

IRM PRESS

701 E. Chocolate Avenue, Hershey PA 17033-1117, USA Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.irm-press.com ITB9204

Chapter XI

Novel Indexing Method of Relations Between Salient Objects

R. Chbeir Laboratoire Electronique Informatique et Image, Université de Bourgogne, France

Y. Amghar Laboratoire d'Ingénierie des Systèmes d'Information, INSA de Lyon, France

A. Flory Laboratoire d'Ingénierie des Systèmes d'Information, INSA de Lyon, France

ABSTRACT

Since the last decade, images have been integrated into several application domains such as GIS, medicine, etc. This integration necessitates new managing methods particularly in image retrieval. Queries should be formulated using different types of features such as low-level features of images (histograms, color distribution, etc.), spatial and temporal relations between salient objects, semantic features, etc. In this chapter, we propose a novel method for identifying and indexing several types of relations between salient objects. Spatial relations are used here to show how our method can provide high expressive power to relations in comparison to the traditional methods.

INTRODUCTION

During the last decade, a lot of work has been done in information technology in order to integrate image retrieval in the standard data processing environments. Image retrieval is involved in several domains (Yoshitaka, 1999; Rui, 1999; Grosky, 1997;

This chapter appears in the book, *Effective Databases for Text & Document Management* by Shirley A. Becker. Copyright © 2003, IRM Press, an imprint of Idea Group Inc. Copying or distributing in print or electronic forms without written permission of Idea Group Inc. is prohibited.

Smeulders, 1998) such as GIS, medicine, surveillance, etc., where queries' criteria are based on different types of features such as metadata (Trayser, 2001; Sheth, 1998; Duncan, 2000), low-level features (Wu, 1995; Berchtold, 1997; Veltkamp, 2000), semantic features (Oria, 1997; Mechkour, 1995; Chu, 1998), etc.

Principally, relations between salient objects are very important. In medicine, for instance, the spatial data in surgical or radiation therapy of brain tumors is decisive because the location of a tumor has profound implications on a therapeutic decision (Chbeir, 2000, 2001). Hence, it is crucial to provide a precise and powerful system to express spatial relations.

In the literature, three major types of spatial relations are proposed (Egenhofer, 1989):

• *Metric relations* measure the distance between salient objects (Peuquet, 1986). For instance, the metric relation "far" between two objects A and B indicates that each pair of points A_i and B_i has a distance greater than a certain value d.

• *Directional relations* describe the order between two salient objects according to a direction, or the localization of a salient object inside images (El-kwae, 1999). In the literature, 14 directional relations are considered:

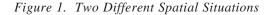
- Strict: north, south, east, and west
- Mixture: north-east, north-west, south-east and south-west
- Positional: left, right, up, down, front and behind

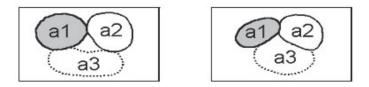
Directional relations are *rotation variant* and there is a need to have referential base. Furthermore, directional relations do not exist in certain configurations.

• *Topological relations* describe the intersection and the incidence between objects (Egenhofer, 1991, 1997). Egenhofer (1991) has identified six basic relations: *disjoint, meet, overlap, cover, contain* and *equal*. Topological relations present several characteristics that are *exclusive* to two objects (i.e., there is one and only one topological relation between two objects). Furthermore, topological relations have *absolute* value because of their constant existence between objects. Another interesting characteristic of topological relations is that they are transformation, translation, scaling and zooming *invariant*.

In spite of all the proposed work to represent complex visual situations, several shortcomings exist in the methods of spatial relation computations. For instance, Figure 1 shows two different spatial situations of three salient objects that are described by the same spatial relations in both cases: topological relations — a1 Touch a2, a1 Touch a3, a2 Touch a3; and directional relations — a1 Above a3, a2 Above a3, a1 Left a2.

The existing systems do not have the required expressive power to represent these situations. Thus, in this chapter, we address this issue and propose a novel method that





Copyright © 2003, Idea Group Inc. Copying or distributing in print or electronic forms without written permission of Idea Group Inc. is prohibited.

7 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igiglobal.com/chapter/novel-indexing-method-relationsbetween/9211

Detween/921

Related Content

Agility in Software Development and Project Value: An Empirical Investigation

VenuGopal Balijepally, Gerald DeHondt, Vijayan Sugumaranand Sridhar Nerur (2017). *Journal of Database Management (pp. 40-59).* www.irma-international.org/article/agility-in-software-development-and-project-value/194999

Investigating Goal-Oriented Requirements Engineering for Business Processes

Geert Poels, Ken Decreus, Ben Roelensand Monique Snoeck (2013). *Journal of Database Management (pp. 35-71).*

www.irma-international.org/article/investigating-goal-oriented-requirements-engineering-forbusiness-processes/86283

Blockchain Adoption in Banking Systems: A Boon or Bane?

Sugandh Aroraand Tawheed Nabi (2022). *Applications, Challenges, and Opportunities of Blockchain Technology in Banking and Insurance (pp. 19-42).* www.irma-international.org/chapter/blockchain-adoption-in-banking-systems/306453

Incorporating I Ching Knowledge Into Prediction Task via Data Mining

Wenjie Liu, Sai Chen, Guoyao Huang, Lingfeng Lu, Huakang Liand Guozi Sun (2023). *Journal of Database Management (pp. 1-16).* www.irma-international.org/article/incorporating-i-ching-knowledge-into-prediction-task-via-data-mining/322097

Technology versus Methodology Support for Database Design: A Study of Designer Choice Related to Perception and Performance

Thomas E. Marshalland Michael L. Gibson (1996). *Journal of Database Management* (pp. 3-13).

www.irma-international.org/article/technology-versus-methodology-support-database/51168