Chapter 6
Kansei Database and AR*-Tree for Speeding up the Retrieval

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ABSTRACT
Along with Kansei information being successfully introduced to information retrieval systems, particularly multimedia retrieval systems, many Kansei retrieval systems have been implemented in the past two decades. And, it has become clear that the traditional multimedia retrieval systems using key-words or/and other text information are not enough in many applications, because that they can not deal with sensitive words reflecting user’s subjectivity. In this chapter, Kansei retrieval systems efficiently taking user’s subjectivity into account will be discussed in detail. Like many traditional retrieval systems, Kansei retrieval systems are also based on databases system, which are called Kansei databases. After roughly introducing some existing Kansei retrieval systems is a general flow for designing Kansei retrieval systems. Also, we will discuss how to speed up the Kansei retrieval systems by using multidimensional indexing technologies and you will learn that our proposed multidimensional index structure, Adaptive R*-tree (AR*-tree for short), is more suitable to Kansei retrieval systems than the traditional multidimensional indexing technologies.

1. INTRODUCTION
Information retrieval systems are certainly user-oriented, where how to reflect user’s subjectivity becomes an important and hard problem. When a user wants to search for something, for instance a passenger car or a costume, he/she normally have a kind of feeling such as “graceful and looks intelligent, but not so expensive.” This feeling is called as “Kansei” in Japanese, which means the user’s psychological feeling as well as the physiological issues. Unfortunately, traditional information retrieval systems cannot efficiently deal with the search requests given with Kansei words.

In recent decades, Kansei retrieval systems that can process Kansei words and Kansei in-
formation have attracted many attentions. Like many traditional retrieval systems, the Kansei retrieval systems are also based on databases (called Kansei databases) and Kansei is usually expressed with emotional words such as beautiful, romantic fantastic, comfortable, calm, and so on. For instance, image retrieval systems having an ability to handle subjective expressions are useful especially when the users, who have not enough knowledge about contents of the image database and have no specific query image, try to retrieve unknown images using some Kansei words (e.g., “beautiful”, “calm”, etc.). However, because the key-words processes in traditional retrieval systems are registered by operators and they are influenced by the operators’ subjectivities, it is difficult to obtain the data based on user’s feeling or Kansei by using the traditional key-word retrieving methods. This means that the traditional retrieval systems using key-words or/and other text information cannot deal with sensitive words reflecting user’s subjectivity. Thus, they are not enough in many applications.

In this chapter, after briefly introducing some existing Kansei retrieval systems, a general flow for designing Kansei retrieval systems is presented. Then, we will discuss how to speed up Kansei retrieval processes using multidimensional indexing technologies. Some existing multidimensional index structures that are possibly used to Kansei retrieval systems are introduced. From the discussions and experimental result, you will learn that our proposed index structure, Adaptive $R^*$-tree ($AR^*$-tree for short), is more suitable to Kansei retrieval systems than others. Finally, we will briefly summarize this chapter.

2. SOME EXISTING KANSEI RETRIEVAL SYSTEMS

Many Kansei retrieval systems aiming at specific applications have been proposed in the last two decades. Some selected examples are briefly introduced here.

Kurita (1992) proposed a retrieval method on image databases using sensitive words reflecting user’s subjectivity. Because the user’s subjectivity such as visual impressions (e.g., fantastic, nice…) may be very different from each other even to the same picture, it is difficult to register each picture along with the visual impressions of all the possible users. The authors adopted a learning stage, in which some typical pictures are selected for the users learning. And a relationship (user’s model) can be obtained between the sensitive words of each user and the features of the pictures. This relationship can be used for future Kansei retrievals.

Fukuda (1995, 1996) proposed a method for a textile-design image database system. In this method, a relationship was built between Kansei words and the features of the images (e.g., the color or the pattern shape). This is similar to the idea in the work of Kurita (1992). In addition, a new human interface based on “Kansei” retrieval method using user models was developed for a distributed image database systems of textile designing. This method provided an easy and flexible access to the image database by specifying certain Kansei words that make users more satisfied with the retrieval result. Furthermore, the user model would be updated after evaluating the difference between his/her Kansei and objective model based on knowledge-base.

Harada (1999) proposed a method for retrieving the relevance between Kansei words and the shape features of images. Their purpose is to study a methodology for building an image data retrieval system. The system can accept natural language sentences that contain subjective expressions. In this method, images are retrieved interactively using comparative sentences. In order to interpret sentences including subjective expressions and match the images, a space that binds subjective expressions and image features is introduced. The conditions that the space should satisfy and