot be modified by the customer. The product is fixed in such a case. Variable products may be customized via product parameterization or product configuration. We differentiate between different kinds of such a customization.

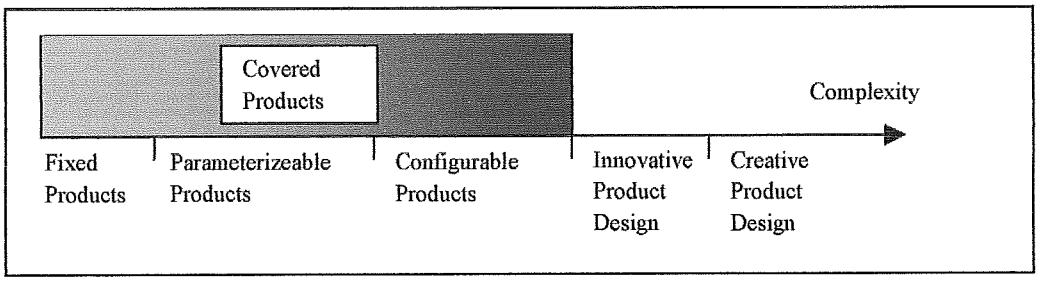

Fig. 1. The Continuum of Products.

2.1 General Product Categories

Fixed Products: At the lower end of this continuum we have fixed products. The product cannot be modified and as a result, the sales assistant cannot customize the product. Examples are music CDs, books, integrated circuits, etc., or a single computer monitor, where the product is completely fixed.

Parameterizeable Products: Next on the continuum, we find products which are parameterizeable by certain values. These values may be discrete, like the color of a good and also they may be continuous values, like the capacity of a storage device. The sales assistant may calculate these values or he may use given or existing ones during the sales process. However, the product may only be modified by the instantiation of one or more parameters concerning the product.

Configurable Products: Next, we have configurable products which consist of a set of predefined components and the knowledge about how components can be connected. Further, all available components must be known and also all the knowledge how components are allowed to be connected. During the sales process the sales assistant has to configure the product for the customer.

We will not cover innovative product design which produces an artifact significantly different from existing ones or even creative product design products which produce a new type of artifact. Examples for such tasks are the design of complete assembly lines, a one-family house, or other complex products which do not have a very similar prototype in the past.

2.2 Case-Based Product Recommendation: The Scenario

During recent years, the technology known under the term Case-Based Reasoning (CBR) has become a successful tool to realize product customization. The main idea behind CBR is the assumption that it should be possible to use experiences of the past, called cases, to solve actual problems. In an e-Commerce scenario, the cases are represented by the available products or their descriptions respectively. The actual problem that has to be solved is given through a set of customer demands, i.e. the customer formulates his needs and wishes on a searched product. We consider the scenario in which a customer enters a virtual shop to buy a complex technical system. Complex technical systems (e.g., PCs) can usually be decomposed into a set of different components. We suppose that the shop offers a set of pre-configured standard systems as well as the different individual components.

If the shop provides an intelligent product recommendation agent the first step of the sales process is a demand acquisition phase in which the customer states his individual demands on the searched product. The result of this demand acquisition phase can be formulated in form of an incomplete product description (on a technical level) which we call *query*. This query is then used to start a similarity-based retrieval in order to determine one of the available pre-configured standard systems that fulfills the demands as well as possible. However, because of the large number of possible product variants, the retrieved product does usually not fulfill the demands exactly. Hence, to be able to present the customer a satisfying result, it is necessary to customize the product, e.g., by replacing some components by more suitable ones [9]. This is the task of the adaptation phase of CBR. In the following, we review several well-known approaches to adaptation in CBR and discuss whether they are appropriate for the customization of complex products.

2.3 Existing Approaches

Customization Rules and Customization Operators. The knowledge how existing solutions can be adapted on actual problems is encoded explicitly. Adaptation rules [3] consist of a set of preconditions and a set of actions. Dependent on the evaluation of the preconditions, the actions are able to modify a retrieved case to a new target case with respect to the given query. Customization operators [7] are very similar to adaptation rules. While the rules will be executed after the retrieval automatically, the operators provide more control by the customer. Therefore, the retrieved case with an additional set of applicable operators will be presented to the customer. If the retrieved product does not fulfill his demands, he can repeatedly choose operators to change the given product until he gets a satisfying result.

The general problem of both approaches is the necessity to define every possible case modification that may occur explicitly in the form of preconditions and actions. Therefore, even simple domains often require a large number of customization rules or operators to cover all customization possibilities. For really complex domains, the huge amount of necessary rules or operators prevents the application in practice.

Configuration From-Scratch. The configuration of a product can also be performed from-scratch by classic configuration systems [4] without using CBR. Applying such a system for the customization of products in an e-Commerce application often leads to some disadvantages. First, if it is impossible to configure a product that fulfills all customer demands exactly, such a system rarely finds a suitable alternative solution. Second, in classic configuration systems it is often difficult to handle optimality criteria. Therefore, the system can only present any solution (if existing), but a high quality of this solution cannot be guaranteed in general. An additional problem of the from-scratch configuration is the time-critical aspect, i.e. the configuration process usually takes a lot of calculation time. This is often not acceptable in e-Commerce applications.

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