

Chapter 27

Development of Image Engineering in the Last 20 Years

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ABSTRACT

This chapter provides a summary of a bibliography series on image engineering (IE) for 20 years. This bibliography series already contains more than 12,000 publications selected from more than 50,000 publications in IE-related journals. Twenty years ago, a bibliography series on IE was started. With a set of carefully selected journals and a thorough reading on the papers published, several hundreds of papers related to IE have been chosen each year for further classification and statistical analysis. This chapter will present an overview of this survey series by showing the ideas behind and consideration on this work, as well as the comprehensive statistics obtained from this work. Some insights from it are also discussed.

INTRODUCTION

In recent years, images become more and more an important medium for human beings to observe the information of the real world around. Images can be obtained by using different observing and capturing systems in various forms and manners. The human visual system is just a typical example of an observation system. In its general sense, the word “image” could include all entities that can be visualized by human eyes, such as a still image or picture, a clip of video, as well as animations, cartoons, charts, drawings, graphics, paintings, even also texts and visual patterns, etc. In the early days, images were called pictures. Nowadays, with the progress of information science and society, the term “image” rather than “picture” is generally used because computers store numerical images of a picture or scene.

Image techniques are those techniques that have been invented, designed, implemented, developed, and utilized to treat various types of images for different and specified purposes (Zhang, 2009b). The researches and applications based on images are turned out to be a hot spot in the modern information society. They have attracted more and more attention in recent years with the fast advances of mathematic theories and physical principles, as well as the progress of computer and electronic devices, etc.

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Image engineering (IE), an integrated discipline/subject comprising the study of all the different branches of image techniques, which has been formally proposed and defined around 20 years ago (Zhang 1996a; Zhang 1996c) to cover the whole domain, has been evolved very quickly. Image engineering is now a very broad subject encompassing mathematics, physics, biology, physiology, psychology, electrical engineering, computer science, automation, etc. Its advances are also closely related to the development of telecommunications, biomedical engineering, remote sensing, surveying and mapping, document processing, industrial applications, etc.

Twenty years ago, a bibliography series on IE have been started. With a set of carefully selected journals and a thoroughly reading on the papers published, several hundreds of papers related to IE are chosen each year for further classification and statistical analysis. This work has been made already for consecutive 20 years (Zhang, 1996a; Zhang, 1996b; Zhang, 1997; Zhang, 1998; Zhang, 1999; Zhang, 2000; Zhang, 2001; Zhang, 2002; Zhang, 2003; Zhang, 2004; Zhang, 2005; Zhang, 2006; Zhang, 2007; Zhang, 2008a; Zhang, 2009a; Zhang, 2010; Zhang, 2011; Zhang, 2012; Zhang, 2013; Zhang, 2014a; Zhang, 2015). The last summary of this survey series can be found in (Zhang, 2014b).

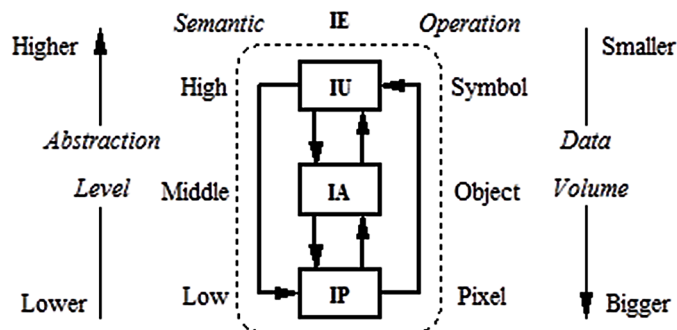
The main purpose of this survey work is triple, that is, to capture the up-to-date development of IE, to make available a convenient means of literature searching facility for readers working in related areas, and to supply a useful reference for the editors of journals and potential authors of papers. This series summarize the selected papers for each year, analyzes the distributions of the selected papers from various sources and provides various statistics about the classified papers in each subject group. This paper will present an overview of this survey series by showing the ideas behind and considerations on this work, as well as the comprehensive statistics obtained from this work. Some insights from it are also discussed.

BACKGROUND

For image engineering that is a new discipline, its scope is first described.

IE, from a perspective more oriented to techniques, could be referred to as the collection of three related and partially overlapped groups of image techniques, that is, Image Processing (IP) techniques (in its narrow sense), Image Analysis (IA) techniques and Image Understanding (IU) techniques. In a structural sense, IP, IA and IU build up three inter-connected layers of IE as shown in Figure 1. Each of them operates on different elements (IP's operand is pixel, IA's operand is object, and IU's operand is symbol) and works with altered semantic levels (from low at IP, via middle at IA, and to high at IU).

Figure 1. Three layers of image engineering



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